E3 review supporting materials

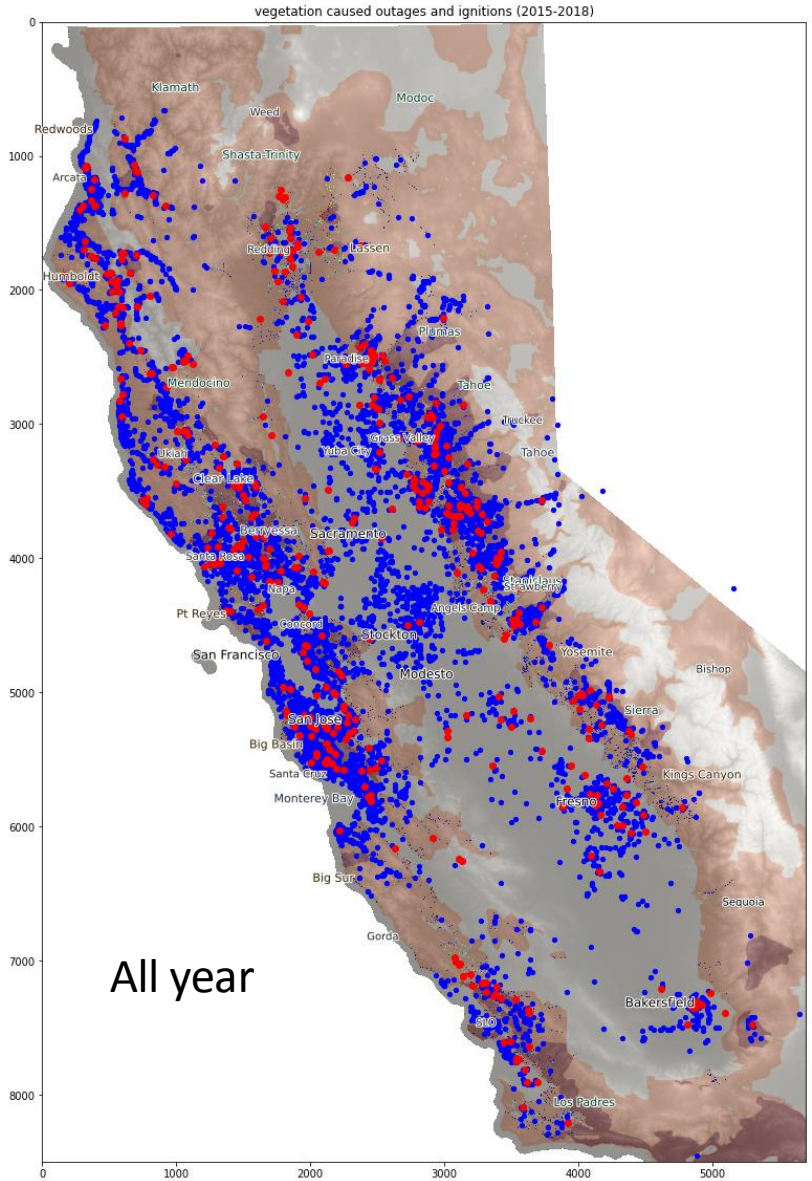
Produced by RaDA

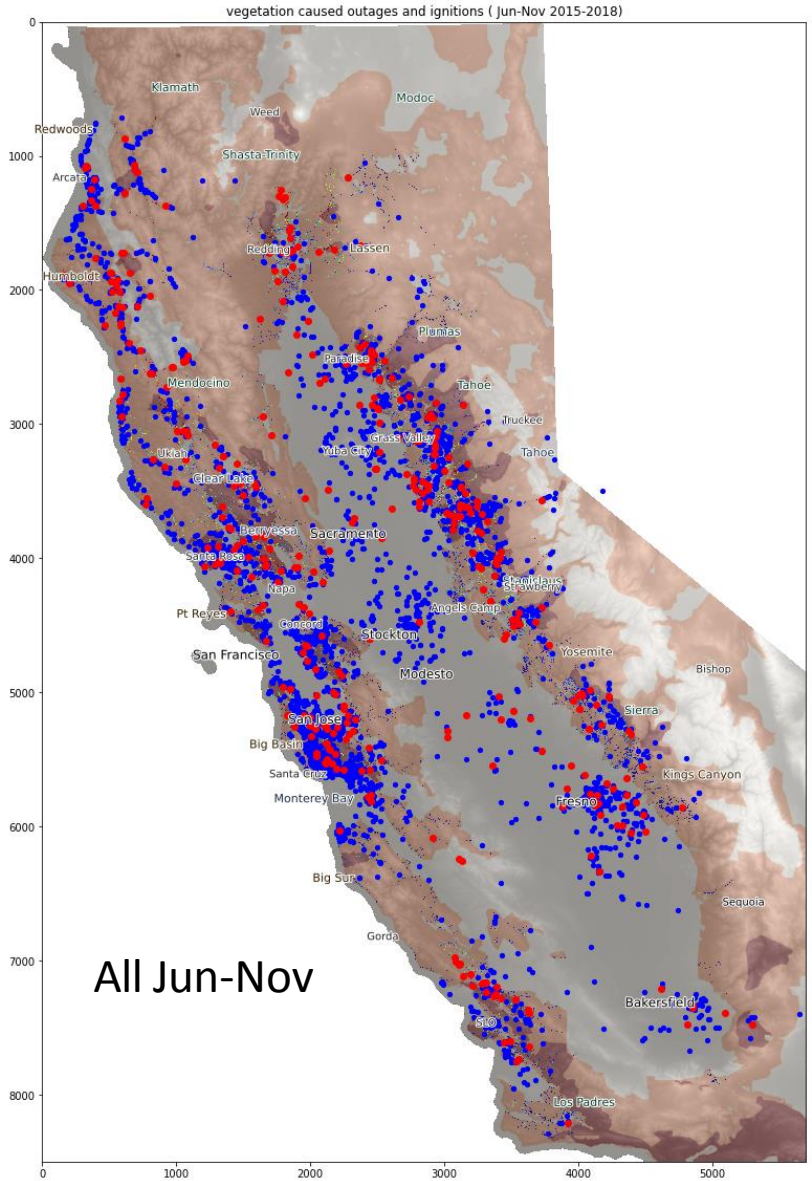
5/10/2021

Where did outage and ignitions occur?

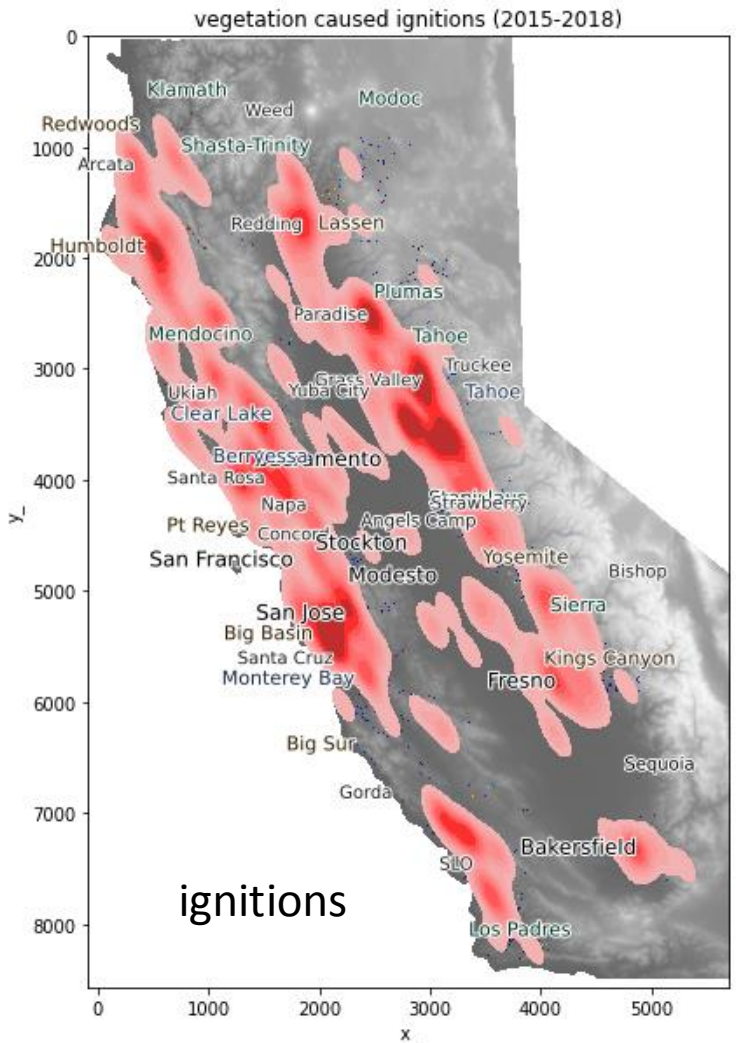
This section maps the locations of 2015-2018 vegetation caused outages and ignitions

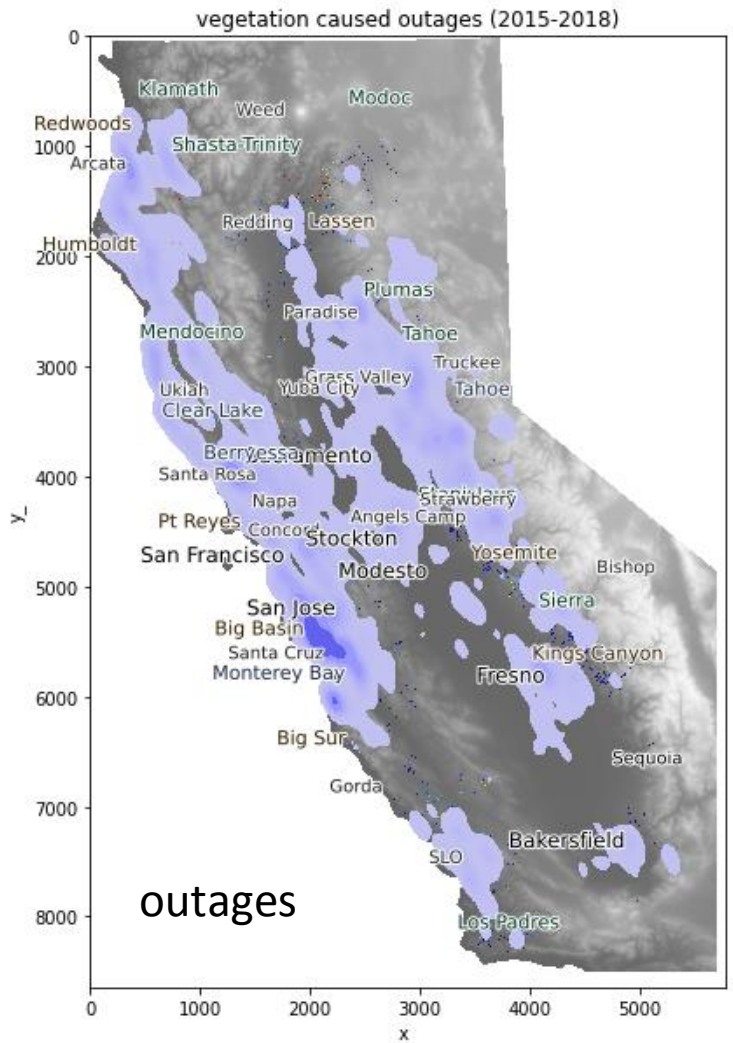
Veg. caused outages (blue) and ignitions (red) 2015-2018

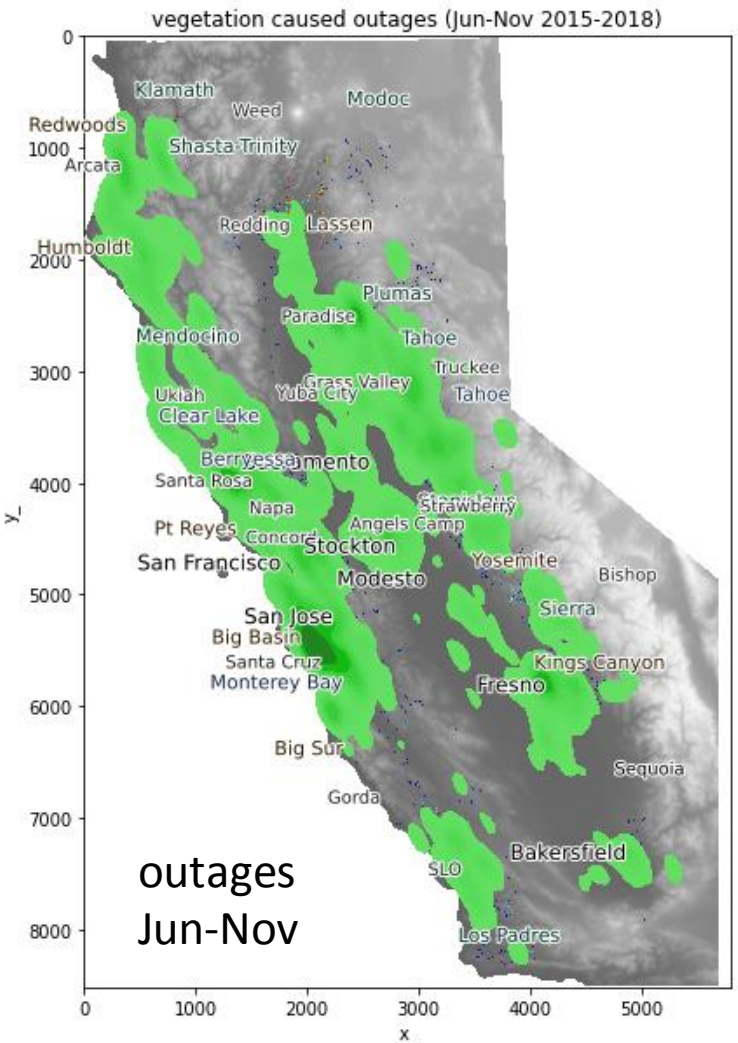




Kernel density of veg. caused ignitions, outages, and summer outages, left to right







Comparing models trained on outage and ignitions.

This section presents the results of running Maxent models with 2015-2018 vegetation caused outages and ignitions as their inputs – this is new work.

25% of outages and their corresponding ignitions, selected at random were withheld for testing of prediction performance

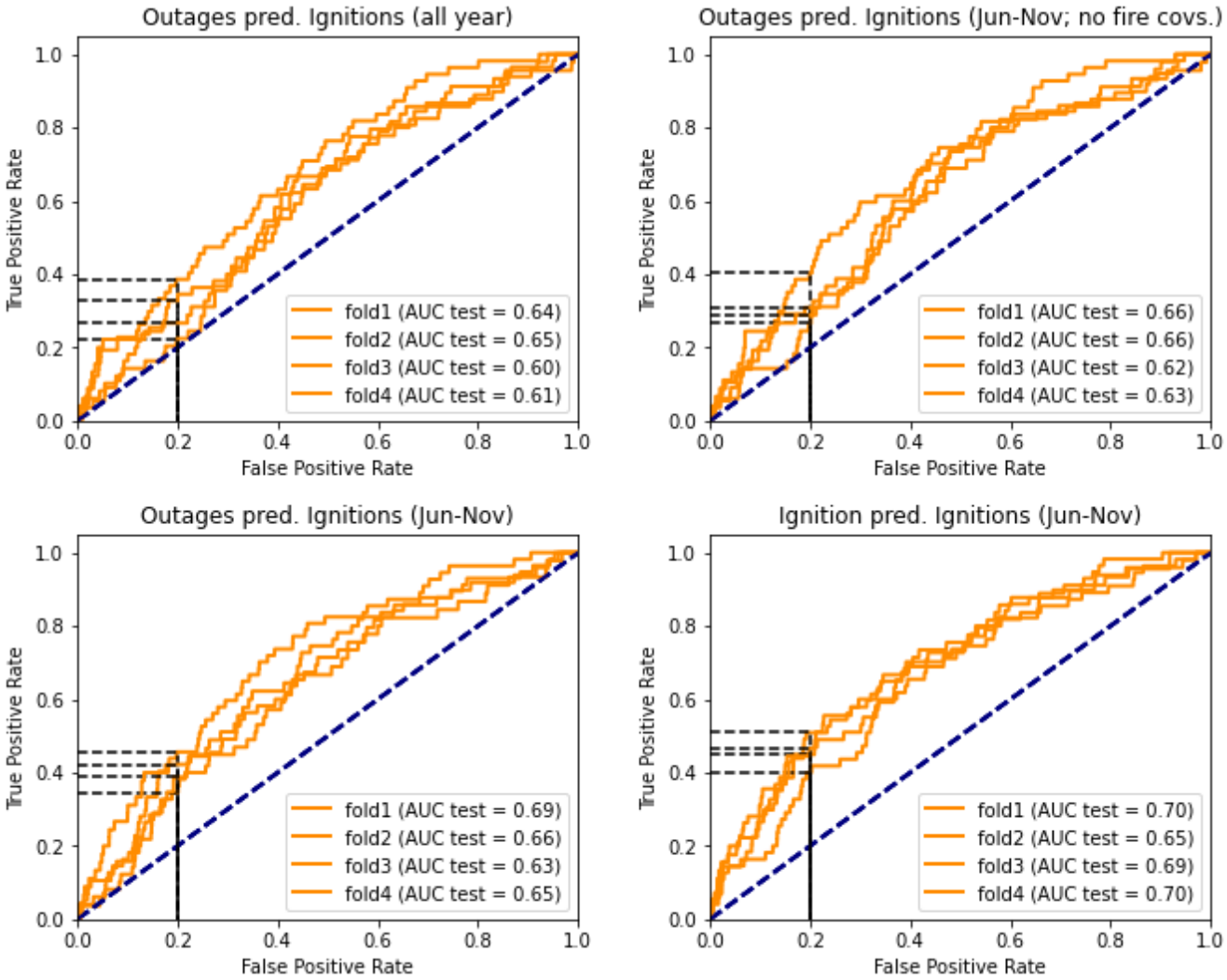
The models are directly comparable to the official 2021 models, but because of the testing design, the results are not identical.

Outage vs. ignitions performance (2015-2018)

- Relate outages to ignitions by outage_id
- Select 25% of outages at random for testing
- Track the corresponding ignitions as train/test
- 4-fold 25/75% train test splits, always predicting test ignitions, with ROCs and AUCs based on test data
- AUCs (mean across 4-folds)
  - All veg. outages; no fire cov. 0.624
  - Veg. outages Jun-Nov; no fire cov. 0.639
  - Veg. outages Jun-Nov 0.658 (best effort outage model)
  - Veg. ignitions Jun-Nov 0.684 (official veg. model formulation)

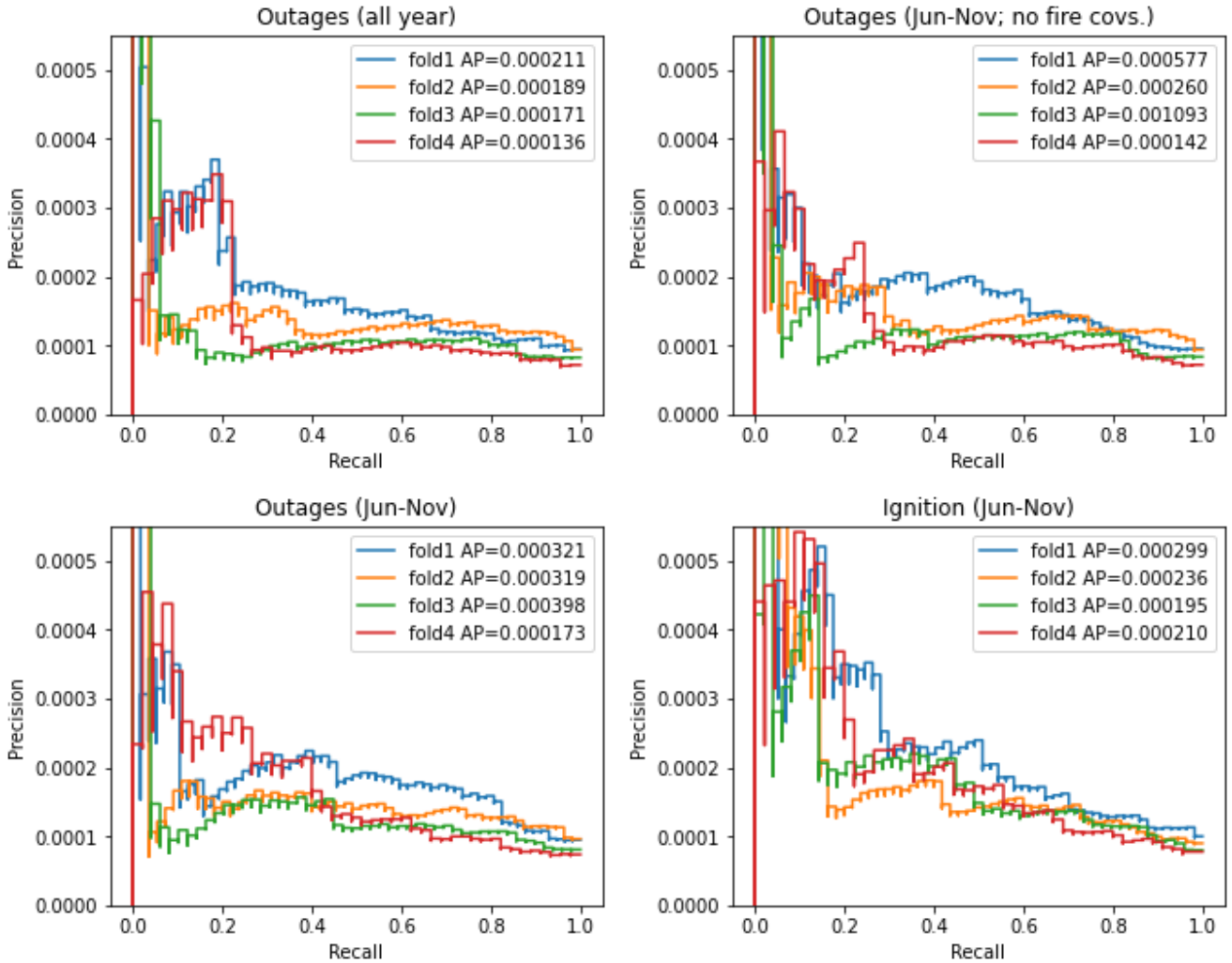
ROC curves for 4 model specifications

- 4-fold cross validation with 25/75% train test splits
- Official vegetation-cause model had “core covariates” and “fire covariates”
- Upper row - veg. caused outages trained on core covariates. L: all outages; R: Jun-Nov outages
- Lower row – both with “official” covariates; Jun-Nov. L: outages; R: ignitions
- Marker lines at 20% recall (top 20% of prioritized pixels, show ignitions model averaging 2.28x more ignition detections than chance.



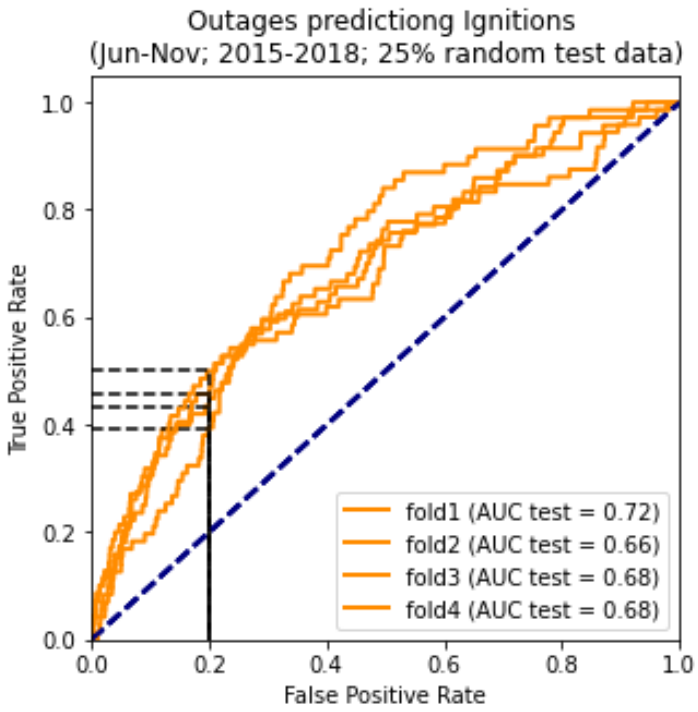
Compared to the best outage modeling, expected risk-spend efficiency (aka True Positive Rate) at 20% recall is 13% higher (45.6% vs. 40.3%).

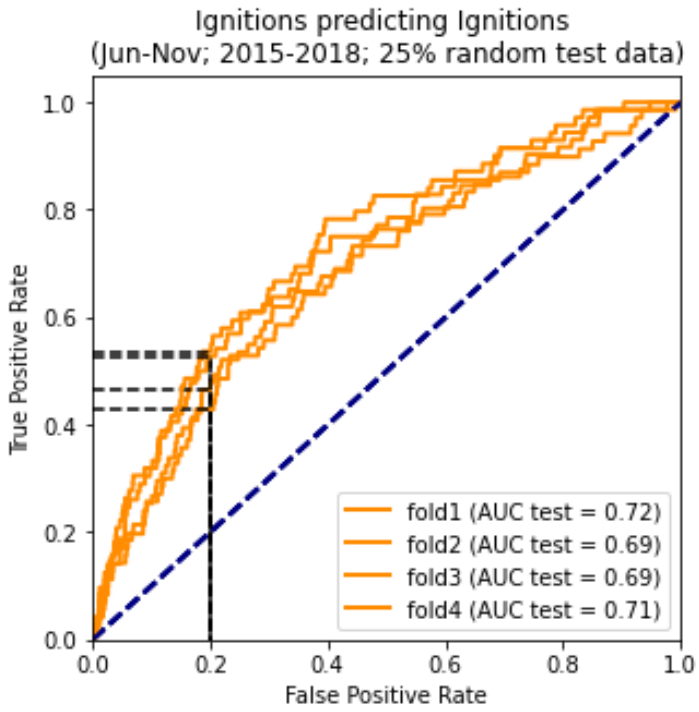
Precision-Recall for same models/folds



ROC curves for conductor-involved cross validation

- 4-fold cross validation with 25/75% train test splits
- Both with “official” covariates; Jun-Nov.
  - L: outages; R: ignitions
- Marker lines at 20% recall (top 20% of prioritized pixels, show ignitions model averaging 2.45x more ignition detections than chance.
- Mean AUC performance
  - Cond ignitions: 0.703
  - Cond outages: 0.687

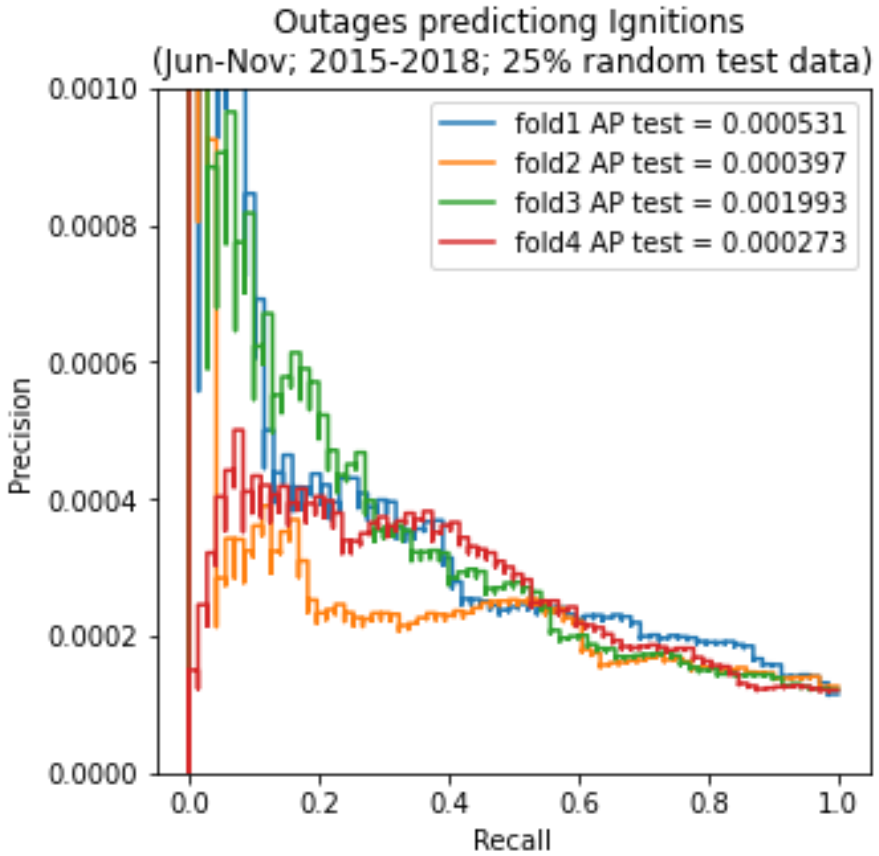


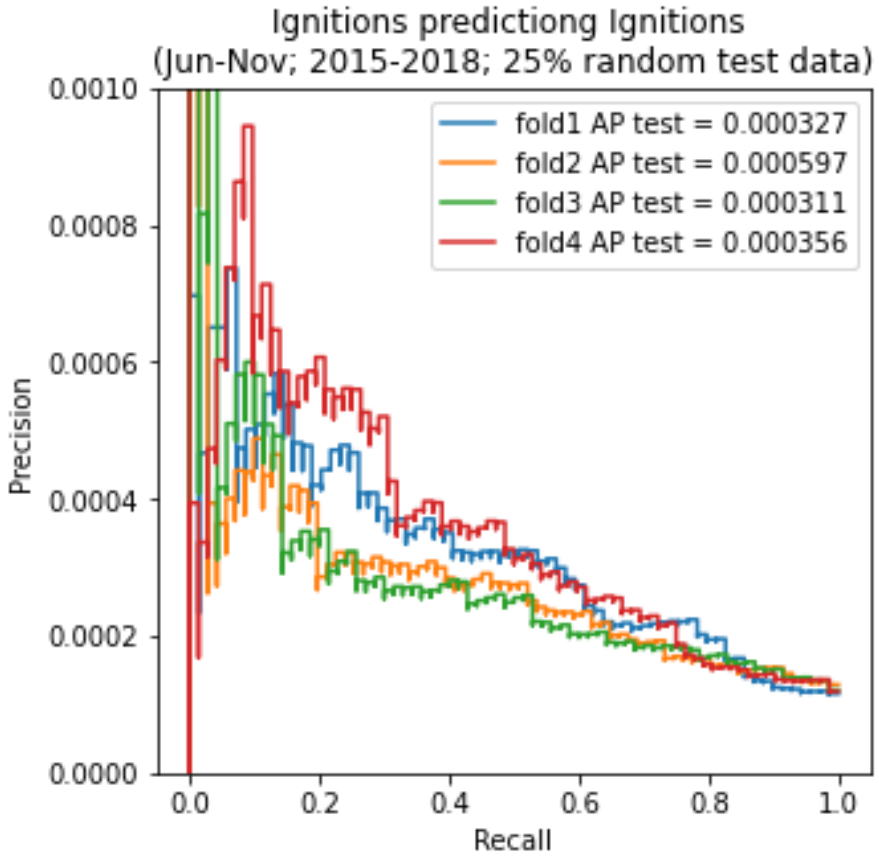


Compared to the outage modeling, expected risk-spend efficiency (aka True Positive Rate) at 20% recall is 9.4% higher 48.9% vs. 44.7%).

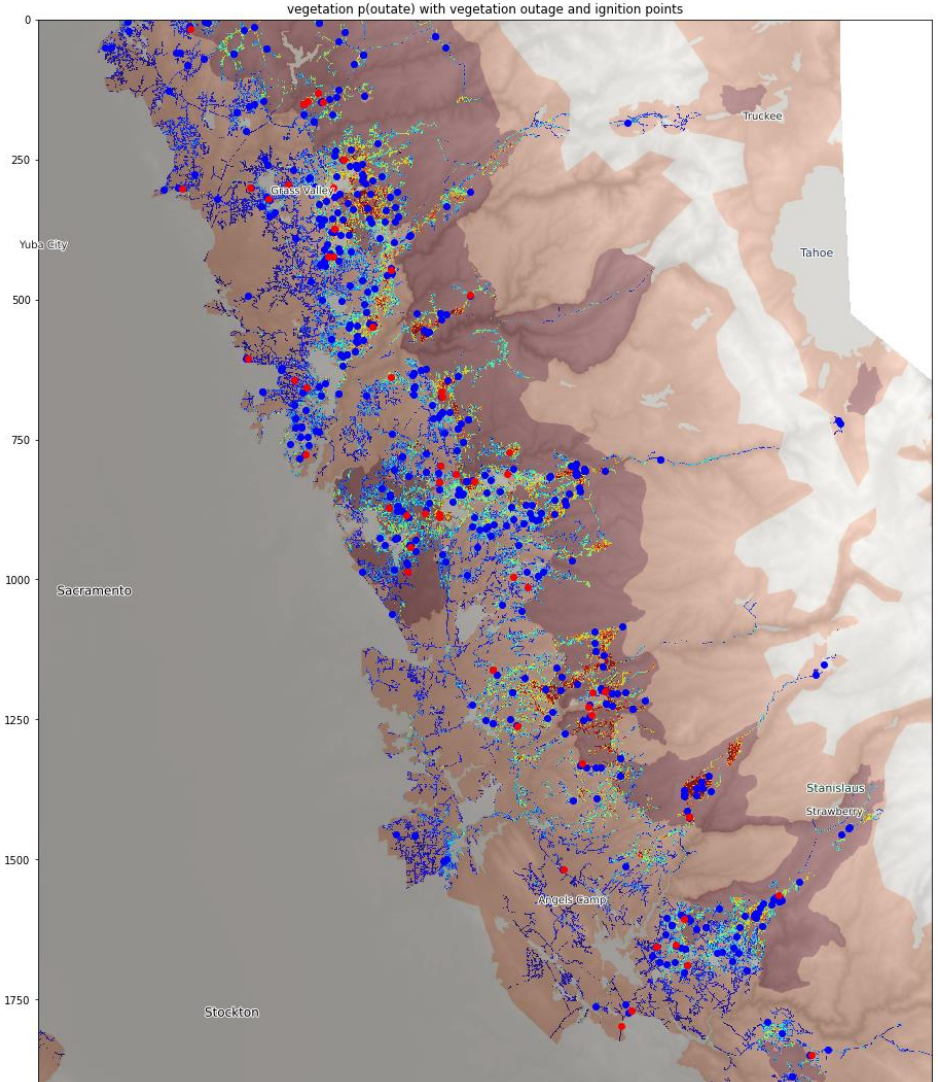
Precision recall for same models/folds

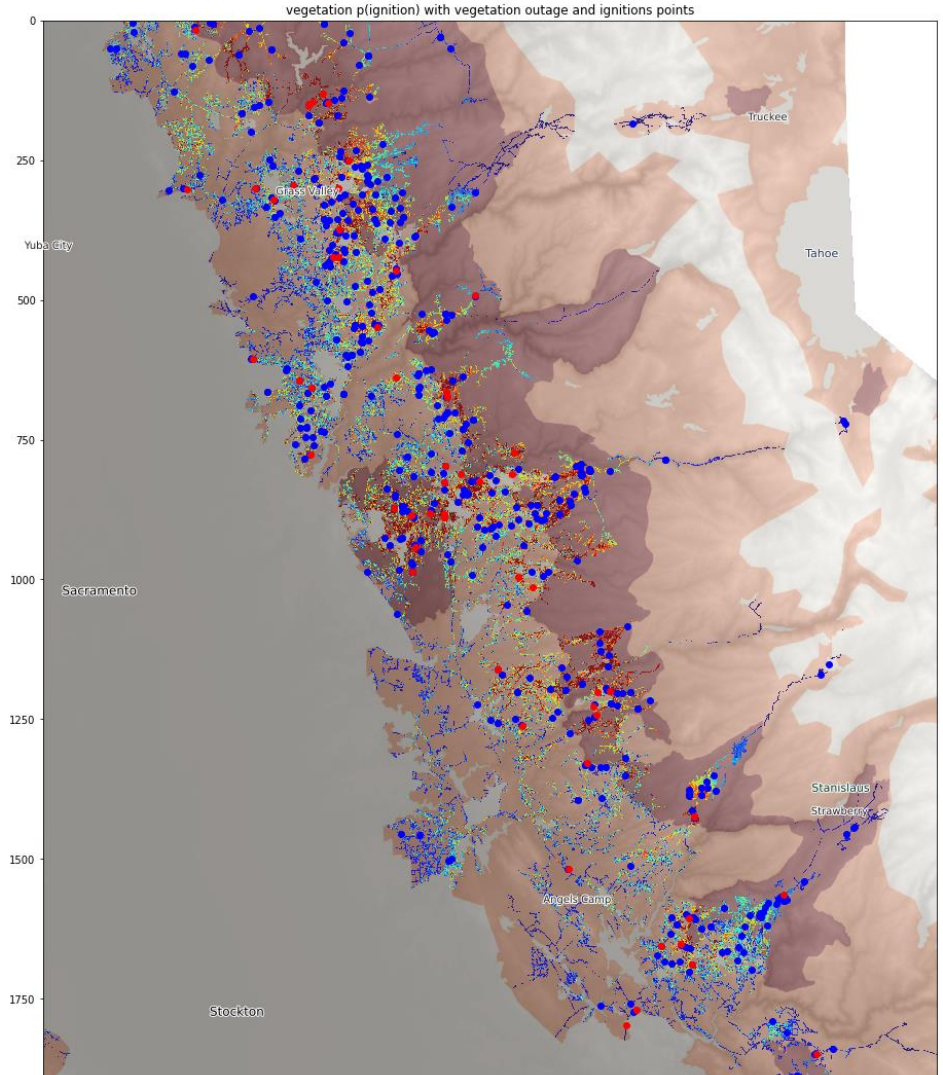
- Higher and to the right are better



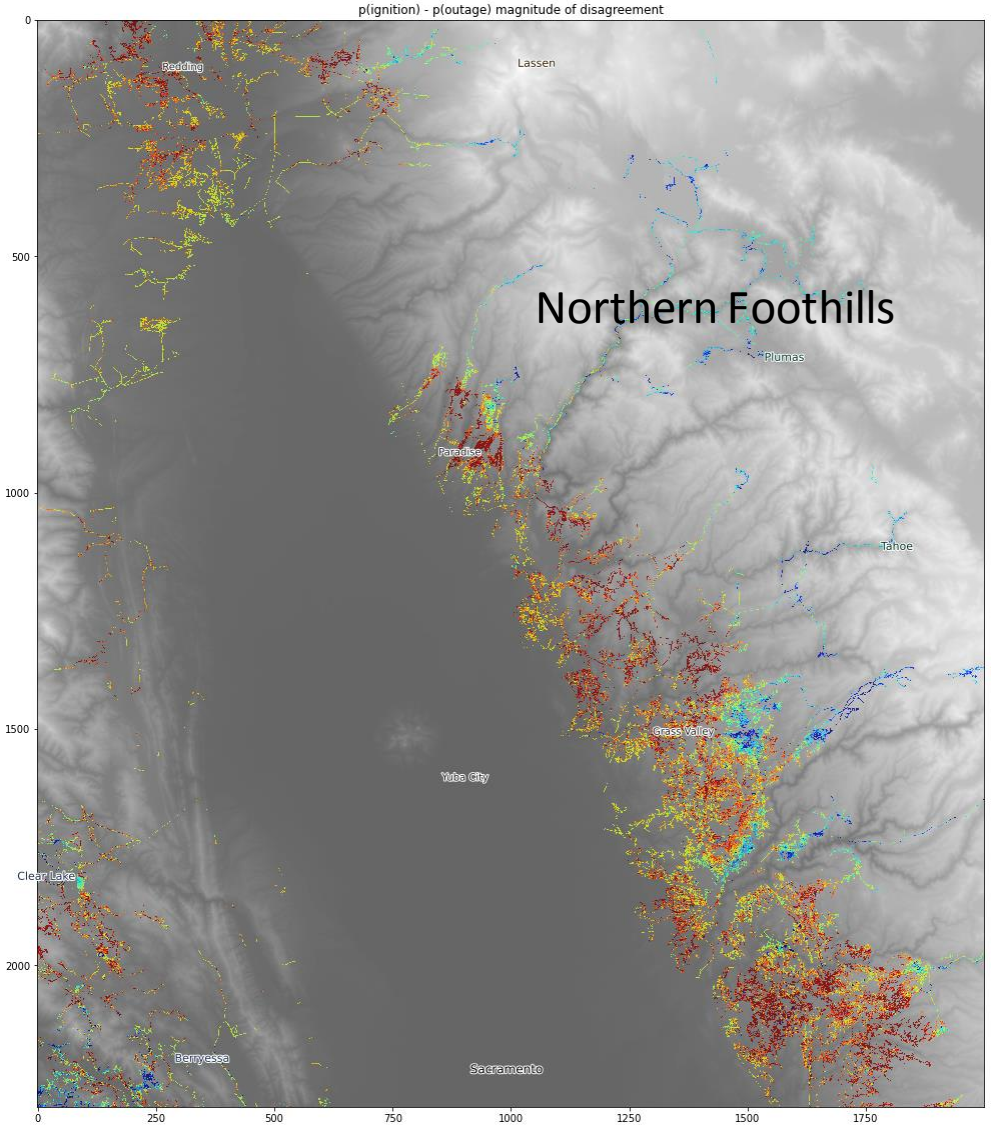


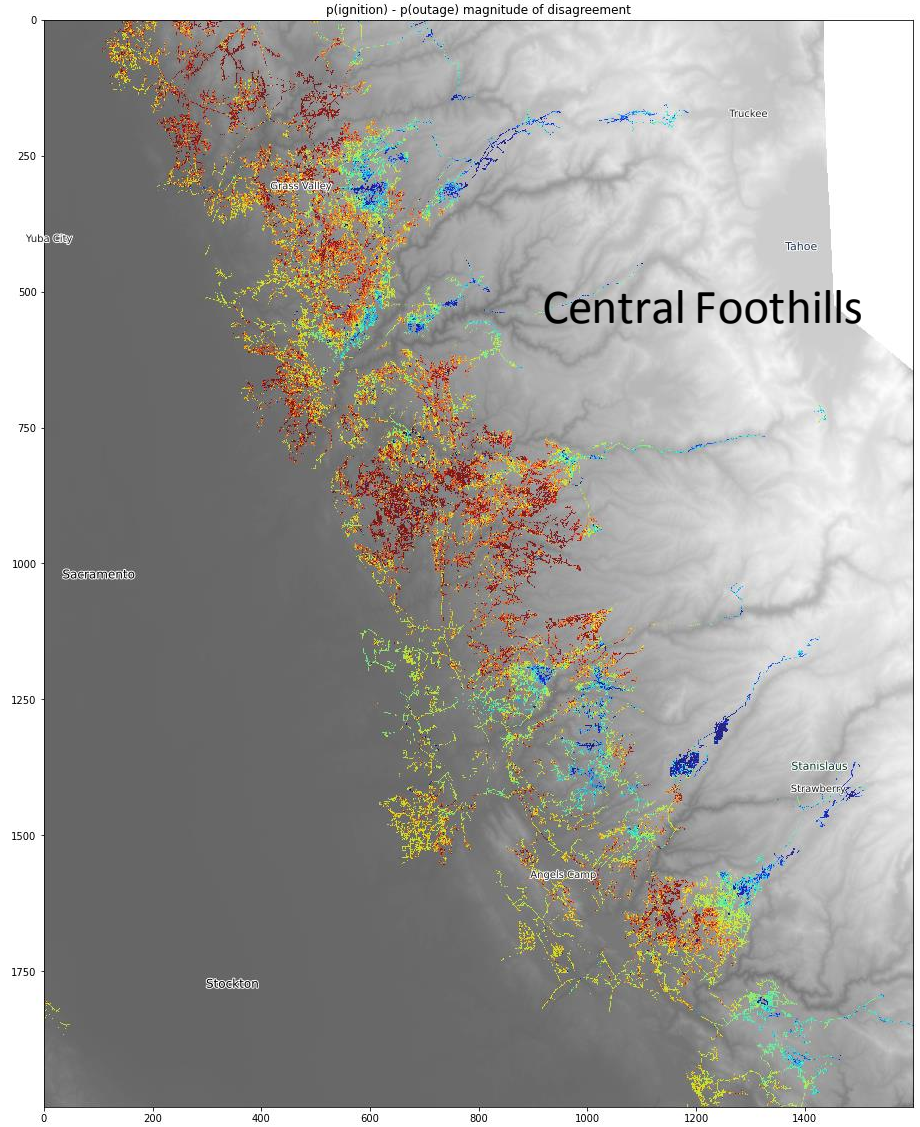
Outages (blue) and ignitions (red) vs. p(outage) (left) and p(ignition) right



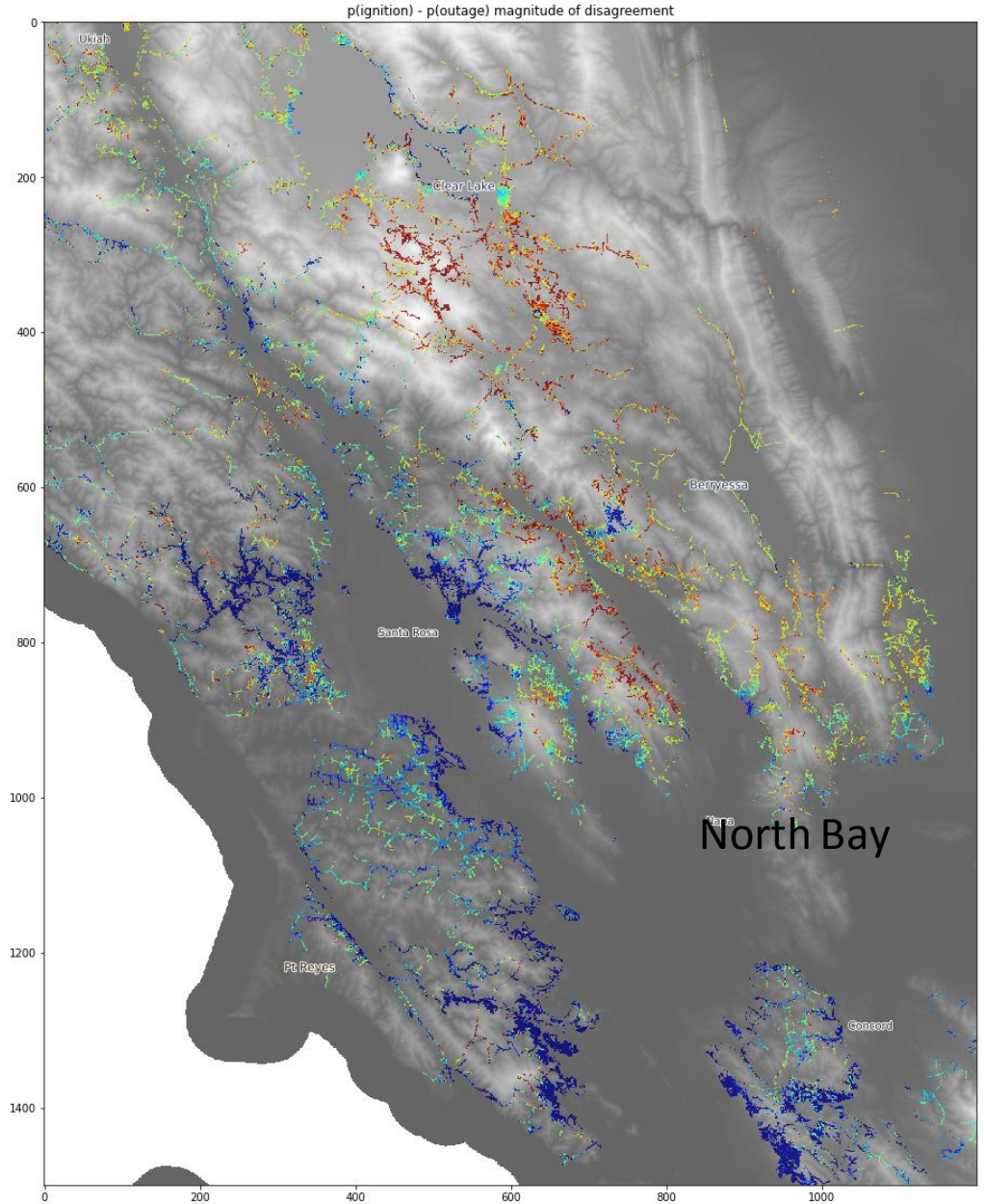


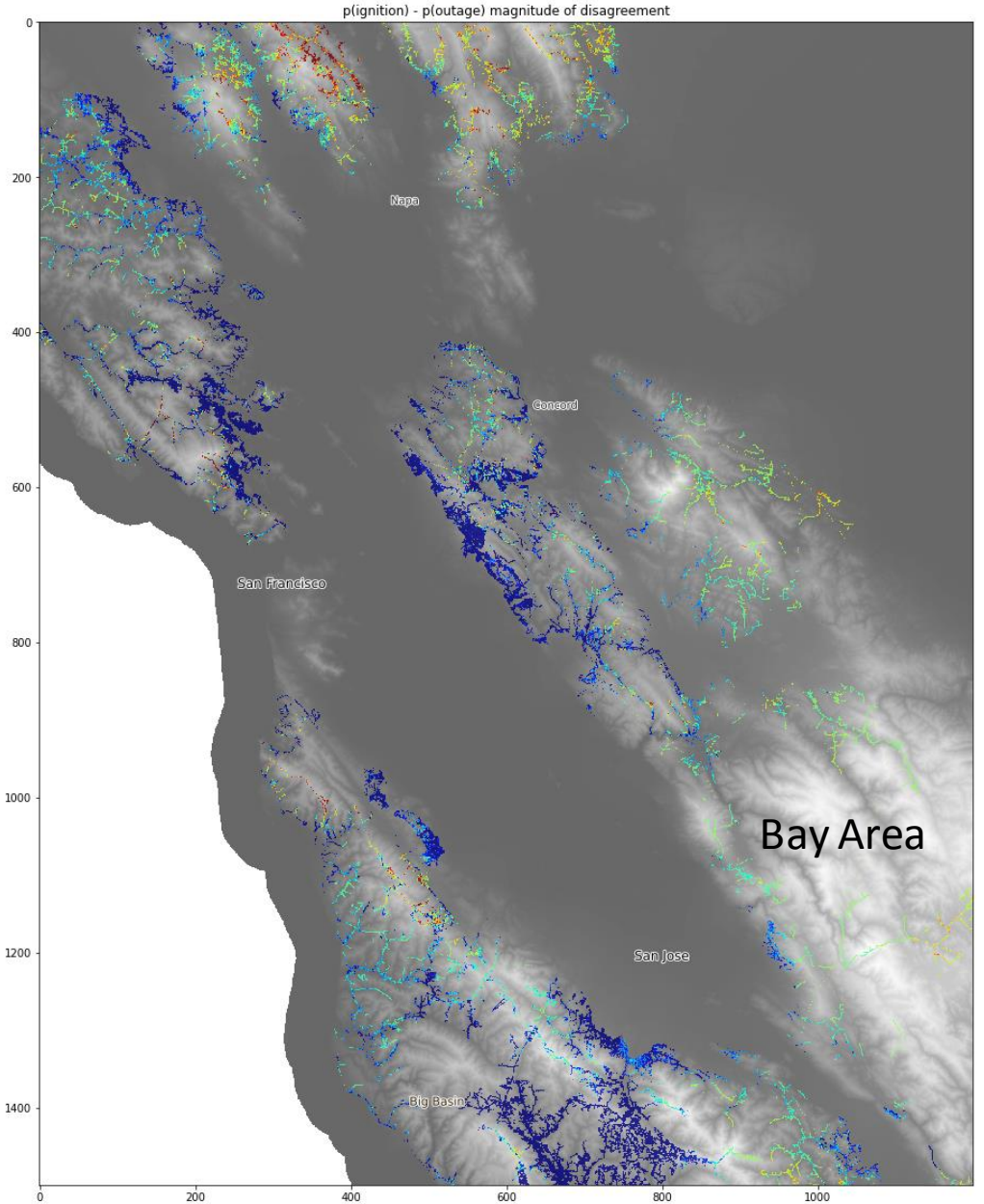
P(ignition) – P(outage) where are they different?



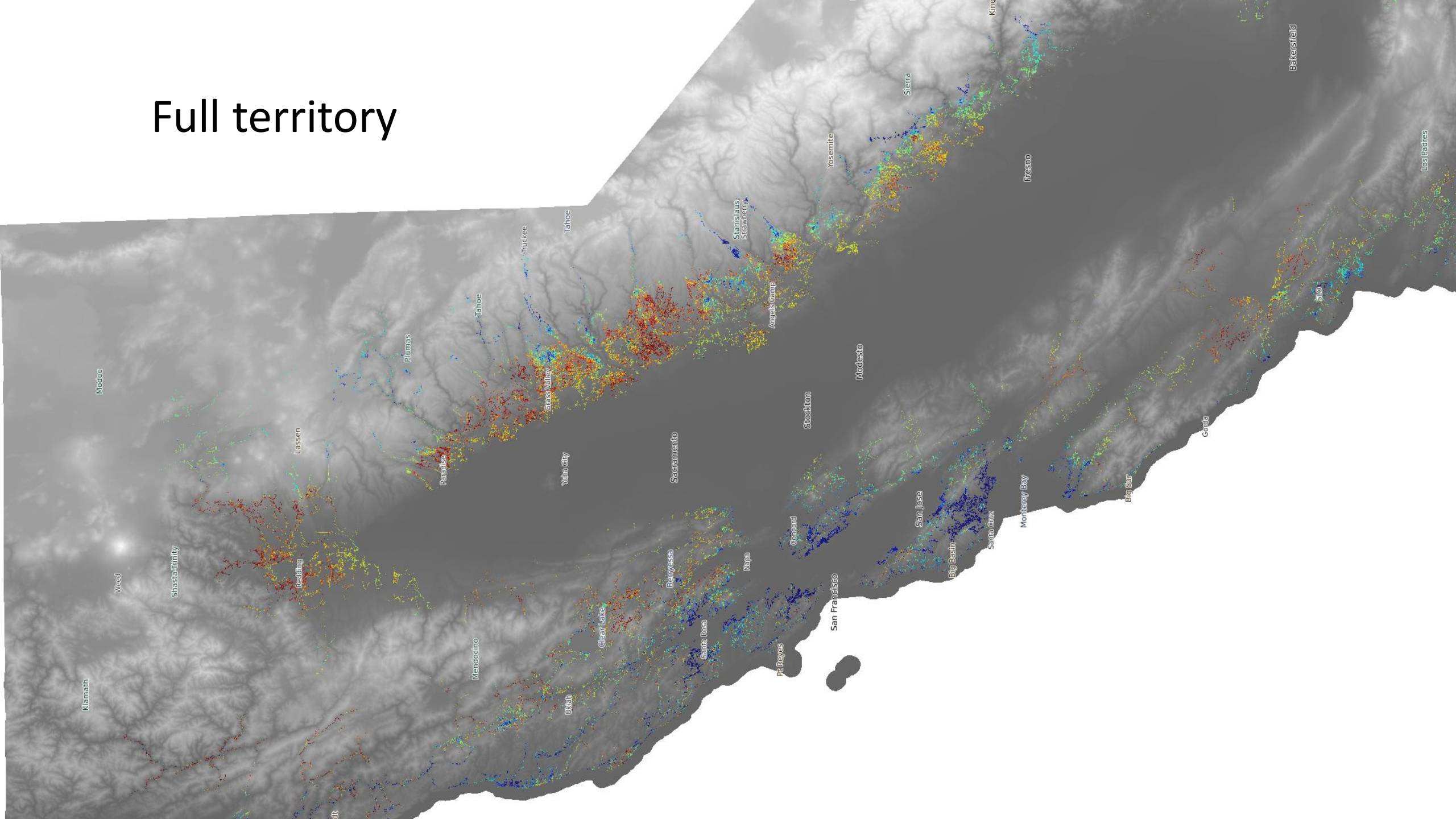


P(ignition) – P(outage) where are they different?





Full territory

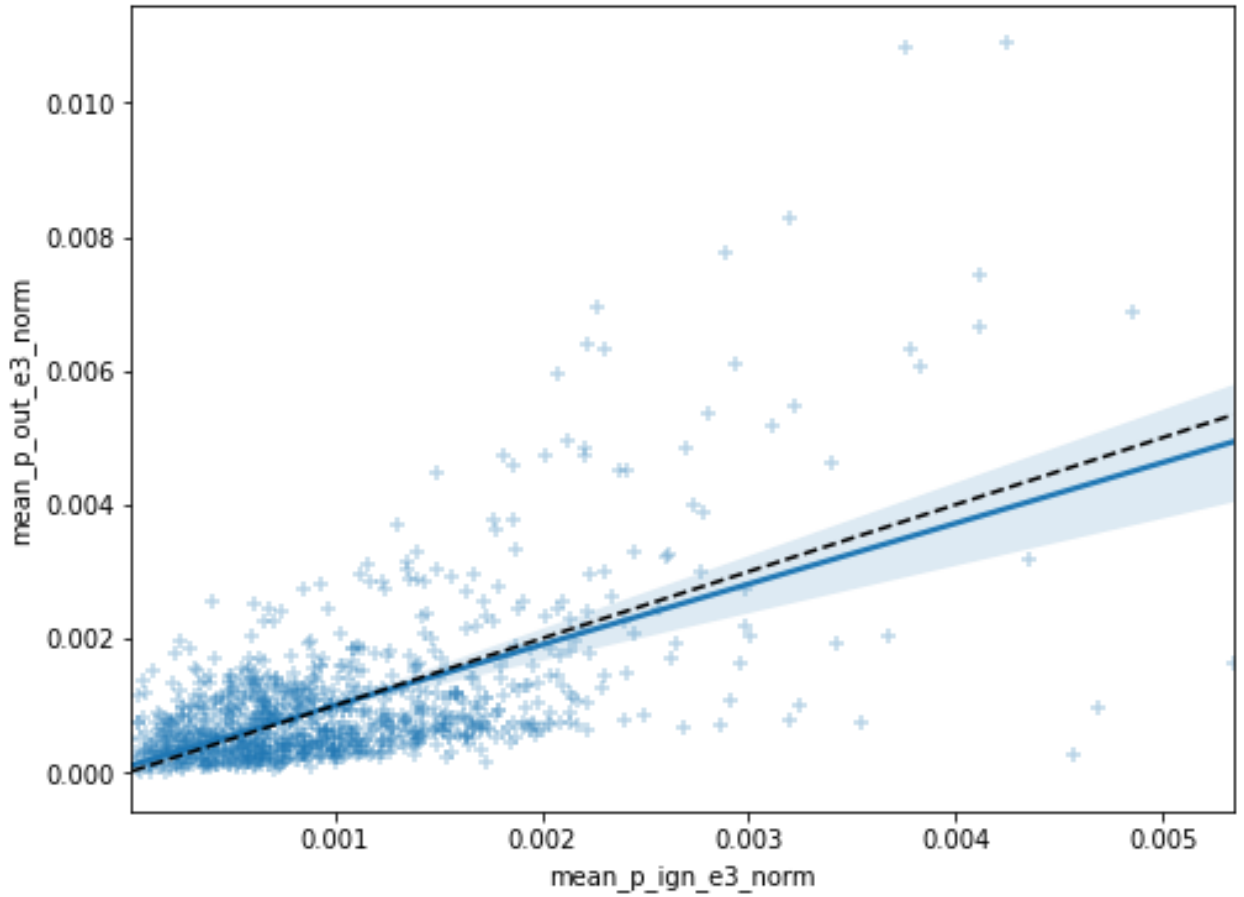


Summarizing results to the Circuit Protection Zone

Note tabular results are available as:
VMD_trees_2019_pz_summary_covariates_e3_hftd_23.csv

CPZ comparison of P(ignition) and P(outage)

- “Roll-up” pixel data to CPZ
- Normalize CPZ mean P(outage) and P(ignition), both trained on Jun-Nov events for 2015-2018 (fold1)
- Scatter normalized values (outage model y-axis; ignition model x-axis)
- Black dashed line is P(outage) = P(ignition)
  - Under the diagonal, P(ignition) is higher
  - Above the diagonal, P(outage) is higher
- Blue line is the trend



P(ignition) covariate correlations (fold1 ignitions model)