Annual Meeting Report

SCC-IRG Track 1: Reducing the Vulnerability of Disadvantaged Communities to the Impacts of Cascading Hazards Under a Changing Climate

Sponsor:

National Institute of Food and Agriculture (NIFA)

Nice, CA
July 25-26, 2022

Participant Institutions:

Lake County Sheriff's Office
Sacramento Police Department
USDA National Institute of Food and Agriculture
Mississippi State University
Oregon State University
University of California Irvine
University of Illinois Urbana-Champaign
University of Colorado Boulder

Video:

https://www.facebook.com/LakeCountyOES/videos/622887045920808/?extid=NS-UNK-UNK-UNK-IOS_GK0T-GK1C-GK2C

ATTENDEES:

NIFA Project Manager (virtual):
Steven J. Thomson (National Program Leader) - USDA National Institute of Food and Agriculture

Research Team:
Farshid Vahedifard (Professor) – Mississippi State University
Roxane C. Silver (Professor) – University of California, Irvine
Alireza Ermagun (Assistant Professor) – Mississippi State University
Ben Leshchinsky (Associate Professor) – Oregon State University
Timothy D. Stark (Professor) - University of Illinois Urbana-Champaign
Amir AghaKouchak (Professor) – University of California, Irvine
Diego Thompson (Assistant Professor) - Mississippi State University
Katya Schloesser (Education and Outreach Associate) – University of Colorado Boulder
Charlotte Love (Postdoctoral Scholar) – University of California, Irvine
Masood Abdollahi (PhD Candidate) - Mississippi State University
Kayley Estes (PhD Candidate) - University of California, Irvine

Community Partners:
Kathy Lester (Police Chief) – Sacramento Police Department
Gavin Wells, Lieutenant (Deputy Director of Emergency Services) - Lake County Sheriff's Office
Leah Sautelet (Emergency Service Manager) - Lake County Sheriff's Office
Dale Carnathan (Emergency Service Manager, Retired) - Lake County Sheriff's Office
Garrett James - Emergency Services Specialist, Mendocino County
Travis Killmer - Disaster Recovery Field Coordinator, Mendocino County
Steven Switzer, Planner from Planning and Building Services, Mendocino County

AGENDA

Monday, July 25

- 8:00 to 8:30 – Breakfast
- 8:30 to 9:00 – Welcome and Introduction of Attendees (Farshid Vahedifard)
- 9:00 to 9:45 - Opening Remarks
    - Gavin Wells, Lake County Sheriff's Office
    - Leah Sautelet, Emergency Services Manager, Lake County
    - Kathy Lester, Chief, Sacramento Police
    - Steven J. Thomson, National Program Leader, USDA-National Institute of Food and Agriculture (NIFA) *(online)*
- 9:45 to 10:15 – Break and networking
- 10:15 to 10:30 - Overview of Project's Objectives and Tasks (Farshid Vahedifard)
- 10:30 to 12:00- Research Presentations (Progress, Challenges, and Plan, each presentation about 25 minutes)
    - Task 1.1. Understanding and characterizing the interplay among cascading hazards (Amir Aghakouchak)
    - Task 1.2. Enhancing fire resilience in managed landscapes and Wildland Urban Interfaces (Tirtha Banerjee)
    - Task 1.3. Collect and infuse data for monitoring, modeling and validation of wildfire and related cascading hazards (Tim Stark)
- 12:00 to 13:00 – Lunch
- 13:00 to 14:30 – Meeting with Advisory Board and Community Partners
    - *In person and online*
- 14:30 to 15:00 - Break and networking
- 15:00 to 16:30 - Research Presentations (Progress, Challenges, and Plan, each presentation about 25 minutes)
    - Task 1.4a. Characterizing and modeling wildfire-related geohazards (Ben Leshchinsky)
    - Task 1.4b. Characterizing and modeling wildfire-related geohazards (Farshid Vahedifard)
    - Task 2.1. Using focus group methodology, identify information shortfalls and behavioral responses of emergency managers, planners, and disadvantaged residents (Alireza Ermagun, Diego Thompson)
- 16:30 to 19:00 - Site Visit *(to be confirmed with Gavin Wells and Leah Sautelet)*
- 19:00 Dinner

Tuesday, July 26

- 8:00 to 8:30 – Breakfast
- 8:30 to 8:45 - Opening (Farshid Vahedifard)
- 8:45 to 10:15- Research Presentations (Progress, Challenges, and Plan, each presentation about 25 minutes)
    - Task 2.2. Using longitudinal surveys of a probability-based representative sample of Lake County residents, identify the perceptions, needs, and

behavioral responses of individuals at risk for wildfires and cascading hazards (Roxy Silver)
        - Task 3.1. Develop a unified, spatiotemporal model to evaluate the evolving likelihood and timing of impacts of cascading hazards (Amir AghaKouchak, ??)
        - Task 3.2. Develop real time English/Spanish messaging service to inform rural Hispanic communities of current and ongoing risks of cascading hazards (Tim Stark)
- 10:15 to 11:00 - Break and networking
- 11:00 to 11:30- K-12 Education and Outreach (Katya Schloesser)
- 11:30 to 12:30 – Lunch
- 12:30 to 14:00 – Evaluation and brainstorming (research progress, issues, community engagement plan etc.)
- 14:00 to 14:30 - Break and networking
- 14:30 to 16:00 – Plan for the upcoming year and further collaboration
- 16:00 to 16: 30 adjourn

Opening Remarks (Gavin Wells, Leah Sautelet, Kathy Lester, Steven Thomson):

A summary of the challenges Lake County faced during the past 8 years was presented as follow:

2015: Drought, low water level at Clear Lake, and 3 wildfires (Rocky Fire, Valley Fire, and Jerusalem Fire).

2016: One wildfire (Clayton Fire)

2017: Mass Flooding and wildfire (Sulphur Fire)

2018: Pawnee Fire, Ranch and River Fires (Mendocino Complex)

2019: Mass Flooding and landslides throughout the county.

2020: Lake Storm, Lake County Napa Valley Fire

2021: Drought, low water level of Clear Lake, drying of residential wells, Cache Fire

Gavin explained in case of fire, evacuation is done by moving people to shelters that are located across the county rather than moving people out of the county. In case of evacuation, public transport is provided for seniors and others with no access to personal vehicles. The only two narrow major roads in the county challenge the evacuation in case of fire. Another problem in case of evacuation is senior citizens, farmers, and ranchers who are not willing to leave their property. The emergency alerts system goes through AT&T landlines, cellphones, emails, and text messages. Cellphone coverage is a major problem. Many places across the county have no coverage or only have one cell tower that can be affected by fire. There are sirens in some locations. However, the coverage area is limited, and the sound is not loud. Sirens are mostly effective for outdoor notification.

Fire mostly took place in the south of the county. Considering the chain of events following the fire the county is concerned with flooding, debris flow, and mudslide. Not so many major landslides followed the previous fires, but numerous shallow slope failures followed the fires. As for more major landslides, one happened in Anderson Springs several years following the Valley Fire which dropped down and blocked one of the access routes. Loss of a large section of roads across the county has also been reported due to the movement of debris into roads following the fires. Dam failure in Indian Valley would cause inundation of 4 feet throughout the valley (3000 residents) in two hours as the result of mass flooding.

Kathy Lester briefly explained the unprecedented climate change and fire regime in California, poor management of federal lands when the fire hits, and the urge for collaboration between

Federal and State authorities to fight against wildfires. She also mentioned the need for collaboration among public policymakers, decision-makers and scientists. She further talked about how limited resources challenge California in the fight against wildfires. The number of fires caused by arsonists is increasing in California. She concludes her speech by bringing up the affected air quality as a result of frequent wildfires in California.

Steve Thomson briefly explained the process over which the proposal got accepted and funded by NSF and NIFA. The amount of funding that had already been assigned to the project was mentioned. The possibility of an increase in the project budget by supplements without competition was also mentioned by Steve.

Overview of Project's Objectives and Tasks (Farshid Vahedifard)

Farshid Vahedifard quickly went over the proposal. The preliminary objective was to advance the state of the art in terms of modeling temporal and spatial cascading hazards. The second objective was to identify information shortfalls between planners, emergency managers, and community members. The third objective was to develop a multilingual evacuation tool to cope with cascading hazards. He reviewed the research team, stating that 5 universities are involved in the project and respected community partners. He then discussed the study area stating that more than 60% of the county has burned since 2015. He then discussed each task that was included in the proposal. The first task includes modeling the interaction and interplay between cascading hazards, modeling wild and urban interface, and collecting data for validating and modeling the cascading hazards following wildfire. The second task includes identifying information shortfalls in response to cascading hazards with two subtasks of using focus groups methodology and the second one is using surveys to evaluate individual's perception of cascading hazards. The final task and the outcome are tools that enable emergency managers to communicate and act in a timely manner to protect the community when facing cascading hazards (real-time modeling of cascading hazards, bilingual alert system). The project will also have an educational component.

Understanding and characterizing the interplay among cascading hazards (Amir AghaKouchak)

Amir AghaKouchak explained the concept of cascading hazards by an example in California. He then discussed the compound event of drought and heat waves. He then discussed the different

types of cascading events: Multivariate Compound Events, Spatially Compound Events, Temporally Compound (Cascading) events, and Preconditioned Compound Events. He explained that his research team was able to develop models to evaluate risk analysis, frequency, and the likelihood of compound events. He then discussed the snow-temperature fire dynamic as one specific type of compounding event important for the Northern part of California, including Lake County. More heat waves are now happening when snow is still on the ground. More heat waves and subsequent temperature increases and snow melting rates increase the chance for drought (endangering water supplies) and flood in the same year.

Many of the areas usually covered by snow are now experiencing wildfires by fire moving to higher elevations. He then explained the interplay between droughts, heatwaves, snow melting, fire, and flooding/debris flow. He then talked about the increase in the number of extreme precipitation events. His team has developed a model to simulate non-stationary extreme events characteristics. He continued his presentation by explaining how his team will model the cascading hazards (temporally compound events). He showed cascading hazards are now occurring more frequently across California. However, he mentioned that they needed to modify the model to be run in finer resolution to get more reliable results on the county scale. In this model, calculations are done backward from the events to the drivers; then it is examined if the obtained derivers could cause such events. If the two match, the cascading hazard is most likely to happen. He concluded his presentation by discussing the anthropogenic contribution to extreme events.

Collect and infuse data for monitoring, modeling, and validation of wildfire and related cascading hazards (Timothy Stark)

Timothy Stark discussed the 4 locations for field monitoring and data collection.

1) North Fork Cache Creek Landslide (also monitored by USGS and the county)
2) Northeast of Clear Lake (Near Nice)
3) Clear Lake Oaks (a major road to hidden valley, might be blocked by debris flows and affect the community livening nearby)
4) HW175, Hopland Grade - Cow Mountain

Other Possible locations:

- The intersection of 20 and 53 highway, Walker Ridge Road, slope stability problem along Cache Creek
- Cobb Mountain (Burned in Valley Fire) - Anderson Springs

The possibility of using InSAR to collect data was discussed.

Each site will have a weather station, soil moisture gauges, and tiltmeters.

Characterizing and modeling wildfire-related geohazards with Focus on Debris Flows (Ben Leshchinsky)

Ben Leshchinsky explained his work on modeling debris flows following wildfire. His team has developed a physics-based approach as a predictive tool for shallow landslide and debris flow susceptibility. The model enables extrapolation to a variety of triggering disturbances like the storm intensity and burn severity. Such analysis may be linked to practical spatial data to evaluate risk. Inputs for the model, such as the topography of the area and stability of slopes, can be obtained remotely from available datasets. The model characterizes the uncertainty to obtain the risk of ground movement for different deriving scenarios (extreme rainfall). The end result would be the generation of threshold maps for the possibility of ground movement within the terrain.

Characterizing and modeling wildfire-related geohazards with Focus on Landslides (Masood Abdollahi)

Masood Abdollahi presented the model he and Farshid Vahedifard developed to evaluate landslide and shallow slope failures in the years following a wildfire. This is a physics-based model that takes the terrain settings, physical properties, and projected (or historical) rainfall characteristics as inputs to model the possibility of a landslide after a wildfire. Such input parameters can be easily obtained through available databases or field measurements. The model is dynamic and considers the changes in vegetation cover and terrain physical properties after the fire. Masood later showed the application of the model by employing it to evaluate a case study in California, where Fish Fire and Reservoir Fire burned combined 4,500 acres in San Gabriel Mountain near Azusa, Duarte, on June 20, 2016. The model could successfully capture the location of the landslides that later occurred in this area (January 2019) due to a heavy rainstorm. Masood concluded his presentation by discussing the model's applicability to other regions across the nation, including the area of interest of this project, Lake County.

Site Visit:

As the last activity of the first day, the team visited two sites located south of Clear Lake, which previously was burned in the Valley Fire and later experienced a number of landslides.

- Anderson Springs, the number of residents was considerably reduced after the Valley Fire. Two years later, the area experienced several slides.
- Hoberg's Resort (South Lake County)

Using focus group methodology, identify information shortfalls and behavioral responses of emergency managers, planners, and disadvantaged residents (Diego Thompson)

Diego Thompson explained how holding focus groups could help identify the information shortfall among policymakers, emergency managers, and community members regarding cascading hazards. He identifies the vulnerable groups in Lake County as elders and disabled people, low-income residents, individuals who don't speak English, and people who don't trust governmental institutions. Through these focus group meetings, he and Alireza Ermagun try to find answers to the following questions: 1) what are the factors that influence decision makers' actions during the cascading events, 2) What resources do emergency managers use to assess the risk of fire and other extreme events in their jurisdiction, 3) How decision-makers communicate with the community in case of extreme events, and 4) How can we enhance the resiliency of disadvantaged community against cascading hazards. To o so, they had 3 focus groups with 12 participants from 9 counties in California. Some of the results show: The lack of unified protocol for emergency managers to assess the risk of cascading hazards, unequal access to risk assessment resources throughout the state, and financial limitations of both the governmental agencies and community members hinder the efficient transfer of info and alerts in case of hazards, and reluctancy of some individual to follow the protocols caused by their distrust in the government. He concluded his presentation by discussing the next he and Alireza are going to take as follows: Publish the collected data and continue to have focus groups with senior, AFN, and low-income residents.

Using longitudinal surveys of a probability-based representative sample of Lake County residents, identify the perceptions, needs, and behavioral responses of individuals at risk for wildfires and cascading hazards (**Roxane Silver and Kayley Estes**)

Roxane Silver started her presentation by emphasizing the need for studying community behavior in the event of cascading hazards, especially those initiated by wildfire. She explained that we are missing a longitudinal real-time understanding of evacuation behavior. She also mentioned our lack of knowledge on how pre-disaster thoughts and feelings are associated with the post-event psychological outcomes. The goals of her research team for this project are: 1) Predicting evacuation behavior, 2) Identifying factors that affect individuals' evacuation behavior, 3) Incorporating the outcome of (1) and (2) designing the pre-disaster evacuation procedure better. She continued her presentation with an example of an earlier survey she had conducted in two waves before and after Hurricane Irma in Florida, indicating that under threat, people's of their evacuation zone status might not be accurate. For the current project, she plans to do a two waves survey before and after the fire season. Questions are about how people live under the constant threat of fire, what are the emotional consequences, and how they perceive and plan for future disasters (Kayley continues the presentation). She explained why finding out people's perception of disasters is important in predicting their behavior in case of extreme events. She explained their research team aimed to survey a sample of 1250 residents' representing the entire county with compensations of $20 and $25 for pre- and post-fire surveys, respectively. Surveys would be available online (paper and pencil packets are also included). Surveys would come in both English and Spanish. She ended her presentation with a list of items included in each survey.

Develop real-time English/Spanish messaging service to inform rural Hispanic communities of current and ongoing risks of cascading hazards (Timothy Stark)

Timothy Stark explained that the county's alert system is cell tower based and could experience malfunction during the fire. He intends to use radio stations to broadcast alert messages. He would also help the sheriff's office by providing them with Spanish templates to be used for alert message translation from English in case of different events. The next item on the list would be putting out info so that when residents hear the siren, they listen to the radio channel.

K-12 Education and Outreach (Katya Schloesser)

Katya Schloesser started her presentation by explaining how she had been trying to enhance the perception of teachers and young students of natural hazards. The focus had been on wildfire, drought, and flood. The project had a major focus on action. The goal is to modify the curriculum to be more applicable to Lake County. The lessons can last from two days to three months and

include hazards lessons and scenario-based role-playing games modeled after scenarios the fire department run with its own personnel. The focus in Lake County would be on cascading hazards and the impact on disadvantaged communities. Trauma practices would be included. She intends to create a story map of the county to teach students about the history of the county but the focus would be on enhancing the resiliency of the community. She also mentioned exposing students to the parts which experienced natural disasters in the past would help them gain a better perspective of the problem. Interviewing the teachers, adding the resiliency classes to their existing curriculum, piloting the curriculum with teachers and receiving their feedback, having workshops for teachers, representing the curriculum at the California Association of Science Educators, and submitting the curriculum to schools are on her list.

Follow-up Actions and Actions for Future

Task 1.1: We need to decide what kind of cascading hazard we are facing, then we can go back and modify our modeling depending on our area of interest. Projection of fire and extreme events are set to be done.

On the modeling side, more technical meetings are required.

Task 1.3: 4 Sites have been selected. Instrumentation is expected to start in August. InSAR component can be added to field monitoring. The possibility of adding one more station at Anderson Springs is discussed. The possibility of collaboration with Calpine Geothermal for data collection in Anderson Springs was brought up by Leah. Another idea discussed was field measurement and data collection in prescribed burn activities in cooperation with Cal Fire.

Task 1.4: Debris flows and landslide modeling can be combined into one unified model to predict both short- and long-term scenarios. Pre-populate both debris flows and landslides hazard map maps for possible projected scenarios.

Task 2.1: Have the full draft of the first paper before the end of August. Forming and Having the next focus group within the next six months

Task 2.2: Set up a meeting with Pen State staff for sampling. Increase the sample size to look at sub-samples. Consider the “drug use” issue in Lake County.

Task 3.2: Do the assessment with teachers this fall. Interview and recruit teachers to do a pilot study on the proposed curriculum in the spring. Revise the curriculum next summer. Have the workshop for teachers in the fall. Submit the curriculum to the California Association of science educators and get it published.

Possible Future Collaboration:

- ***NASA: Wildfire Reduction Program***
- ***NIFA***
- ***Cal Fire***

Other Items to Follow up:

Designing an interactive website to engage the community and teach them about the risk of cascading hazards and how to be prepared for them.

Advertisement of our ideas and project through our community partners. For this purpose, we can reutilize the equipment the county had for hazard mitigation projects, newspaper ads, radio, etc. To build on the existing program and start with the partners already engaged is more practical. We need to interview people who have already lost some to natural hazards to see their perspectives. We can represent our ideas in the county's councils and gatherings (i.e., Cobb Area Council, Disaster Council).

We need to have more focus meetings with different groups' leaders in the county. Each focus group will have a sample size of 10 to 12 with an overall of 50 people. Compensate of $20-25 can be considered for the participants. Results of the focus groups can help with the design of the surveys.

Surveys are pushed back to the next fire season.

Effective ways to have more productive focus groups: Design and send out flyers, one person be available in the county to do area focus groups, including vulnerable groups like the senior population, advertising on social media, and including community leaders.

Other ways to recruit people for the focus groups are to advertise at festivals held in the county (i.e., Kelseyville Pear Festival in September), use colleges in the county to broadcast our work,

start partnerships with high schools and send info to parents through teachers and students, using and FM stations.

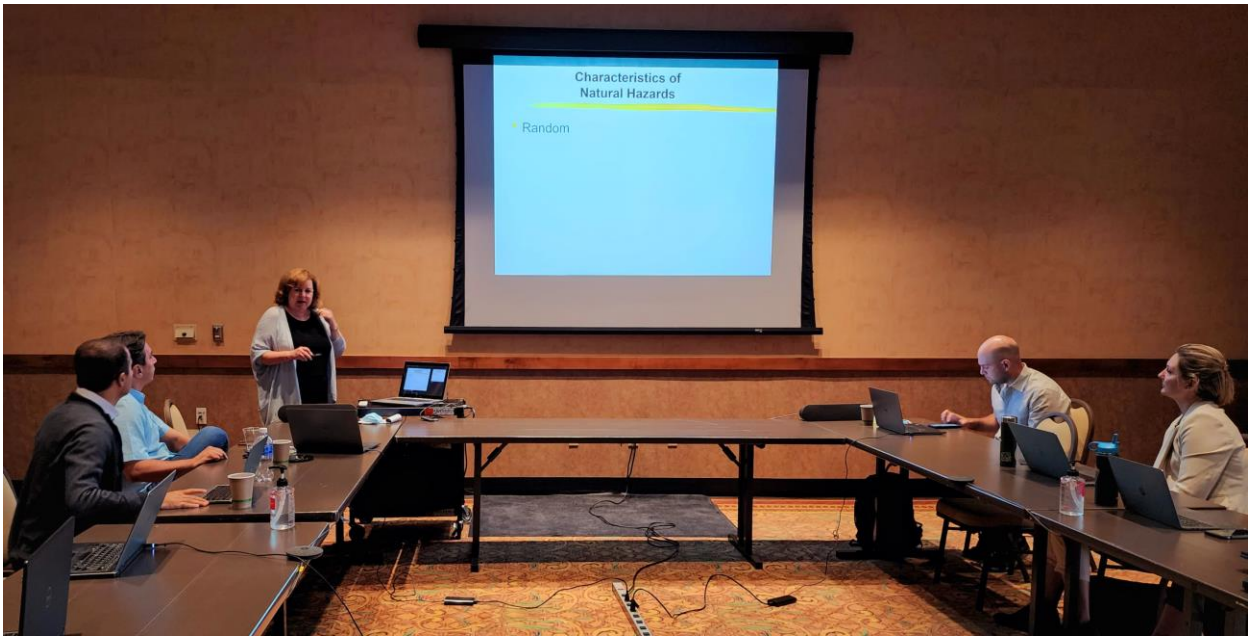
Using new high internet services (fiber optics) and FM towers as means of communication with the community to send out warnings. Regarding using maps residents have access to evacuation zone maps (https://community.zonehaven.com/?latlon=39.1419937,-122.8818354&z=10)..

Inclusion of tribes and ranchers in focus group studies.

It could be better if we could add more stages to the surveys.

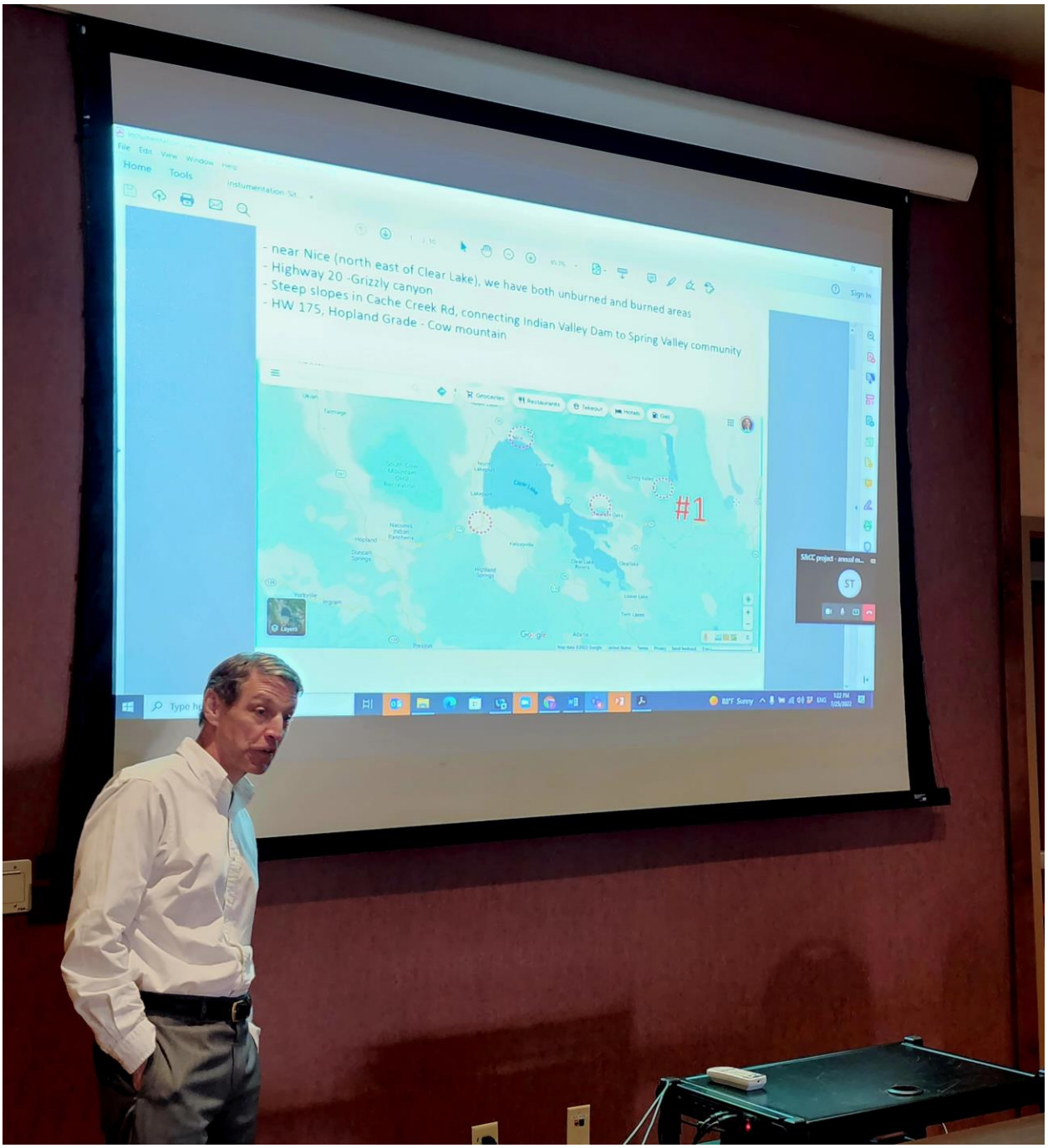
Seek ways to compare the results of our survey with those conducted by the census.

Appendix


Characteristics of
Natural Hazards
Random


EXIT
Employees Only
EMPLOYEES
ONLY
Landslide
Susceptibility in the
Post-Fire Environment
• Debris flows are a primary hazard in post-fire landscape. Can be triggered by intense rainfall and:
• Sediment buildup in channels, eventual damburst
• Shallow landslides
• Flooding
• All of the above
• Seek to expand tools developed in Oregon for the site of interest to investigate landslides as a trigger of debris flows.


Results
1. What are the factors that influence decision making under cascading events?
2. What information do emergency managers use to assess the risk of wildfires and related hazards in their jurisdiction?
➢ Different and unequal assessment of risks and vulnerabilities.
➢ Most resources came from outside communities and institutions: National Forest, U.S. Forest Service, Cal Fire, etc.
➢ There isn't a unified protocol to assess the risk and/or to work with specific institutions. Very diverse!
➢ Inequality in access to resources comparing counties. This unequal distribution of resources may make some jurisdictions more vulnerable than others.


- near Nice (north east of Clear Lake), we have both unburned and burned areas
- Highway 20 -Grizzly canyon
- Steep slopes in Cache Creek Rd, connecting Indian Valley Dam to Spring Valley community
- HW 175, Hopland Grade - Cow mountain
#1


Jordan Creek
2D
Google
100%
Imagery date: 4/19/21 - newer
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
300 m
Camera: 1,046 m 38°59'35"N 122°33'04"W
325 m