Coffee Detection, Spatial Assessment and Modeling

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This Talk

1. Modeling coffee agro-ecosystems on Hawaii Island (especially CBB, coffee plants; plus detection)
2. Visualizing spatial data and model results
3. Field collection of data to validate the model

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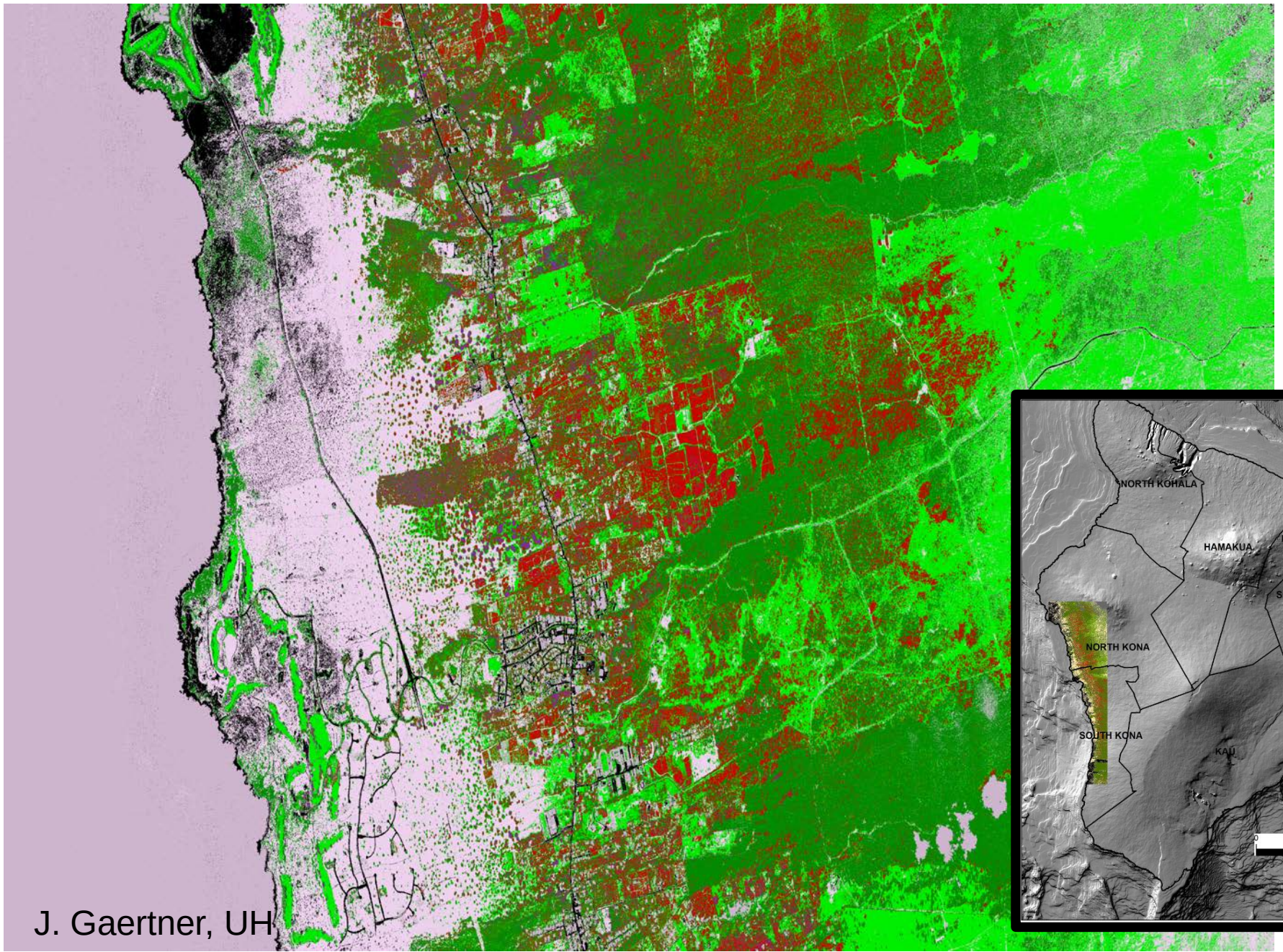
Two Modeling Tracks

1) We are producing a validated spatial model of coffee agroecosystems on the island. We would like this to serve as a broad background we can ask general questions.
2) We are developing models of a more limited scope to serve as tools to address specific research and management questions.

Detecting Coffee Patches in Hawaii

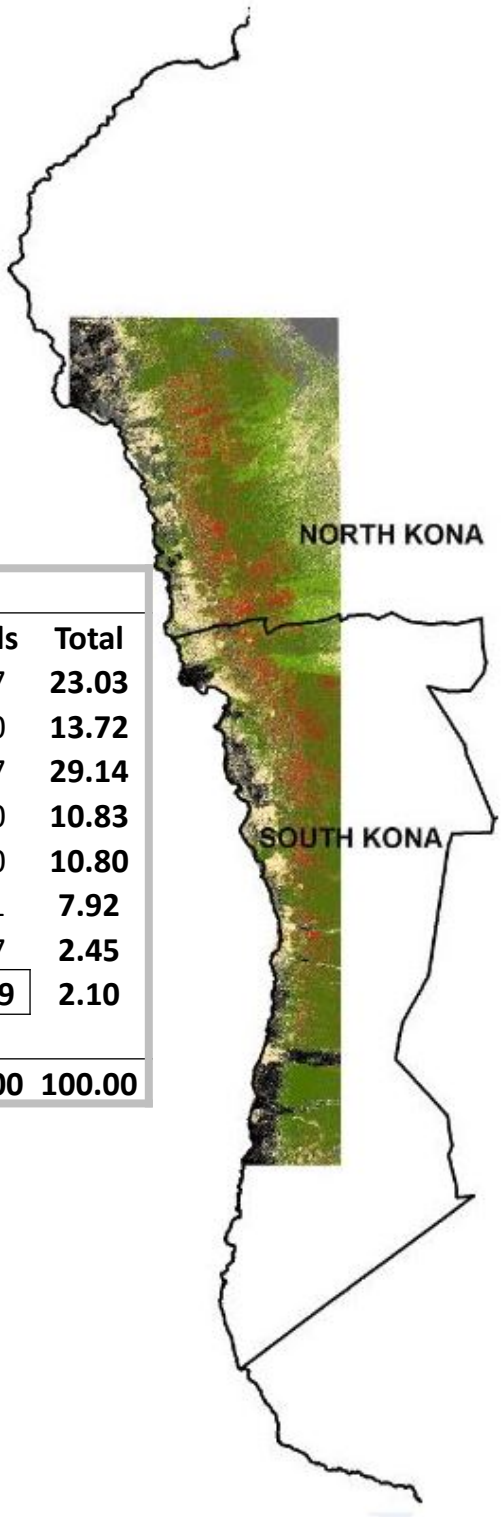


J. Gaertner, UH

Accuracy Assessment

Overall Accuracy %	68.15
Kappa	0.6081

Class	Ground Truth Percent %								
	Coffee	Mcnut	Forest	Grass	Mpod	No Veg	Urban	Roads	Total
Coffee	**71.82**	18.46	7.70	1.06	5.80	0.00	0.00	0.27	**23.03**
Macnut	10.11	**36.39**	5.88	4.41	9.01	0.00	0.00	0.00	**13.72**
Forest	3.38	24.01	**75.82**	12.39	5.80	0.00	0.27	0.27	**29.14**
Grass	7.29	1.35	2.03	**80.60**	0.15	0.67	0.00	0.00	**10.83**
Monkeypod	5.29	19.00	6.95	1.38	**79.24**	0.00	0.00	0.00	**10.80**
No Veg	0.32	0.48	1.32	0.16	0.00	**98.67**	2.69	2.41	**7.92**
Urban	1.79	0.31	0.18	0.00	0.00	0.07	**93.55**	1.07	**2.45**
Roads	0.00	0.00	0.12	0.00	0.00	0.59	3.49	**95.99**	**2.10**
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**



Model Components

- Coffee plants
- CBB populations
- Pathogens/parasites
- Critical inputs:
  - Temperature
  - Solar irradiation
  - Rainfall
  - Management

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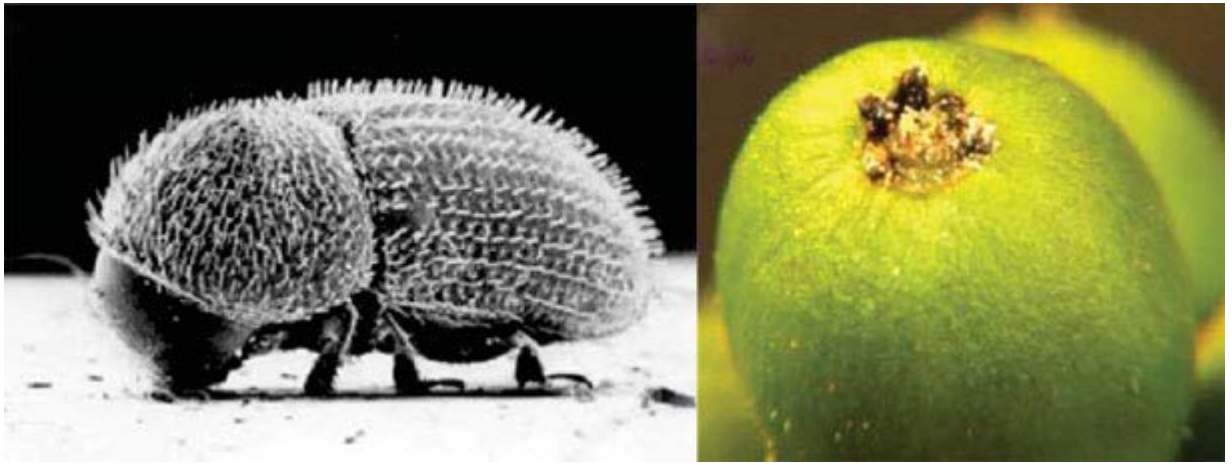


Acuna et al, PNAS (2011)

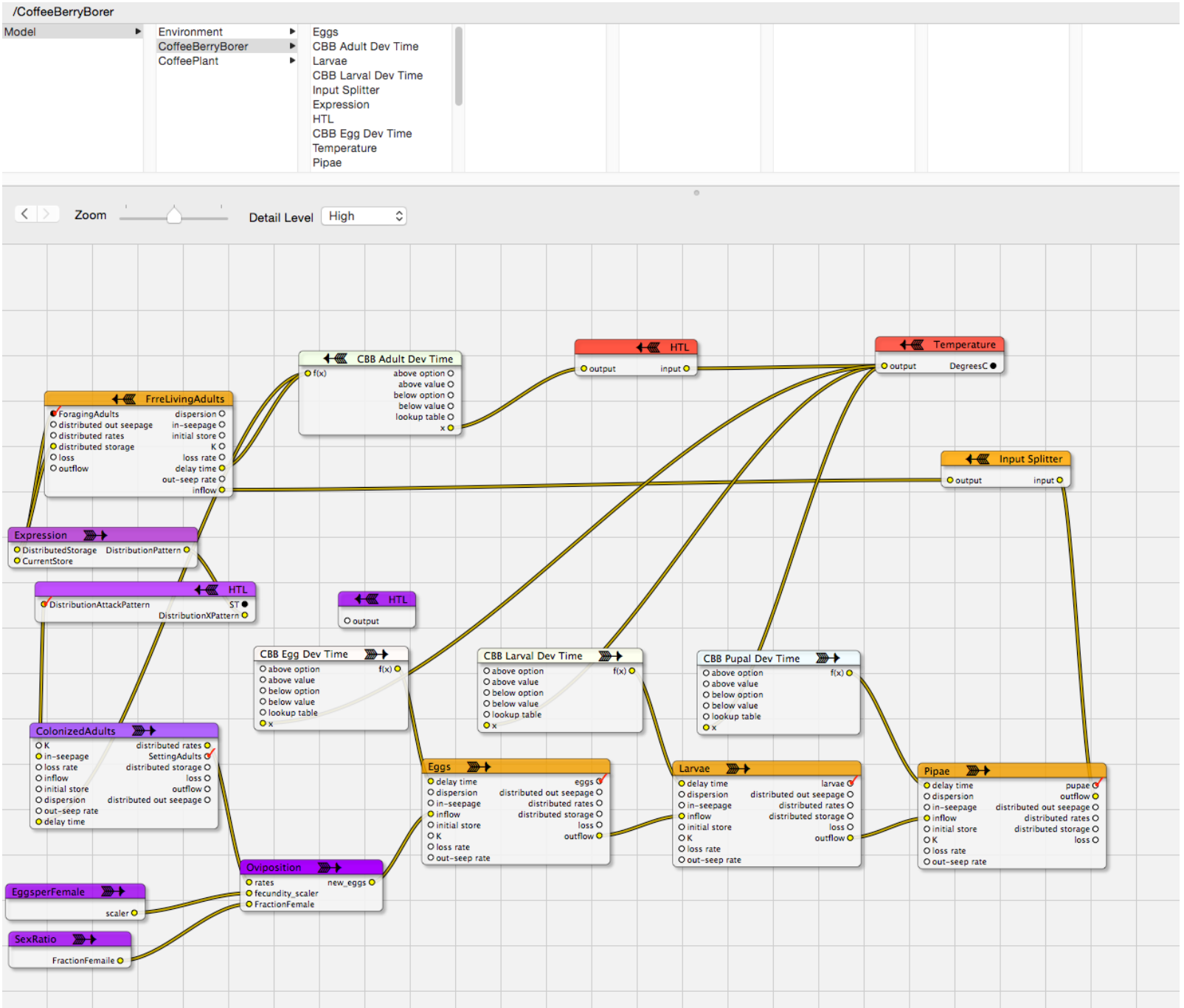
Plant Model Components

Light interception & photosynthesis per branch and per plant
Effects of temperature
Water and nitrogen acquisition
Photosynthate allocation
Fruiting phenology and dynamics

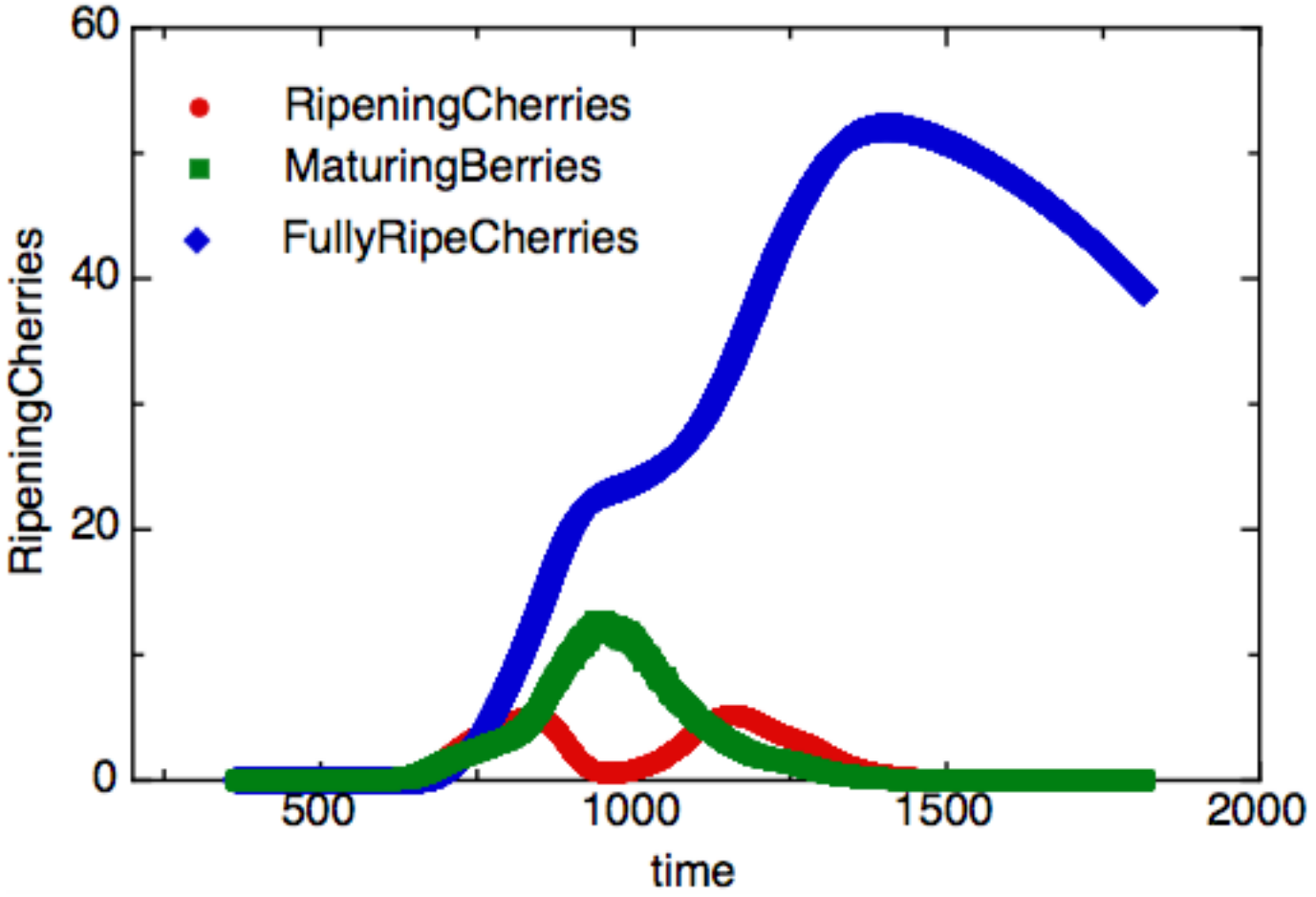
Insect Model Components

Development
Reproduction and mortality
Migration and emigration
Disease/Management

Model Construction (Hermes)



Quick Results



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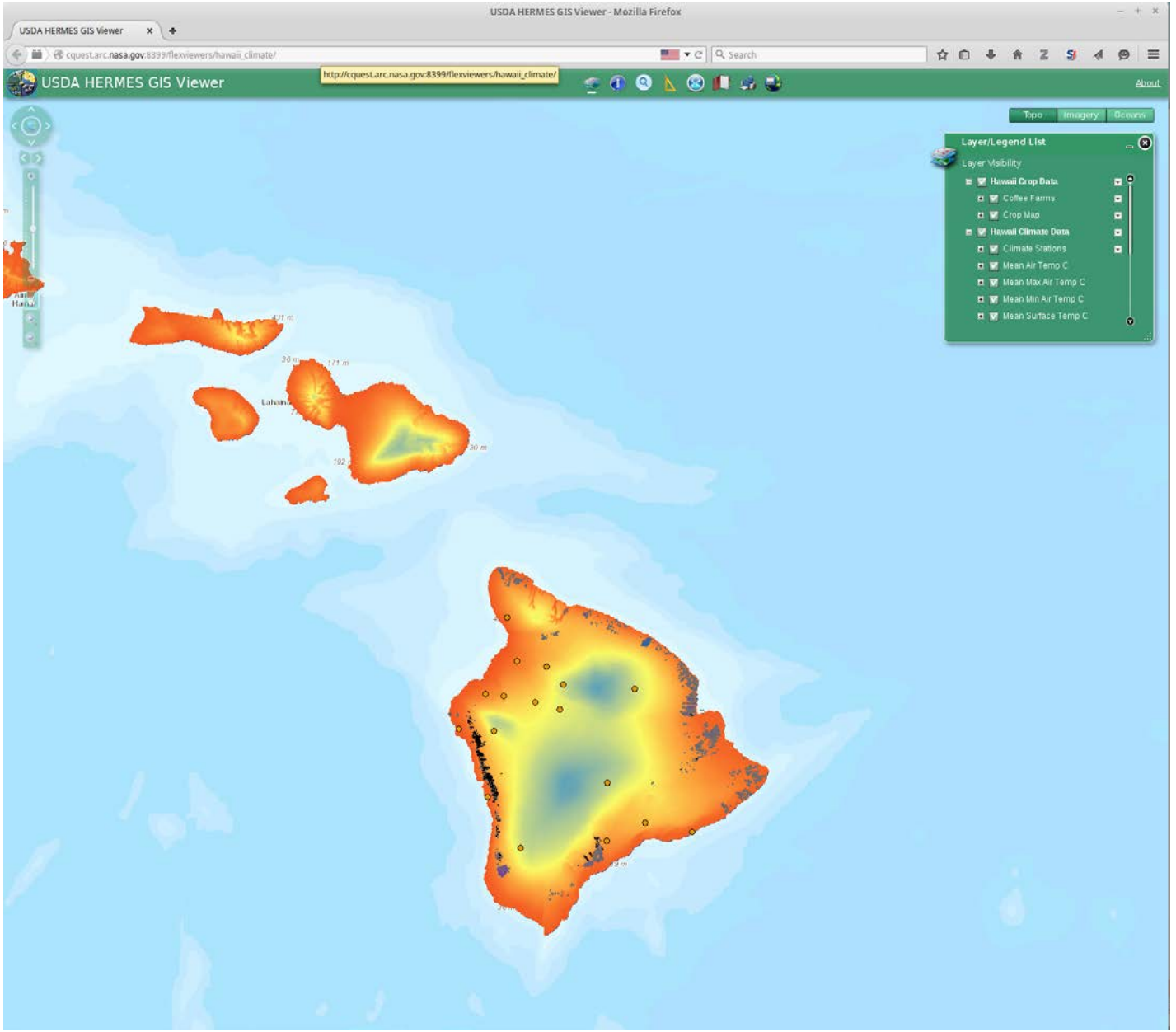
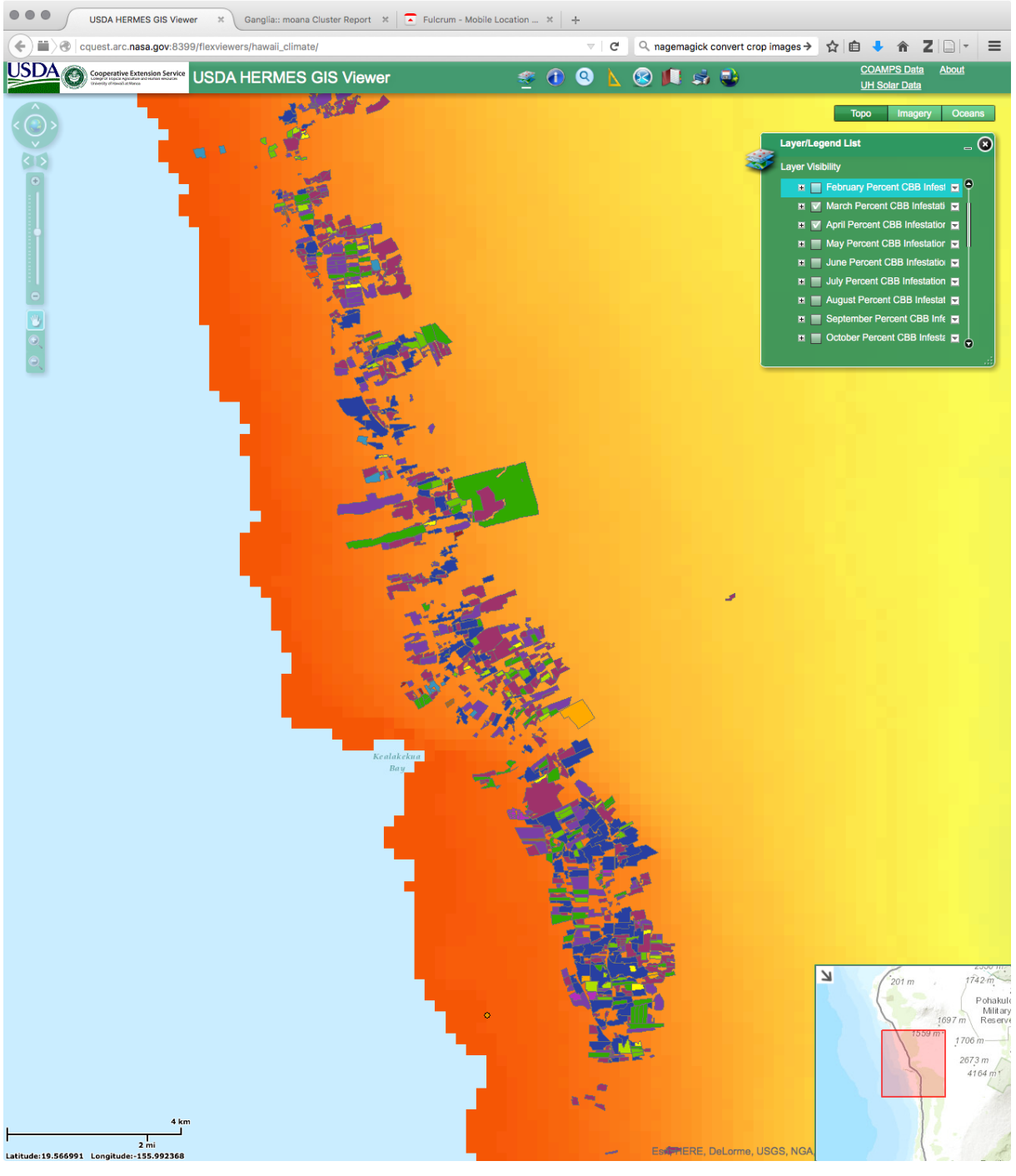
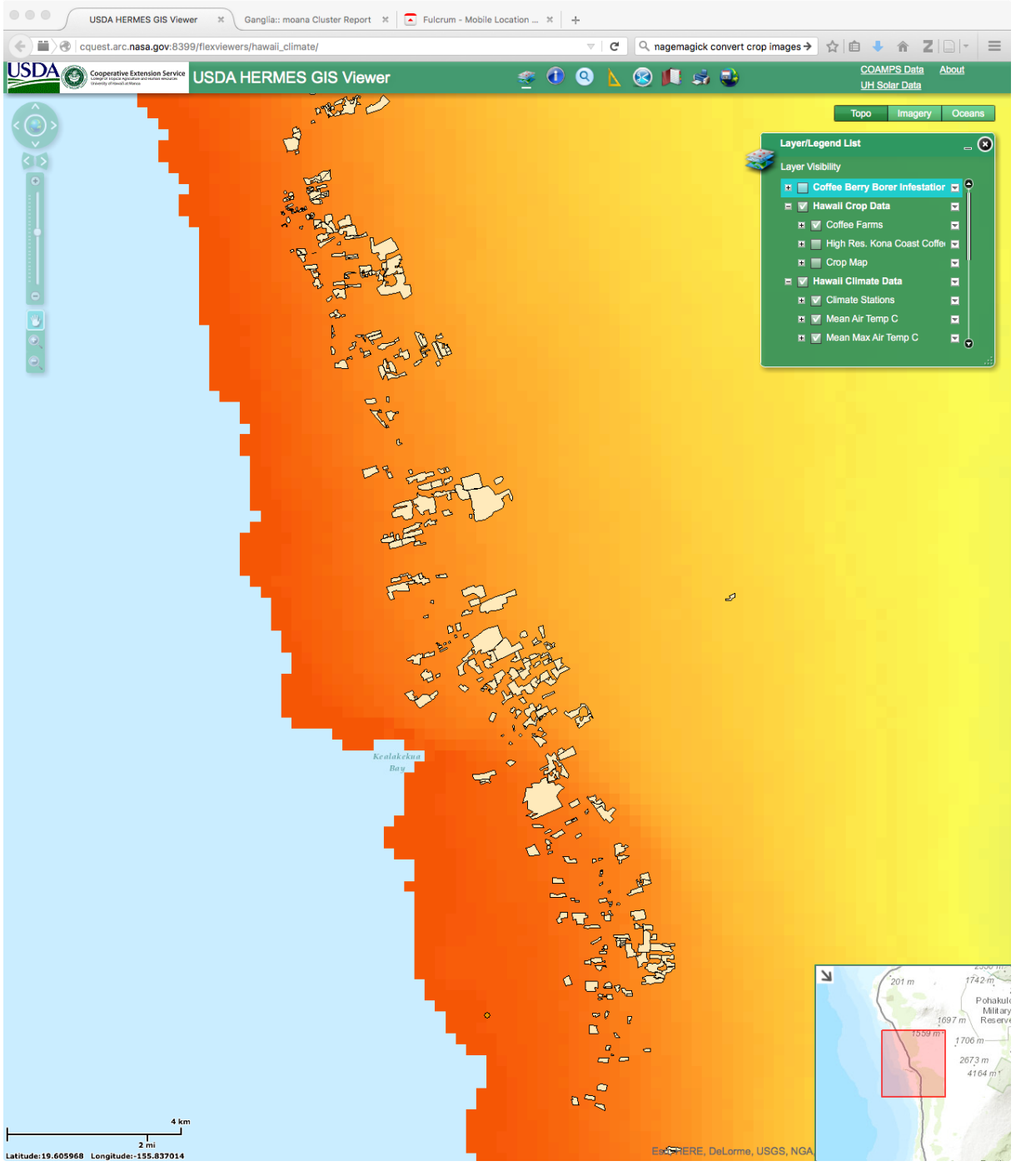
Model Interaction (Viewer)



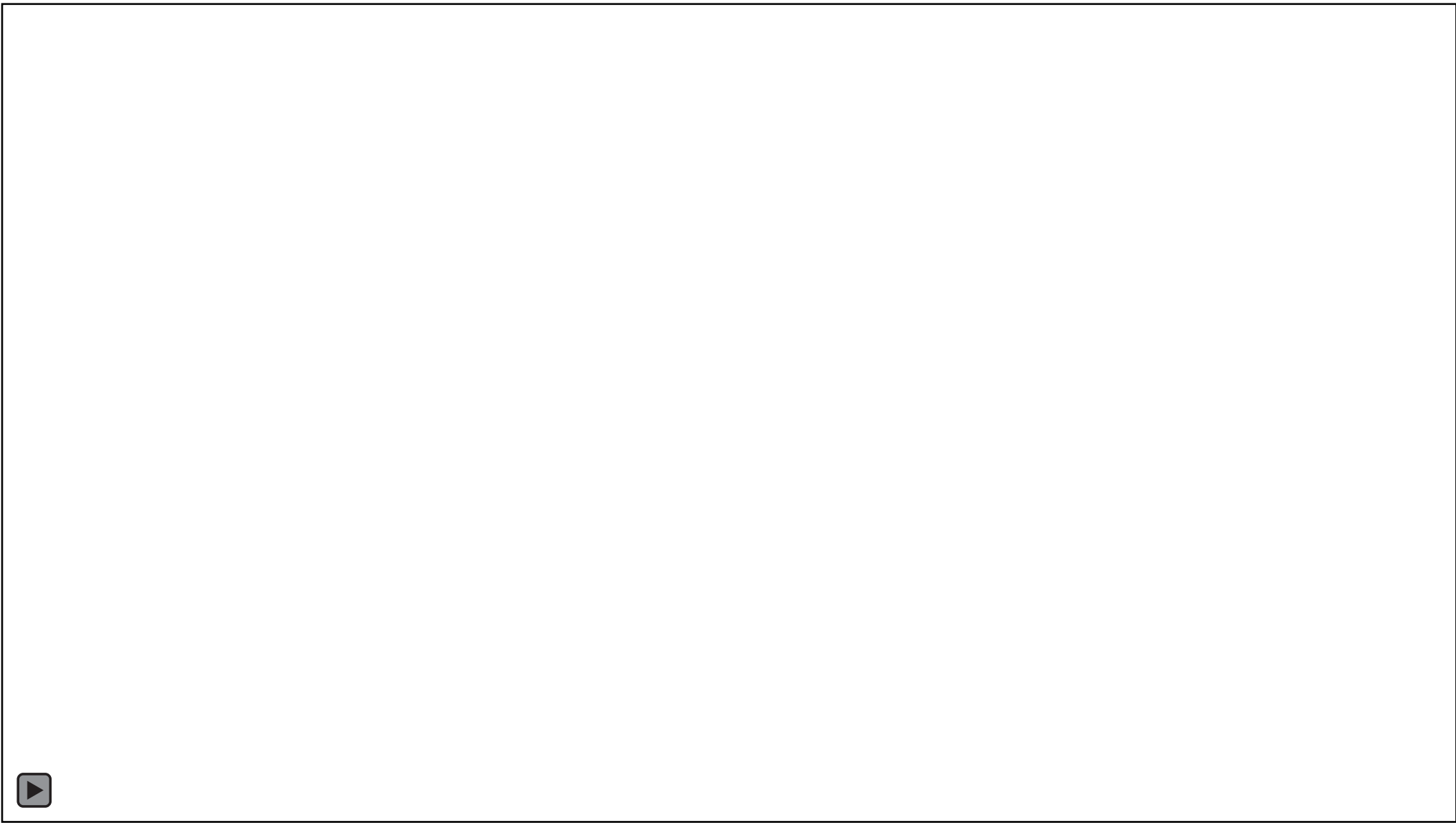
Spatial data viewer



Spatial data viewer



Model Interaction (Model output)



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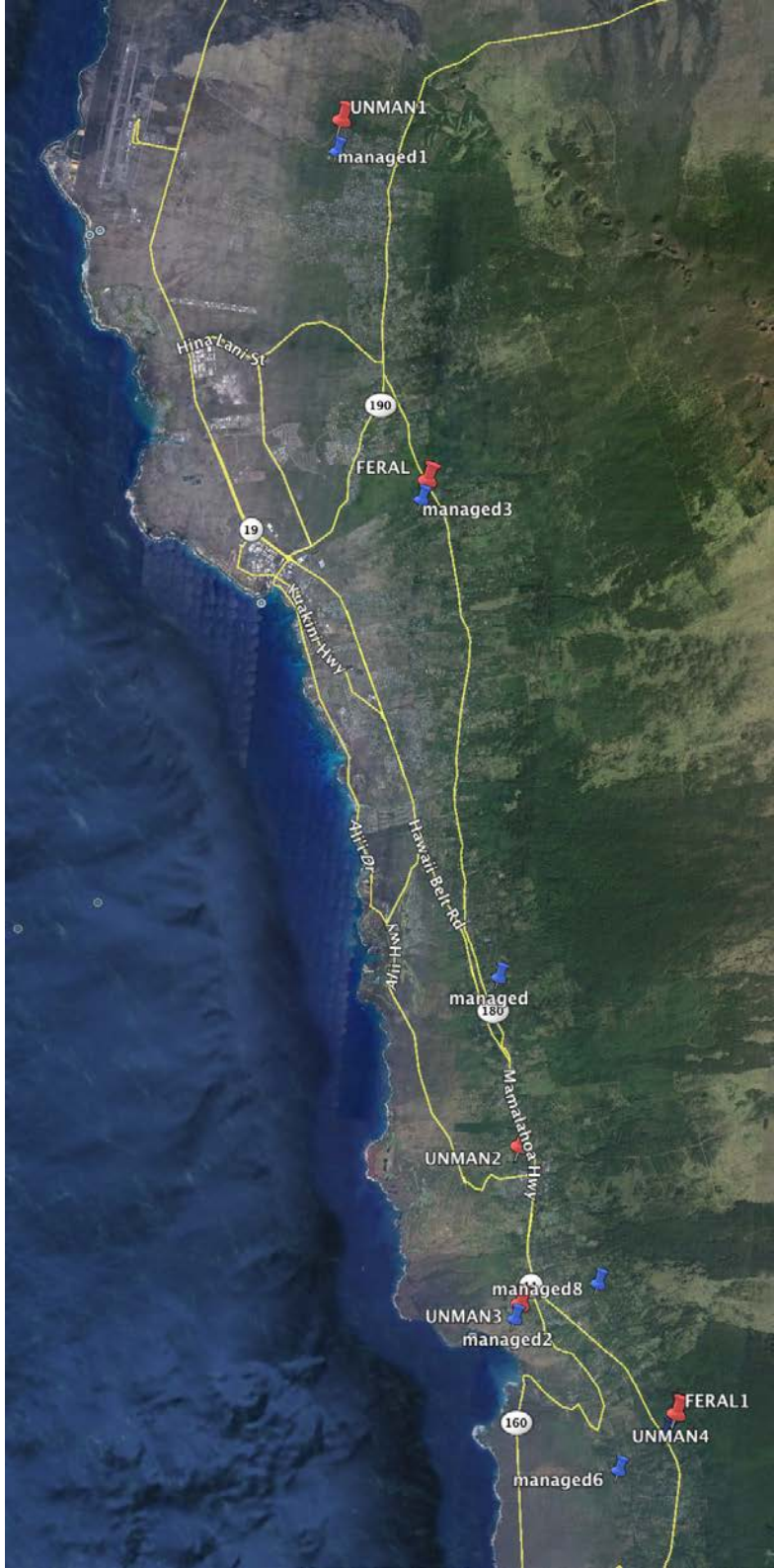
Area-Wide Field Data

- Data being collected for 7 managed farms, 2 unmanaged and 2 feral sites
- Visit each site every two weeks
- Check:
  - CBB infestation level (in field, plus dissection)
  - Trap catch
  - Plant phenology
  - Weather
  - Management



Progress on Spatial Data – Field

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Progress on Spatial Data – Field

- Unmanaged/feral sites are matched with managed farms (control)
- Sentinel plants placed in each unmanaged/feral site (2 per site)

Acknowledgements

CBB Modeling Group

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