Examining Environmental and Structural Impact of Extreme Events on Land Cover

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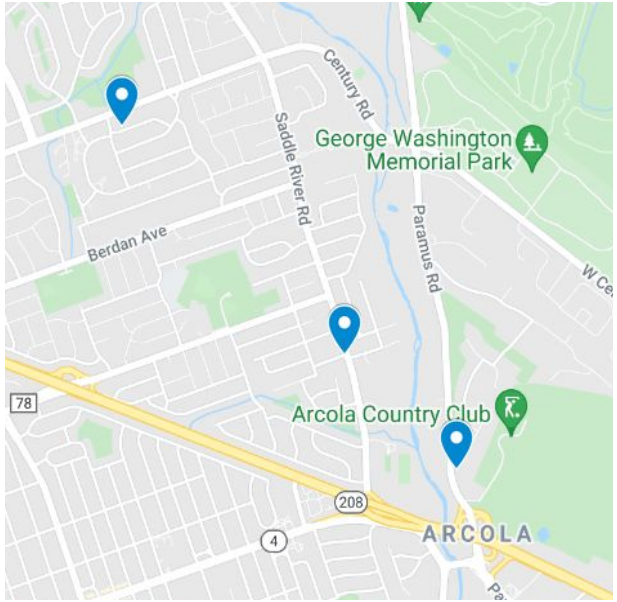
Why is it important?

- **Problem**
  - Extreme events threaten humans and the environment
  - Climate change is increasing the number and severity of extreme events (Oxfam International, 2020, Cuevas-González et al., 2009)
  - Impact assessment aids scientists and policymakers in planning preventive and reconstruction measures
- **Research Question:** How have various extreme events environmentally and structurally impacted land cover in areas across the United States?
- **Goals**
  - Assess recovery time and immediate and long-term impact of extreme events by examining Camp Fire and Tropical Storm Elsa
- **Hypothesis**: Incomplete recovery from fire and storm had little impact

Methods

- **Camp Fire:**
  - NASA Worldview
  - CV2 in Python analyzes RGB content of images
  - Produces the mean greenness value of images
  - Took baseline pre-fire image, post-fire week 0 image, and one image for each of 26 weeks after the fire
- **Tropical Storm Elsa:**
  - GLOBE Observer App
  - Bergen County, New Jersey
  - Before and after storm pictures at three locations per cardinal direction

Methods

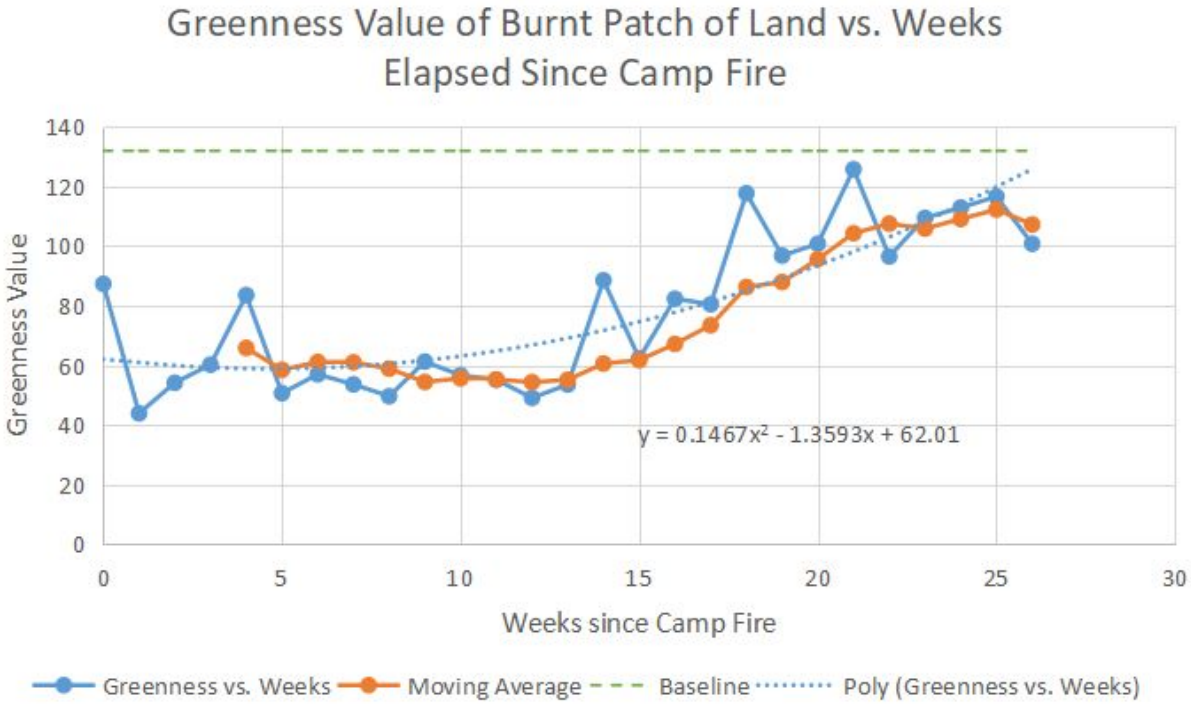


Caption: study site of Paradise, California and Bergen County, New Jersey on Google My Maps

Three photographed locations in New Jersey

Results: Camp Fire

- Damage was substantial
- Greenness increased but always stayed below baseline
- Recovery was significant but incomplete
- No greenness outliers



Results: Tropical Storm Elsa

- ⅔ of the 12 pictures at a specific location and direction showed no changes
- Remaining ⅓ were inconclusive

Coordinates of Observation	North Picture	East Picture	South Picture	West Picture
40.941093°, -74.109019°	 	 	 	 

Before (top) and after (bottom) pictures at one location

Discussion

- Complete recovery takes longer than 26 weeks
- Tropical Storm Elsa had minimal impact
- Errors
  - Bias in choosing weekly satellite images
  - Single baseline measurement may be inaccurate
  - Before and after pictures captured different features
- Other studies made burn severity maps using NDWI to assess the health of vegetation (Gao, 1996)
- Satellite data has been used to analyze changes in land cover (Khan et al., 2014)

Conclusion and Implications

- Greenness values and citizen science can provide information on severity of damage and time for recovery
- Analysis could be extended beyond 26 weeks until full recovery
- Future studies can use greenness to predict impact of other extreme events
- Machine learning can analyze changes in land cover
- Shows importance of research on land cover and allows for more comprehensive measures to prepare for extreme events

Thank you!

- Peer Mentors:
  - Pratham Babaria
  - Kavita Kar
- Cassie Soeffing
- Dr. Russanne Low and Peder Nelson
- All other SEES instructors and associates

SEES Highlights

- Alissa: Exploring the nearby area and taking Land Cover observations, Collect Earth Online activity
- Evan: Dr. Allison Parker’s talk
- Joseph: learning about new career opportunities at NASA
- Cassie: talking with mentors
- Benjamin: Building my mosquito trap and checking it every week.

Team Roles

- Alissa Sherbatov: came up with the project idea, collected and analyzed data, created greenness recovery graph, helped plan means of data collection, wrote part of paper
- Evan Hsiang: analyzed data, gathered sources, wrote part of paper, made most of slideshow, wrote script
- Joseph Ortiz: introduction of paper, started slideshow, part of slideshow, made copy of Poster template
- Benjamin Koppe: cited sources, introduction of paper, worked on part of data analysis of Elsa
- Cassie Kilburn: worked to develop project idea, communicated with mentors, ensured requirements were met, edited video

Selected Bibliography

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