Iterative Forecasting to determine potential program effectiveness for Sudden Oak Death

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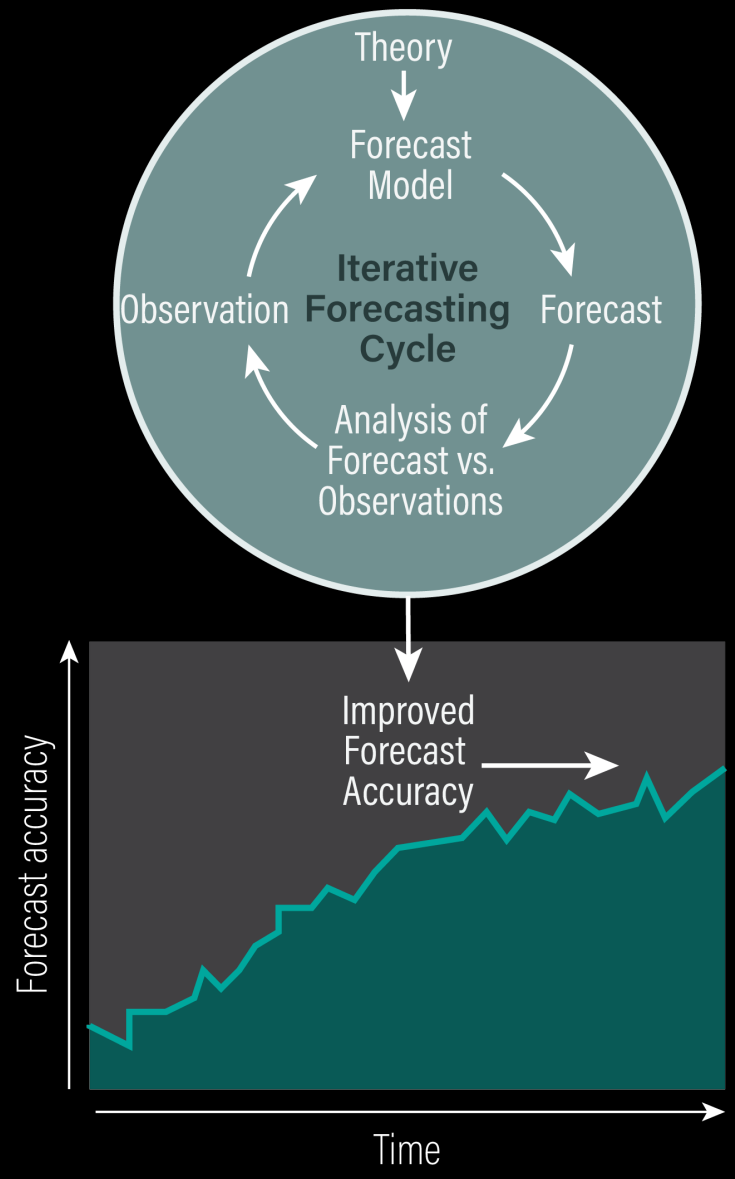
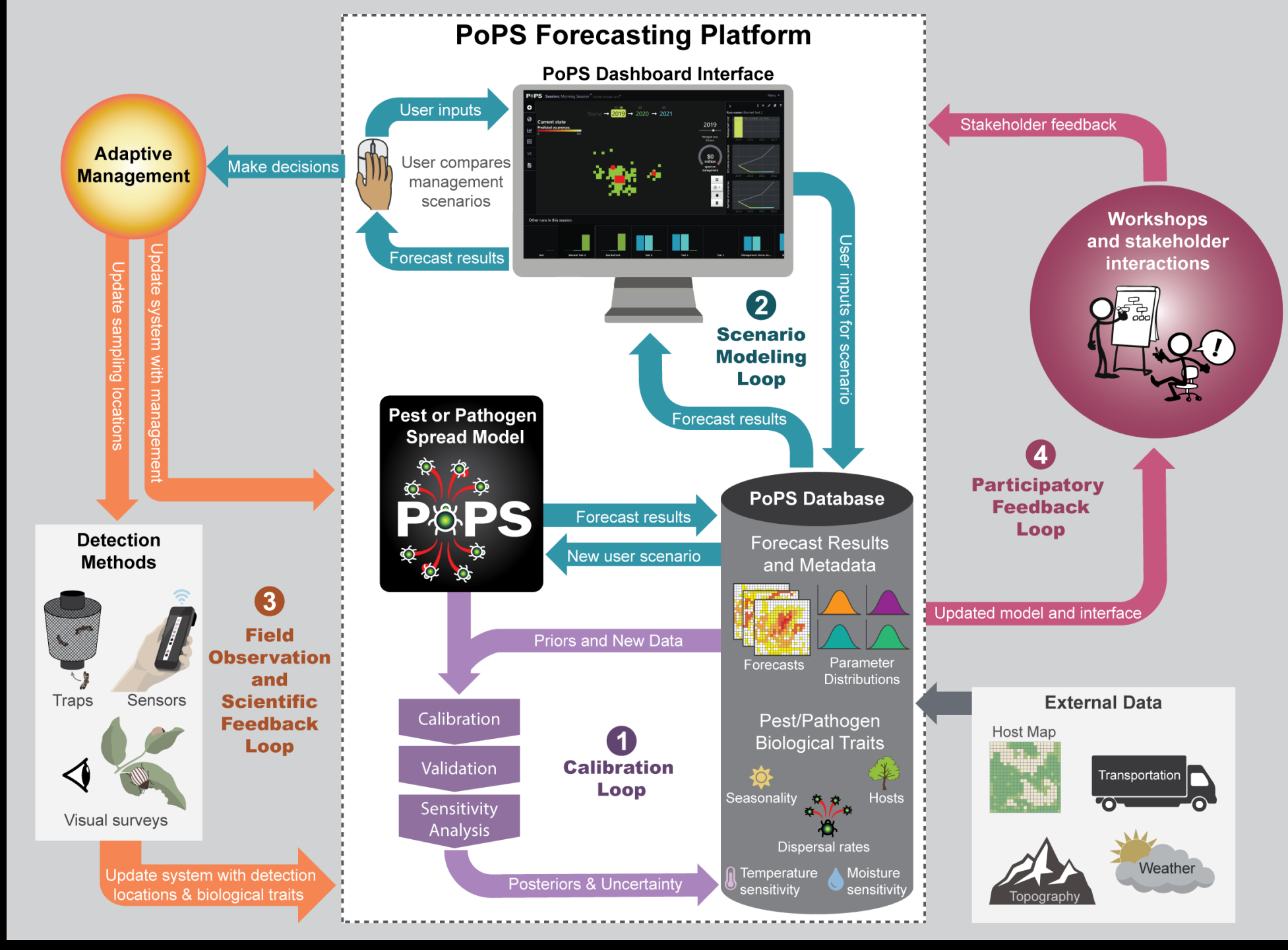
Iterative Forecasting Improves Forecasts Steadily Over Time

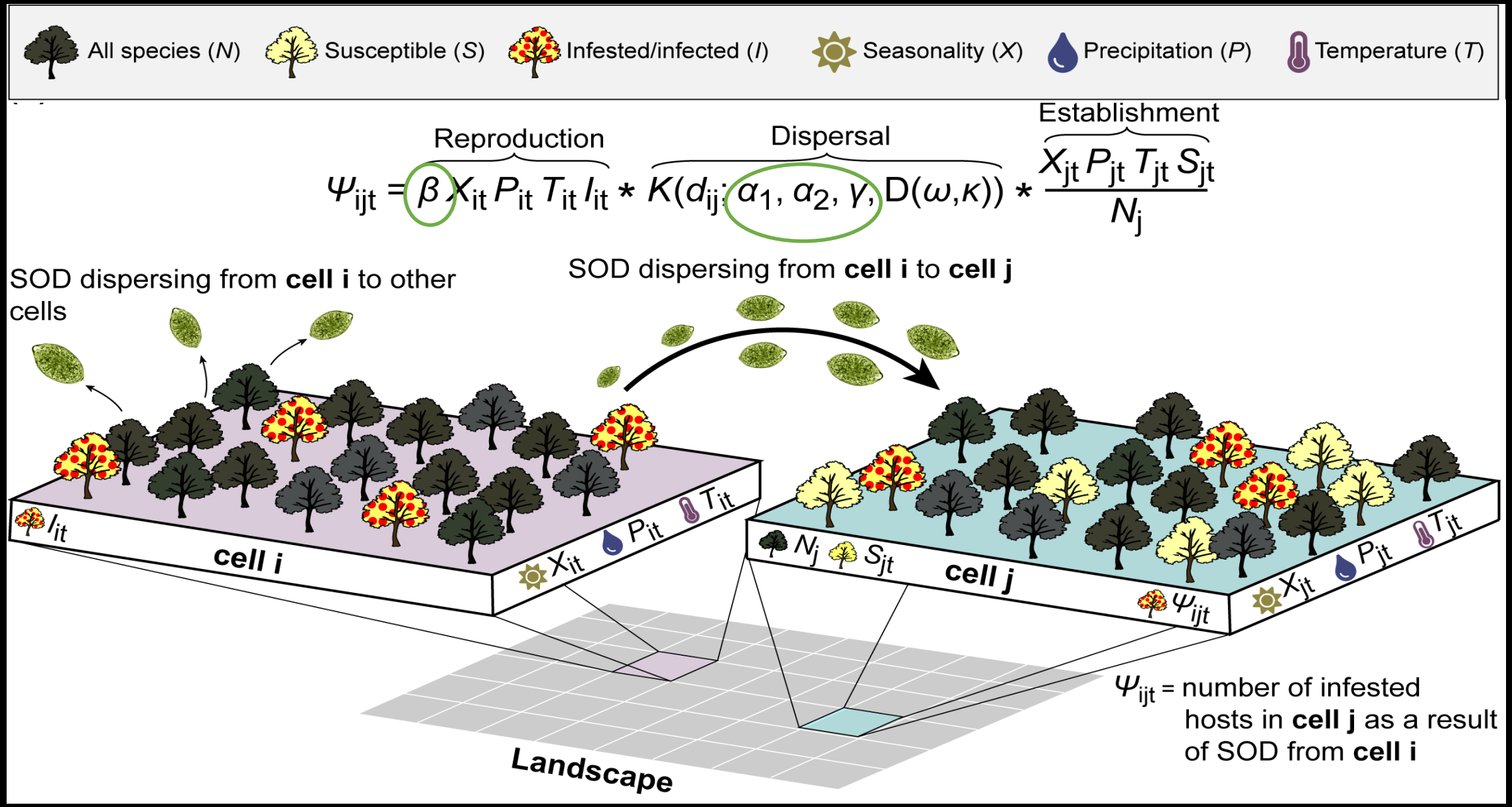


Iterative Forecasting in Ecology:

We believe iterative ecological forecasting can help us improve our ability to model pest and pathogen spread.


PoPS Forecasting Platform
PoPS Dashboard Interface
User inputs
User compares management scenarios
Forecast results
Make decisions
Adaptive Management
Update sampling locations
Update system with management
User inputs for scenario
2
Scenario Modeling Loop
Forecast results
Stakeholder feedback
Workshops and stakeholder interactions
4
Participatory Feedback Loop
Updated model and interface
Pest or Pathogen Spread Model
PoPS
Forecast results
New user scenario
PoPS Database
Forecast Results and Metadata
Forecasts
Parameter Distributions
Pest/Pathogen Biological Traits
Seasonality
Hosts
Dispersal rates
Temperature sensitivity
Moisture sensitivity
Priors and New Data
Calibration
Validation
Sensitivity Analysis
1
Calibration Loop
Posteriors & Uncertainty
Detection Methods
Traps
Sensors
Visual surveys
3
Field Observation and Scientific Feedback Loop
Update system with detection locations & biological traits
External Data
Host Map
Transportation
Topography
Weather

Forecasting SOD spread

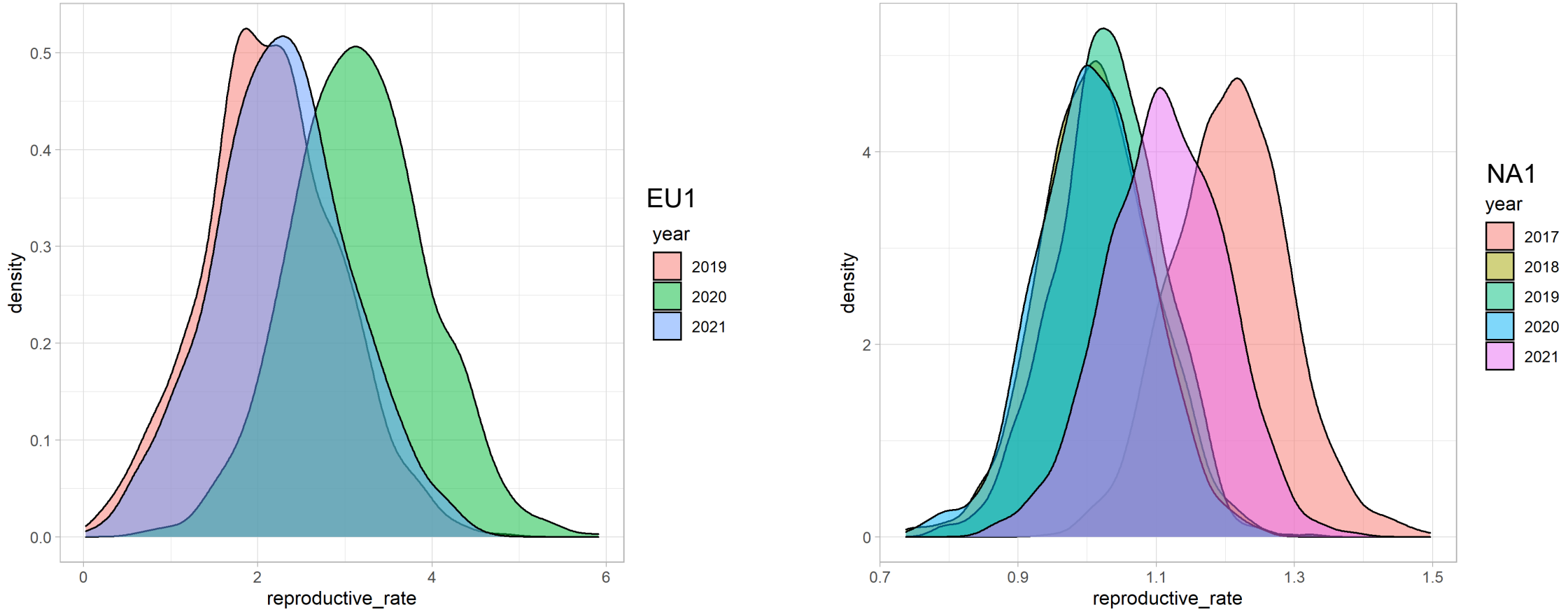


PoPS Forecasting and Control System

Forecasting SLF spread

All species (*N*) Susceptible (*S*) Infested/infected (*I*) Seasonality (*X*) Precipitation (*P*) Temperature (*T*)

$$\Psi_{ijt} = \overbrace{\beta X_{it} P_{it} T_{it} I_{it}}^{\text{Reproduction}} * \overbrace{K(d_{ij}; \alpha_1, \alpha_2, \gamma, D(\omega,\kappa))}^{\text{Dispersal}} * \frac{\overbrace{X_{jt} P_{jt} T_{jt} S_{jt}}^{\text{Establishment}}}{N_j}$$



Forecasting SLF spread

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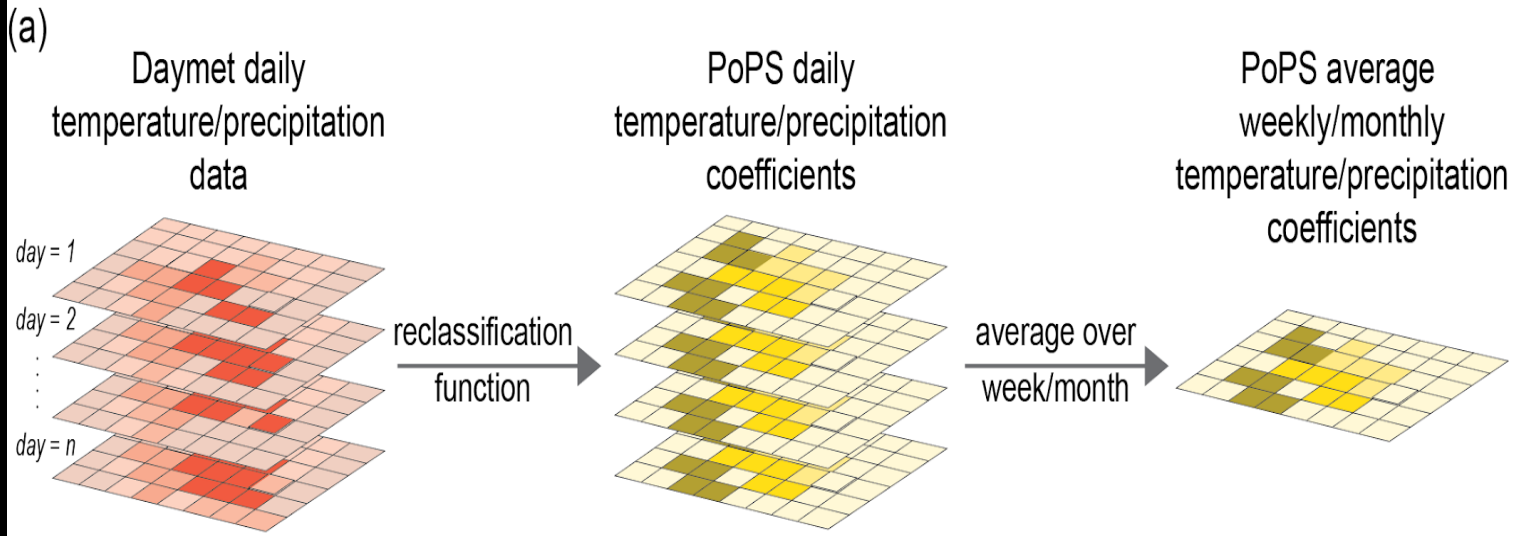
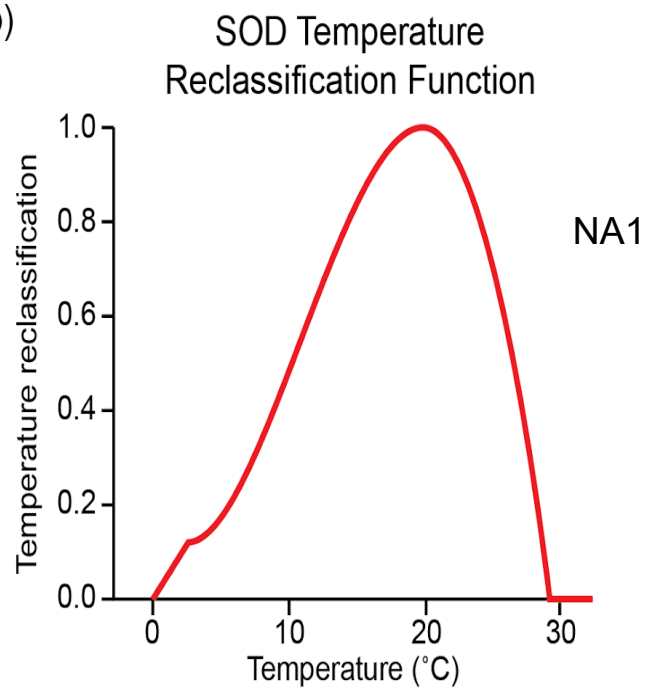
Weather data reclassification

(a)



(b)



Forecasting SLF spread

All species (*N*) Susceptible (*S*) Infested/infected (*I*) Seasonality (*X*) Precipitation (*P*) Temperature (*T*)

$$\Psi_{ijt} = \overbrace{\beta\, X_{it}\, P_{it}\, T_{it}\, I_{it}}^{\text{Reproduction}} * \overbrace{K(d_{ij};\, \alpha_1, \alpha_2, \gamma, D(\omega,\kappa))}^{\text{Dispersal}} * \overbrace{\frac{X_{jt}\, P_{jt}\, T_{jt}\, S_{jt}}{N_j}}^{\text{Establishment}}$$

Weather data reclassification

(a)

Daymet daily temperature/precipitation data

day = 1
day = 2
day = n

reclassification function

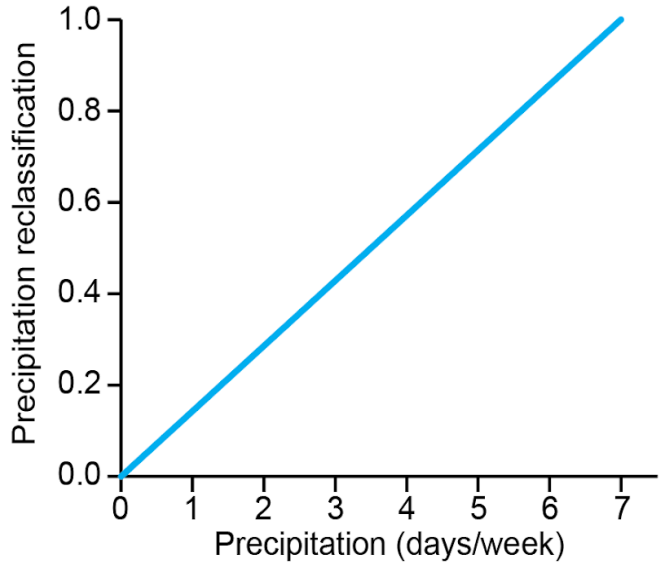
PoPS daily temperature/precipitation coefficients

average over week/month

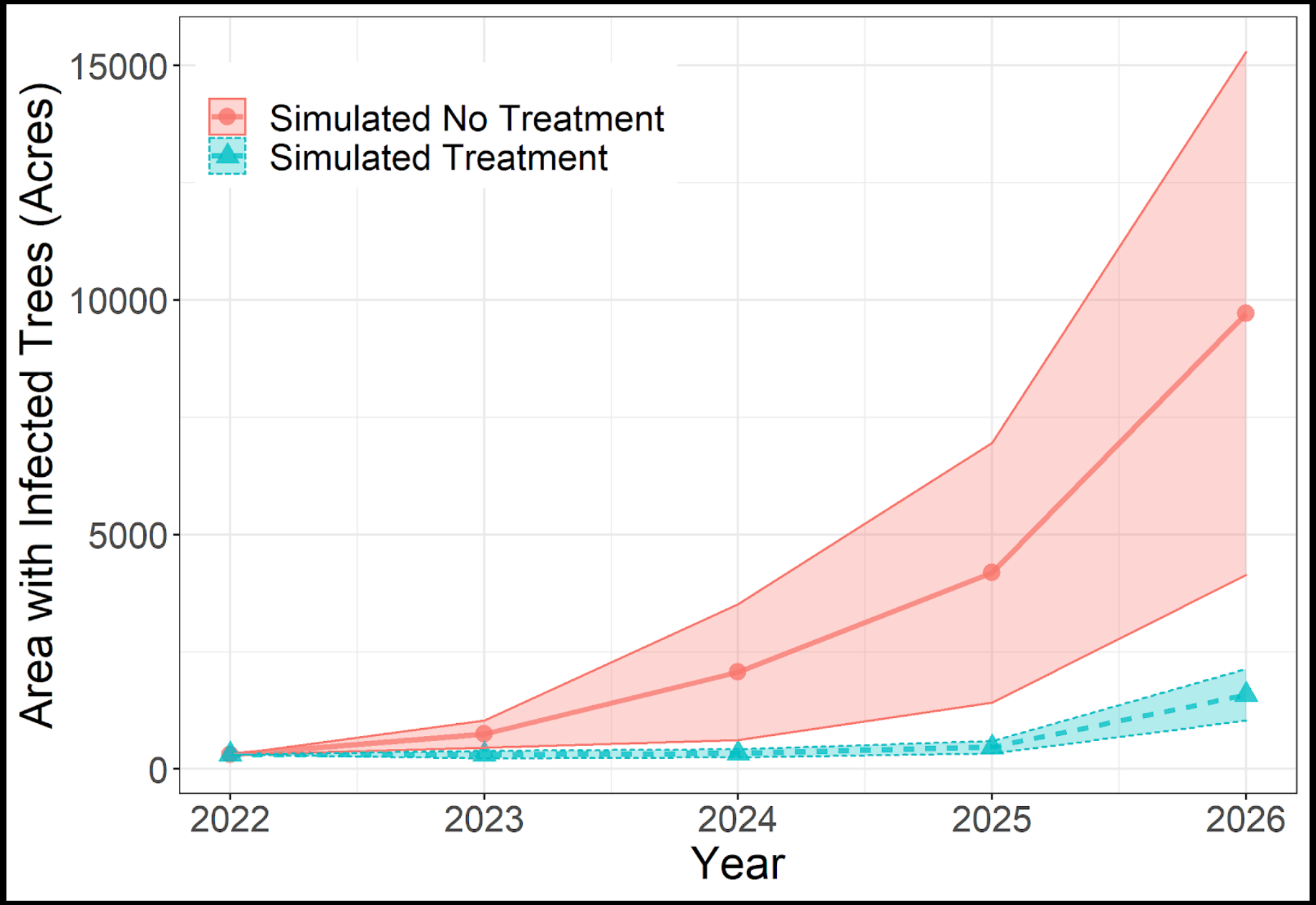
PoPS average weekly/monthly temperature/precipitation coefficients

(c)

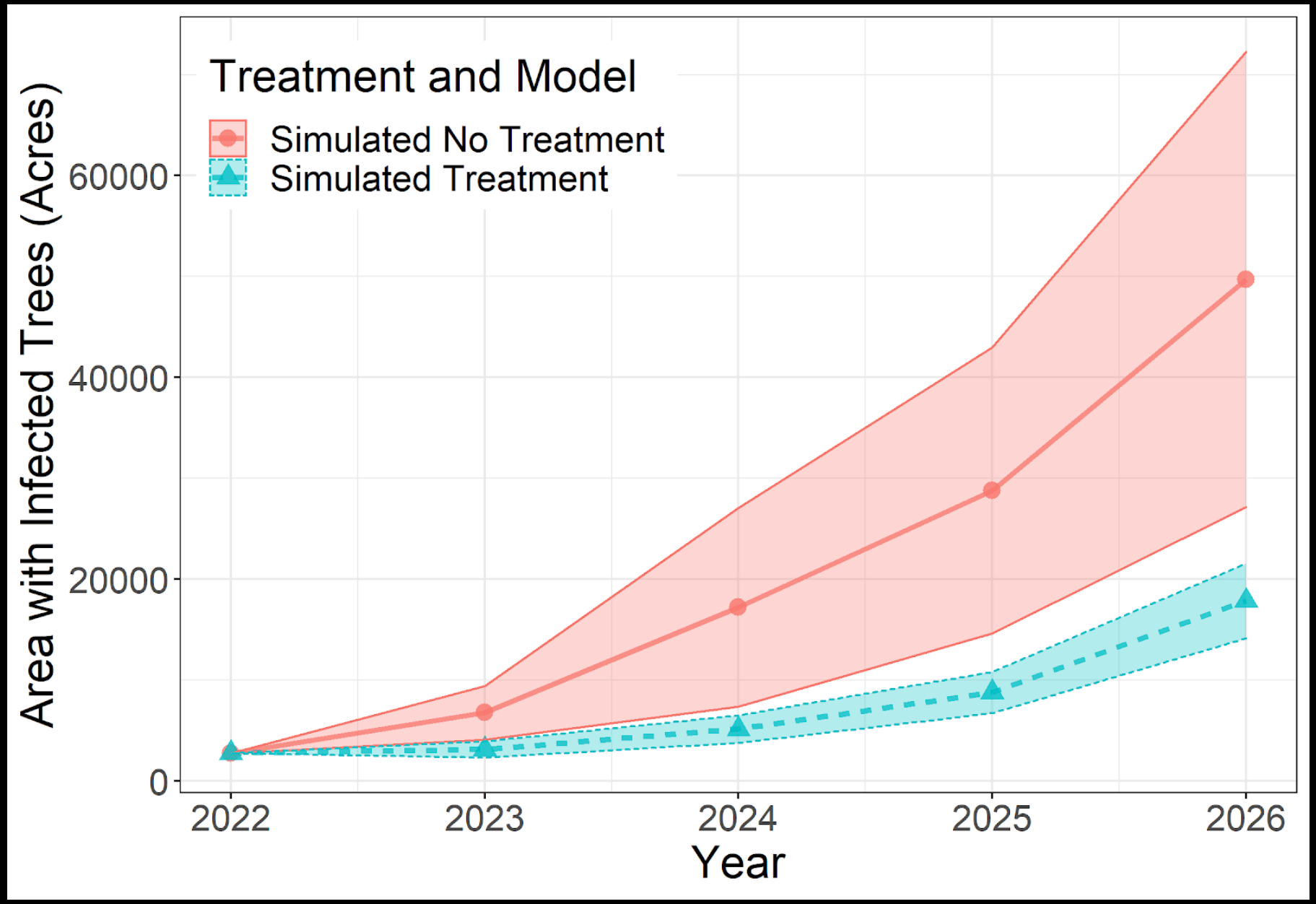
SOD Precipitation Reclassification Function



EU1 Forecasted infected area



NA1 Forecasted infected area



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POPS

Installation instructions at popsmodel.org