

**WebTable 1. Factor variables tested for association with *Phytophthora ramorum* infection**

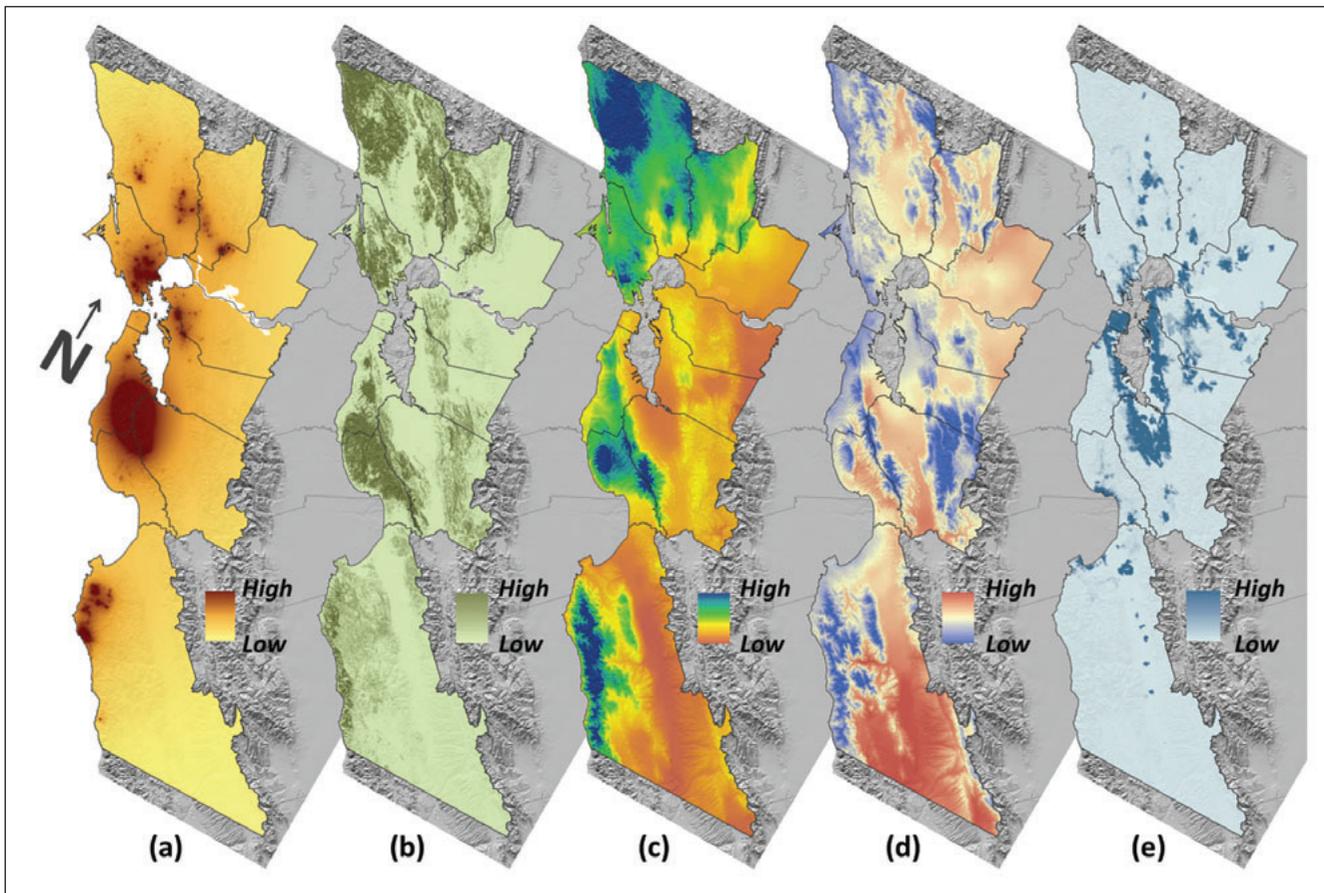
Factors	Variables tested	Base data	Year	Data source
<b>Accessibility</b>	(1) Proximity (km) to roads ( <i>all</i> ) (2) Proximity to roads ( <i>primary and secondary only</i> ) (3) Density of roads ( <i>all</i> ) (4) Density of roads ( <i>primary and secondary only</i> )	TIGER/Line download of <i>all</i> roads and <i>primary and secondary</i> roads in California (CA)	2012	US Census <sup>1</sup>
<b>Population</b>	(1) Population density (persons per square kilometer of habitable land) (2) Housing density (housing units per square kilometer of habitable land)	TIGER/Line download of CA census block data adjusted for area of public lands within each block	2010	US Census <sup>2</sup>
<b>Climate</b>	(1) Mean precipitation (mm; wet season) (2) Mean precipitation (mm; dry season) (3) Mean maximum temperature (°C; wet season) (4) Mean maximum temperature (°C; dry season) (5) Mean minimum temperature (°C; wet season) (6) Mean minimum temperature (°C; dry season)	800-m 30-yr monthly means downscaled to 100-m resolution; wet = 1 Dec to 31 May; dry = 1 Jul to 30 Sep	1981–2010	PRISM <sup>3</sup>
<b>Topography</b>	(1) Solar insolation index (SII); potential mean direct solar radiation in the wet season based on cosine of illumination angle on slope equation (2) Topographic moisture index (TMI); natural log of ratio between upslope contributing drainage area and slope gradient of each location	30-m National Elevation Dataset (NED)	2006	USGS <sup>4</sup>
<b>Vegetation condition</b>	Normalized difference vegetation index (NDVI); the ratio of reflectance values: (near infrared – red)/(near infrared + red)	Landsat TM spectral data	2010	USGS <sup>5</sup>
<b>Host density</b>	Spatial distribution and density of reservoir and alternate infectious hosts	Distribution of host species for <i>P. ramorum</i>	2011	Multiple <sup>6</sup>
<b>Force of invasion</b>	Potential force of invasion by <i>P. ramorum</i> calculated as a negative exponential dispersal kernel <sup>7</sup> : $F_i = \sum_{k=1}^N \exp\left(\frac{-d_{ik}}{a}\right)$	X,Y locations of infected foliar samples	2000–2013	Multiple <sup>8</sup>

**Notes:** <sup>1</sup>US Census Bureau TIGER/Line Shapefiles ([www.census.gov/geo/maps-data/data/tiger-line.html](http://www.census.gov/geo/maps-data/data/tiger-line.html)). <sup>2</sup>US Census Bureau TIGER/Line with Demographic and Economic Data ([www.census.gov/geo/maps-data/data/tiger-data.html](http://www.census.gov/geo/maps-data/data/tiger-data.html)). <sup>3</sup>PRISM Climate Group at Oregon State University ([www.prism.oregonstate.edu](http://www.prism.oregonstate.edu); Daly et al. 2008). <sup>4</sup>US Geological Survey National Elevation Dataset ([ned.usgs.gov](http://ned.usgs.gov)). <sup>5</sup>US Geological Survey Landsat Level 1 Data ([earthexplorer.usgs.gov](http://earthexplorer.usgs.gov)). <sup>6</sup>Data sources as summarized in Meentemeyer et al. (2011). <sup>7</sup>Equation as described in Meentemeyer et al. (2008), Václavík and Meentemeyer (2009), and Meentemeyer et al. (2012). <sup>8</sup>PreBlitz (2000–2007) data as described in Václavík et al. (2012), and Blitz data (2008–2013; [www.sodblitz.org](http://www.sodblitz.org)).

**WebTable 2. Generalized linear logistic regression models of *Phytophthora ramorum* infection probability**

Model	Samples	Equation	Overall predictive accuracy	Optimal ROC threshold	Area impacted (km <sup>2</sup> )
<b>PreBlitz</b>	786(+) 373(-)	$-2.50218 + 0.23966*FOI2006 + 0.00961*HOSTdens + 0.01072*PRECIP$	0.65	0.55	662
<b>2008</b>	879(+) 689(-)	$-5.95512 + 0.16551*FOI2007 + 0.01188*HOSTdens + 0.00737*PRECIP$	0.68	0.35	825
<b>2009</b>	983(+) 1145(-)	$-5.1664 + 0.05235*FOI2008 + 0.01488*HOSTdens + 0.01671*PRECIP$	0.75	0.55	1019
<b>2010</b>	1093(+) 1551(-)	$-4.56107 + 0.03154*FOI2009 + 0.01830*HOSTdens + 0.01491*PRECIP$	0.70	0.45	1120
<b>2011</b>	1640(+) 2562(-)	$-0.06359 + 0.02408*FOI2010 + 0.01728*HOSTdens + 0.01741*PRECIP - 0.25731*Tmax$	0.72	0.45	2847
<b>2012</b>	2261(+) 3600(-)	$-0.03347 + 0.01418*FOI2011 + 0.01897*HOSTdens + 0.01242*PRECIP - 0.21431*Tmax - 0.00019*POPdens$	0.78	0.40	3511
<b>2013</b>	2715(+) 4948(-)	$-2.40005 + 0.00901*FOI2012 + 0.01946*HOSTdens + 0.01730*PRECIP - 0.10708*Tmax - 0.00024*POPdens$	†	0.40	3907

**Notes:** Force of invasion for the year indicated (*FOI*XXXX) has the strongest influence on infection risk for PreBlitz–2010 models. Host density (*HOSTdens*) and mean precipitation during the wet season (*PRECIP*) have a weaker influence on infection risk for all years. Mean maximum temperature during the wet season (*Tmax*) enters the 2011 model as a significant predictor and remains the most important variable in the models through 2013. Population density (*POPdens*) is included in the 2012 and 2013 models, with a weak negative relationship to infection risk. The direction of this effect differs from that observed by Cushman and Meentemeyer (2008); however, their study examined a larger spatial extent at an earlier stage of the pathogen's invasion using fewer observations and a different sampling distribution. Increased sampling in urban areas during the SOD Blitzes may be improving our ability to understand how population density affects disease spread. All model variables are significant at  $P < 0.001$ . *Samples* lists number of cumulative infected (+) and uninfected (-) locations used in models. *Optimal receiver operating characteristic (ROC) threshold* is the infection probability above which a location is considered "high risk" and which maximizes the proportion of samples correctly predicted as "infected" and "uninfected". *Area impacted* is the total area predicted as "high risk" based on whether each location's probability exceeds the optimal ROC threshold. *Overall predictive accuracy* refers to model accuracy when applied to independent presence-absence data from a subsequent year of Blitz sampling. † 2014 Blitz data are not described in this paper.



**WebFigure 1.** Environmental and societal factors associated with risk of *Phytophthora ramorum* infection, including (a) force of invasion, (b) host density, (c) mean precipitation (wet season), (d) mean maximum temperature (wet season), and (e) population density.

#### ■ WebReferences

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