2024 Southeast Alaska Landslide Working Group Summary Report

Introduction

Between March 5 and 6, 2024 representatives from municipalities, Tribes, state and federal agencies, universities, and non-governmental organizations met in Sitka, Alaska to develop an interagency working group on landslide risk reduction. This report describes the major parts of the meeting and provides a detailed listing of which agencies are working to reduce landslide risk in the region, contacts in those agencies, agency roles, and the assets they have available. Note that the Alaska Division of Homeland Security and Emergency Management was not represented at the meeting and therefore is not described below. This report also summarizes a discussion by community members regarding their needs with respect to landslide risk reduction. Finally, it describes some of the major conclusions drawn from the two days of discussion.

Motivation for the Meeting

Co-hosted by Central Council Tlingit Haida Indian Tribes of Alaska (T&H) and the Sitka Sound Science Center (SSSC), this workshop was motivated by a need to increase communication between Tribes, municipalities, state and federal agencies, and other parties interested in reducing the risks posed by landslides in Southeast Alaska. In 2015, a fatal landslide in Sitka, Alaska prompted that community to form the Sitka Geo Task Force. The Task Force's work ultimately led the National Science Foundation (NSF) to support the development of a landslide warning tool for the community of Sitka. The tool was co-developed by community members and a team of geo and social scientists. The co-development team included scientists from the SSSC, RAND Corp, state and federal agencies as well as academic scientists and the Sitka Tribe of Alaska This effort was expanded in 2021 when the NSF funded a second project aimed at bringing natural hazard warning systems to other communities in Southeast Alaska. This project is known as Kutí, which is the Tlingit word for weather. In 2020 another fatal slide occurred in Haines, a neighboring Southeast community, and a third fatal event occurred in nearby Wrangell, Alaska, in November of 2023. By now, it is abundantly clear that there is a need for a sustained, concerted, and region-wide effort to build resiliency and improve protection from landslides.

Landslides in Southeast Alaska pose significant risks to public safety and infrastructure. Municipalities are often hamstrung by the limited amount of flat land available for building and the inherent unpredictability of landslides. In many communities, the built environment is obviously at risk of exposure to landslides, but any municipal acknowledgment of risk raises significant concerns about land value and liability. Consequently, municipal efforts to catalog and mitigate risk are severely constrained. Landslides are an unavoidable feature of the Southeast Alaska landscape. The region is recently deglaciated, has high relief, and experiences dramatic rainstorms known as Atmospheric Rivers. These conditions mean that landslides will continue to occur throughout the region. Moreover, human-induced climate change has and will result in changes in the frequency of storms and in the intensity of rainfall in the region, exacerbating current hazards. A concerted effort to better understand where and when

landslides occur combined with a risk communication program will improve efforts to mitigate impacts and plan for response and recovery.

In 2021 Congress enacted the Landslide Preparedness Act to forestall the kinds of impacts experienced in Southeast Alaska and other parts of the nation. The act directed the United States Geological Survey (USGS) to "identify and understand landslide hazards and risks, reduce losses from landslides, protect communities at risk of landslide hazards, and help improve communication and emergency preparedness". This legislation is a signal that there is an appetite for coordinating landslide risk reduction activities on the local, state, and federal levels. For example, the recently published National Strategy for Landslide Loss Reduction echoes this desire. Strategic Action 2.4 in the National Strategy calls for establishing a National Landslide Hazard Risk Reduction Working Group and welcomes the participation of local entities. The meeting we convened was directly aimed at developing a similar structure for ensuring the coordination of entities involved in landslide risk reduction in Southeast Alaska.

Approach

Our approach for the workshop was to bring together representatives from state and federal agencies involved in landslide risk reduction along with representatives from municipalities and Tribes that are affected by landslides. University researchers, response organizations, and interested non-profit organizations were also invited. Government representatives provided short summaries of their activities in the region. The summaries were prompted with a set of questions. Following the agency presentations, a panel of community representatives convened to discuss community needs.

Following this discussion of agency capacities and community needs the group embarked on a series of discussions aimed at structuring a future working group organization. The themes of the discussions revolved around the components needed for an effective working group including:

1) A commonly held set of outcomes
2) A membership that includes all relevant groups
3) An understanding of each member's role and responsibilities
4) A clearly defined leadership structure
5) An understanding of the resources currently available
6) A mechanism for accountability

Afterward, a set of volunteers created a "formation committee" to sort out the details of the working group's governance structure. This committee will use the notes taken during the meeting to provide a framework that integrates the components listed above into a governance structure for the working group.

Invitees

A number of federal and state agencies are involved in landslide monitoring, research, mitigation, response, and recovery. The subset of the Federal agencies working on the national level with active programs in Southeast Alaska were invited to the workshop and offered the opportunity to describe their programs. Invited federal agencies included the US Geological Survey (USGS), Tongass National Forest (USFS), National Weather Service (NWS), and Federal Emergency Management Administration (FEMA). All except the latter attended. USGS was invited because its Landslide Hazard Program is the

only federal program dedicated to landslide science. They are also conducting research in Southeast Alaska; and partnered with the Alaska Division of Geologic and Geophysical Surveys (DGGS), T&H, and SSSC. We invited the NWS due to their role as the primary weather forecaster in the region. NWS currently forecasts flood conditions and references the possibility of landslides. The Tongass National Forest makes the USFS the largest landowner in the region and they maintain a landslide inventory on the Tongass and a variety of other programs relevant to landslide risk reduction. In addition, the USFS has a geohazards specialist employed in the Tongass. FEMA's Division of Homeland Security-Emergency Management's office (DHS-EM) in the State's Department of Military and Veterans Affairs was invited but could not attend.

Invited state agencies included the Division of Geological and Geophysical Surveys (DGGS) and the Department of Transportation and Public Facilities (DOT&PF). DGGS is located within the Department of Natural Resources and is responsible for determining the potential geologic hazards to buildings, roads, bridges, and other installations and structures in the state. We also invited representatives from DOT&PF, because their role is to maintain an inventory of unstable slopes along roadways, mitigate risk to roadways, and assist in emergency response following landslides. In addition, we invited researchers from the University of Alaska Fairbanks and the University of Alaska Southeast. Researchers at the former were involved in the 2020 response to the fatal slide in Haines, while researchers at the latter are actively engaged with a variety of geohazards in the region.

We also invited representatives from Tribal governments and municipalities in the region. We conferred with T&H to construct a list of tribal and municipal contacts and sent invitations to each. The Tribes and communities that sent representatives included: Central Council of Tlingit and Haida Indian Tribes of Alaska (T&H), Chilkoot Indian Association, City and Borough of Juneau, Haines Borough, Hoonah Indian Association, City of Hoonah, Organized Village of Kake, Metlakatla Indian Community, City of Pelican, Petersburg, City and Borough of Sitka Skagway Borough, and the Wrangell Cooperative Association. Several other organizations also became aware of the meeting and we extended invitations to them. These attendees included the National Park Service, Red Cross, Ground Truth Alaska, and the Alaska Climate Adaptation Center.

Agency Presentations

United States Geological Survey (USGS)

Participants in the SEAK Interagency Landslide Working Group Meeting

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The United States Geological Survey (USGS) operates the Landslide Hazards Program, dedicated to understanding landslide initiation and mobility processes. In 2022 they published a National Strategy for Landslide Loss Reduction. There are four main goals in the Strategy. They include:

1. Ensuring decision-makers have access to information on landslide risk
2. Coordinating efforts at federal, state, tribal, and local levels

3. Developing plans for landslide hazards
4. Developing effective warnings and responses to landslide hazards

The second of these goals calls for a U.S. Landslide Inventory and Interactive Map, a web-based tool for accessing landslide data. In addition, the strategy calls for a National Landslide Hazard Risk Reduction Working Group (NLHRR) that creates a common platform that 1) leverages expertise from different agencies, 2) communicates best practices, 3) develops collaborative projects, and 4) provides input for a grant program. At this point in time neither the NLHRR or the grant program have been initiated.

Data-sharing efforts involve collaborating with federal land managers, emergency management, state geological surveys, and academic/private sectors. The U.S. Landslide Inventory Web Application is an Esri-powered data portal that includes USGS-collected data as well as data and metadata submitted by other parties.
https://usgs.maps.arcgis.com/apps/webappviewer/index.html?id=ae120962f459434b8c904b456c82669d

National Landslide Preparedness Act

On January 5, 2021, the National Landslide Preparedness Act (P.L. 116-323) was signed into law; it authorized a national landslide hazards reduction program and a 3D elevation program within the USGS. This broadened the already existing Landslide Hazards Program under the Natural Hazards Mission Area, and the 3D Elevation Program under the National Geospatial Program and required additional coordination with other federal agencies. See also H.R.8810 - National Landslide Preparedness Act.
https://www.usgs.gov/programs/landslide-hazards/science/national-landslide-preparedness-act#overview

Under this act, USGS works in Southeast Alaska and Prince William Sound with federal, state, and local partners to:

- Conduct data collection and analysis to develop a site-specific landslide hazard assessment
- Provide recommendations to support a long-term monitoring strategy
- Develop an emergency system to alert of an impending or actual landslide that could result in a tsunami

USGS Landslide Hazards Program

The primary objective of the National Landslide Hazards Program is to reduce long-term losses from landslide hazards by improving our understanding of the causes of ground failure and suggesting mitigation strategies. The USGS Landslide Hazards Program is the only Federal program dedicated to landslide hazard science. The program conducts targeted studies to understand landslide initiation and mobility processes. This understanding is used to:

- Develop methods and models for landslide hazard assessment
- Develop and deploy systems and people to monitor threatening landslides where there is a federal role
- Develop methods and tools for landslide alerting, surveillance, and situational awareness

Maps and Data

- U.S. Landslide Inventory and Interactive Map:

A web-based interactive map with a consistent set of landslide data. The searchable map includes contributions from many local, state, and federal agencies and provides links to the original digital inventory files for further information. https://usgs.maps.arcgis.com/apps/webappviewer/index.html?id=ae120962f459434b8c904b456c82669d

- The USGS is actively trying to add some data sharing to the real-time plots. They aspire to add more hydrologic sites (staffing and funding dependent) for research purposes. USGS data and interpretive products go through various levels of review to ensure quality.
- GPS Data https://earthquake.usgs.gov/monitoring/gps/Alaska/ab42_

Partnerships

- DOI, USFS, and other federal land managers
- National Weather Service
- Emergency management
- State geological surveys
- Academic and private sector
- AK Partners
    - Sitka Sound Science Center (SSSC), DGGS, AEC, National Weather Service (NWS), NTWC, USFS

State of Alaska Division of Geological and Geophysical Surveys (DGGS)

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The Division of Geological & Geophysical Surveys (DGGS) is developing the Alaska Landslide Inventory interactive map and Report a Landslide app for public use. DGGS data-sharing protocols ensure the quality and appropriate release of geologic data. Partnerships include the United States Geological Survey (USGS), DOT&PF, and the University of Alaska Fairbanks.
https://dggs.alaska.gov/maps-data/index.html

Mission

They determine the potential of Alaskan land to produce metals, minerals, fuels, and geothermal resources, the locations and supplies of groundwater and construction material, and the potential geologic hazards to buildings, roads, bridges, and other installations and structures. (AS 41.08.020)

Systematic collection, evaluation, archiving, and distribution of geologic data and information on earthquakes, volcanic eruptions, and engineering geology and identification of potential seismic, volcanic, and other geological hazards throughout the state are in the public interest and necessary to orderly, safely, and cost-effective development in the state. (Sec. 41.08.017)

Geological hazard event responses come from the direction of the Department of Military and Veterans Affairs Division of Homeland Security and Emergency Management. However, DGGS is often present following landslide disasters for consultation.

- DGGS has a responsibility to provide sound scientific information and products related to geologic hazards
- Products are meant to educate, forewarn, mitigate, and help prepare response plans
- Assessments require data collection, interpretation, and peer review

Maps and Data Accessibility

Published public data can be found on the DGGS website:
Alaska Division of Geological & Geophysical Surveys Publications - Search | Alaska Division of Geological & Geophysical Surveys Maps & Data - Alaska Statewide Maps | Alaska Division of Geological & Geophysical Surveys

DGGS is currently developing the Alaska Landslide Inventory Interactive Map: A publicly accessible map of landslides in Alaska that includes US Forest Service Tongass National Forest Landslide Inventory data and feeds into the USGS Landslide Inventory. The public will be able to populate the interactive map by reporting landslides through the Report a Landslide App: A downloadable mobile application and web application to record landslides. With the click of a button, landslides can be added from the app to the Alaska Landslide Inventory Interactive Map after being reviewed for quality assurance. ArcGIS Survey123 will power the Report a Landslide Application.

Data Sharing Protocol

DGGS's general policy is that geologic data authorized by the survey must be technically reviewed and published before release to the public. Unpublished data may be withheld from the public or be available only on a limited, case-by-case basis. DGGS' archiving application allows for three levels of record availability: public, limited, and private. Examples of publicly withheld data include incorrect or poorly documented geologic interpretations or proprietary data given to DGGS only for in-house interpretive work.

Partnerships

- U.S. Geological Survey
- Department of Military and Veterans Affairs Division of Homeland Security and Emergency Management
- State of Alaska Department of Transportation & Public Facilities
- State of Alaska Division of Mining, Land, & Water
- University of Alaska Fairbanks
- Short-term partnerships with other universities
- Alaska Earthquake Center
- Engaged in an interagency effort with the United States Geological Survey (USGS), National Tsunami Warning Center (NTWC), the University of Alaska Fairbanks Alaska Earthquake Center (AEC) to understand the hazards posed by a landslide in Barry Arm Fjord, Prince William Sound, Alaska.

  https://dggs.alaska.gov/hazards/barry-arm-landslide.html

https://landslides.usgs.gov/storymap/barry-arm/

Weather Station Network

- Two stations in Southeast Alaska: Mount Riley near Haines and Harbor Mountain near Sitka
- Weather Stations: https://dggs.alaska.gov/weatherstations/#8
- Planning additional stations in Southeast Alaska with DOT&PF-Southcoast Region.

Alaska Department of Transportation and Public Facilities (DOT&PF)

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The Alaska Department of Transportation & Public Facilities (DOT&PF) documents landslide impacts on infrastructure and conducts geotechnical investigations for slope stability improvements. DOT&PF has an open data portal for public use. Information includes infrastructure data and current and future project data. Available data relate to landslide location, removal costs, and locations of unstable slopes. Anyone can download the raw data in various open formats including CSV, KML, ESRI Shapefile, and GeoJSON. The Alaska Department of Transportation & Public Facilities collaborates with agencies like SEOC, DGGS, UAF, and local communities on a project-by-project basis.

https://data-soa-akdot.opendata.arcgis.com/

Maps and Data

The Agency documents the location of landslides that impact DOT&PF infrastructure and associated debris removal and repair costs. They also map and rate unstable slopes along DOT&PF corridors as part of the Unstable Slope Management Program. Data are available online through the Department's ArcGIS website (https://data-soa-akdot.opendata.arcgis.com/).

- Slopes are assigned a hazard rating, risk rating, and Total Unstable Slope Management Program (USMP) rating.
- Ratings are used to identify problem slopes and help prioritize mitigation projects.
- For projects that include slope stability improvements or landslide mitigation aspects, we perform geotechnical investigations to characterize the site and inform design decisions. These investigations may include subsurface drilling, surface mapping, and instrumentation. These data are generally made available to the public after the project is advertised for construction.
- Utilization of drones for monitoring equipment locations

Partnerships

DOT&PF does not have formal partnerships to support geohazard work but frequently collaborates with the State Emergency Operations Center (SEOC), Alaska Division of Geological & Geophysical Surveys (DGGS), University of Alaska Fairbanks (UAF), and local communities on a project-by-project basis.

National Weather Service

Participants in the SEAK Interagency Landslide Working Group Meeting

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The National Weather Service (NWS) provides forecasts and alerts related to weather, hydrologic, and climate conditions that can lead to an increased risk of landslide impacts and alerts the community of such conditions. This is done by mentioning landslides in flood products as an impact from other meteorologic/hydrologic conditions when forecasted values exceed criteria. NWS also issues forecasts of heavy rainfall (atmospheric rivers) which often trigger landslides.

In addition, the NWS issues various products like Special Weather Statements, Flood/Flash Flood Watches, and Areal Flood Warnings to alert the public. Satellites, radar, lidar, and ground observations are deployed to monitor heavy/extreme rain events. Also, NWS partners with USGS, USFS, and local emergency management agencies. Emergency officials and community leaders can receive customized text messages and e-mail alerts for National Weather Service products with InteractiveNWS (iNWS) Mobile Alerting: https://inws.ncep.noaa.gov/. Region-specific landslide hazard data can be found on the National Weather Service website: https://www.weather.gov/ajk/.

Extreme precipitation events and landslides can be reported to the NWS at https://inws.ncep.noaa.gov/report/. The report type must be logged as a weather event such as rainfall, flooding, or wind.

Maps and Data

- Region-specific data including hazards, forecast, satellite, radar, climate, and hydrologic information can be found on the National Weather Service website (weather.gov/Juneau)
- InteractiveNWS (iNWS) is an application suite that allows NWS partners to receive National Weather Service products in new and innovative ways, such as text messaging and mobile-enabled webpages. iNWS strives to fulfill the NWS mission of protecting life and property by using technology to reach out to customers (inws.ncep.noaa.gov)
    - Push Notification email or text message available to:
        - Emergency Management
        - Community Leaders
        - Government Agencies

- Electronic Media: nicole.ferrin@noaa.gov
- NWS relies on a constellation of US and international satellites to build forecasts.
- Extreme rain forecasts include moisture at different altitudes, total moisture, and rainfall rate estimates.
- National Weather Service GIS Viewer https://viewer.weather.noaa.gov/water#layers=42904+40090+42133+41707+41708+41709+41631&x=-136.74498&y=57.37198&z=11.3&panel=legend

NWS Flood/Flash Flood Product Overview

- Special Weather Statement (Hydro): Used to alert the public to changing river conditions when flooding is not expected but rises or other impacts are possible.
- Hydrologic Outlook: These are issued to provide a long lead time beyond 36 hours of the causative event for the potential of flooding or other notable hydrologic events (landslides).
- Flood/Flash Flood Watch: These are issued when meteorological, soil, and/or hydrologic conditions will lead to flooding and/or an increased threat of numerous landslides in known areas within 48 hours is approximately 50 to 80 percent.
- Areal Flood Warnings: These are issued for areas along rivers and streams that are or are forecasted to exceed the established "moderate flood stage" to produce a threat to life and property. This will include the risk of landslides if criteria are met from rainfall and other thresholds.

Limits to Success and How NWS Overcomes Them

- Success = Provide the most lead time possible before impacts happen. Things we can do to improve forecasts include increasing real-time precipitation observations by:
    - Filling in the spatial gaps in observations
    - Increasing the number of high-elevation and mid-slope observations
    - Measuring precipitation at mid-slope and higher requires a heated tipping bucket (or other similar) to melt snow and requires a different power source (constant) on the tower/station than if the station only measured elements like temperature and wind.
- Success = Up-to-the-minute information on ongoing events, but satellites don't capture all the details, and radar coverage is limited. We rely on other sources for observations, don't assume NWS knows what is happening near you:
    - Phone calls from local officials and spotters
    - Community Facebook groups are useful, but can't monitor them all
    - Cooperative Observer Program (COOPs) – only measured once per day
    - The Community Collaborative Rain, Hail, and Snow Network (CoCoRaHS) - can take extra measurements

Partnerships

- USGS land hazards group
    - Soil interaction with precipitation
- USFS
    - Soil scientist expertise in SEAK and historical locations of previous events
- Alaska Division of Geological & Geophysical Surveys (AK DGGS)
    - Map where hazard areas area
    - Information to the public about landslides
- US Coast Guard

- Central Council of Tlingit & Haida
- Red Cross
- State Troopers
- Local Emergency Management
- Local Police/Fire
- Harbormasters & Other City Officials

United States Department of Agriculture - Forest Service

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The Forest Service is the largest landowner in Southeast Alaska and manages the Tongass National Forest. The USFS contributes to landslide hazard assessment by inventorying landslides located in the Tongass. Land use practices in the Tongass routinely require expertise in managing steep slopes for activities like timber harvest and road building. In addition to forest management activities, the USFS houses the Pacific Northwest Research Station, a research entity employing geoscientists. The Pacific Northwest Research Station is participating in the Kutí project. Partnerships include USGS, DGGS, NRCS, and others for data collection and research. The Landslide inventory of the Tongass National Forest Proclamation Boundary is updated yearly or as new imagery or field data becomes available. The inventory was last updated in April 2020.
https://gis.data.alaska.gov/datasets/usfs::tongass-national-forest-landslide-areas/about

Maps and Data

Tongass Landslide Inventory: The landslide inventory of the Tongass National Forest Proclamation Boundary is updated yearly, or as new imagery or field data becomes available. Last updated in April 2020. This feature class is a polygon landslide inventory of the Tongass National Forest. The digital version of this inventory was started in the year 2000. The once-over inventory was completed in 2017. It includes both field and photo-interpreted landslides. The inventory includes all mass wasting features--including talus slopes, snow avalanche fields, and snow avalanche chutes. Therefore, it may be necessary to exclude some mass wasting features in this data set when using it to determine landslide rates. Each of these is coded differently in the attributes. Most of the landslide polygons were digitized on the 1998 to 2010 orthophotos in GIS, although some were digitized using photos taken as recently as 2018. All the landslides have been age-bracketed within the available photo data sets to estimate the year of occurrence. Many of them were age-bracketed using air photos back to the 1929 Navy Trimegon photos. All landslides have been dated before or after 1948 imagery and before or after the 1996 to 1998 imagery. There is an associated point feature class that contains the landslide initiation zone approximations. These points only exist for true landslides--debris avalanches, debris torrents, combination debris avalanches/torrents, slumps, rotational failures, and rock fall-initiated failures. The feature class is updated annually or as new imagery becomes available. Last updated in April 2020. The Tongass National Forest Landslide Inventory data is added to the USGS landslide database. USGS is currently coordinating with DGGS to align data as well.

https://gis.data.alaska.gov/datasets/usfs::tongass-national-forest-landslide-areas/about
Other GIS data include the following—all publicly available:

- Land types
- Streams
- Soils
- Contours
- Lidar

Non-GIS data include the following:

- Experience installing and managing field equipment
- Geotechnical experts and evaluations
- Protocols for assessing steep or unstable slopes for USFS land management activities
    - Timber harvest
    - Road building
- Landslide rehabilitation and erosion control methods
- Access and Travel Management Plan and road maintenance objectives
- Research and technical guides for identifying hazards related to slope stability

Partnerships

- A participating partner in the Kuti project and a formal partner with the Sitka Sound Science Center
- Host DGGS, USGS, NRCS, and other data collection platforms on USFS lands through special use permits and MOUs.
    - Maintains its own set of weather stations; rainfall and soil moisture sensors, stream gages; and Snotel sites
- Memorandum of understanding with the American Association of State Geologists (AASG)
- In response to the 2021 National Landslide Preparedness Act, USFS has Personnel on the Interagency Coordination Committee on Landslide Hazards. As a group, they created the National Strategy for Landslide Loss Reduction. https://pubs.usgs.gov/of/2022/1075/ofr20221075.pdf
- Other partnerships include Barry Arm between USFS, USGS, and the State of AK

University of Alaska Fairbanks

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The University of Alaska Fairbanks is a Land, Sea, and Space Grant university and an international center for research, education, and the arts, emphasizing the circumpolar North and its diverse peoples. UAF integrates teaching, research, and public service as it educates students for active citizenship and prepares them for lifelong learning and careers. UAF collaborates with other university partners and state agencies to map landslides in Alaska. UAF can test soil and rock material as well as frozen soil properties through the Frozen Soil Testing Laboratory (FROST Lab).

Project Data

Mapping has been completed in conjunction with the Alaska Division of Geologic & Geophysical Surveys (ADGGS), including mapping of the landslides throughout the Fairbanks North Star Borough where lidar. Maps are published through the ADGGS website. (https://dggs.alaska.gov/pubs/id/30841)

Upcoming Tools

UAF can test soil and rock material properties and do slope stability analyses. UAF also has the Frozen Soil Testing Laboratory (FROST Lab), which is uniquely poised to test frozen soil properties - something of interest where permafrost slopes are becoming increasingly unstable.

Partnerships

- Alaska Division of Geologic & Geophysical Surveys
- Sitka Sound Science Center
- Oregon State University
- University of Oregon
- University of Washington
- Alaska Department of Transportation & Public Facilities
- Alyeska Pipeline Service Company

Sitka Sound Science Center (SSSC) and K̲utí Project Team

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The K̲utí project, named after the Tlingit word for weather, is a five-year NSF-funded research initiative developing tools to mitigate risks associated with precipitation-induced hazards such as landslides and floods in Southeast Alaska. The project involves a multidisciplinary team comprising atmospheric scientists, geoscientists, hydrologists, social scientists, community leaders, and Tribal environmental staff. The Sitka Sound Science Center is a K̲utí project partner and collects and aggregates precipitation and other valuable atmospheric and geologic data to help Southeast Alaskans reduce landslide risk in the region.

The SSSC also maintains a landslide warning application that is a legacy of a previous grant. The app is accessed via https://sitkalandslide.org. It is a tool that communicates the current probability that a landslide could occur in the vicinity of Sitka, Alaska, and the likelihood that one will occur in the next 72 hours. The tool was co-developed with community members and a team of geo and social scientists and is intended to provide situational awareness. The tool also includes a runout map depicting locations near Sitka where landslides might occur.

Project Data

- Sitka Landslide Risk Dashboard: A tool to communicate the likelihood of a debris flow at any given time based on a model developed by a team of scientists studying landslides in Sitka, Alaska. The model compares conditions when landslides have occurred in the past in combination with weather forecasts and real-time precipitation measurements to determine the likelihood that a landslide will occur, which is posted as a low, medium, or high landslide risk level. Posted risk levels are combined with recommended actions to guide community members toward emergency preparedness and informed decision-making during periods of elevated hazard, with the goal of protecting human life. The Sitka Landslide Risk Dashboard was developed with the Sitka Tribe of Alaska. (https://sitkalandslide.org/)

- 10 Rain Gauges located in Sitka, AK

  https://stilltek.com/sssc/
  https://mesowest.utah.edu/cgi-bin/droman/precip_monitor.cgi?state=AJK&type=0&rawsflag=290&orderby=n

- Hydrologic Monitoring
  - 3 Weather Stations in Sitka
  - 1 Weather Station in Hoonah

- Center for Western Weather and Water Extremes (cw3e) Scripps Institution of Oceanography at University of California San Diego
  - Alaskan Atmospheric River Toolkit: A tool supported by the National Science Foundation Coastlines and People Program #2052972. The toolkit contains graphics designed to forecast the presence and strength of Atmospheric Rivers using data from the NCEP Global Forecast System (GFS), North American Mesoscale Forecast System (NAM), Global Ensemble Forecast System (GEFS – v12), and the European Centre for Medium-Range Weather Forecasts (ECMWF) models. For more information on ARs visit the AR FAQs or

watch informational videos about ARs on the cw3e website. (https://cw3e.ucsd.edu/alaska/)
    - Atmospheric River forecasting decision support tools
    - A scale to characterize the strength and impacts of Atmospheric Rivers
    - Atmospheric River Reconnaissance
- University of Oregon
    - The following projects are currently in development in the Earth Surface Processes Laboratory. For more information, please reach out to Josh Roering at jroering@uoregon.edu
        - High-resolution mapping of landslide locations and time of occurrence on Prince of Wales Island, Skagway, and Klukwan
        - Weather Research Forecast (WRF): Weather models at hourly resolution on Prince of Wales Island

Upcoming Tools

Southeast Alaska Landslide Data Portal: The Southeast Alaska Landslide Data Portal will concatenate landslide risk reduction data from partners throughout the region. The portal will provide a centralized location for individuals to access lidar, topographic, atmospheric, and other relevant information. The data portal schema is currently in development. This project is convened through a United States Geological Survey Grant under the project title "Data Management and Maintenance for Landslide and Environmental Monitoring in Southeast Alaska".

Community Needs

A panel representing various Southeast Alaska Tribes and communities provided a lively and wide-ranging discussion of community challenges relative to landslides and interests in the working group. Panel members included Ralph Wolfe and Ray Paddock (T&H), Albert Smith (Metlakatla Indian Community), Tom Matisse (City and Borough of Juneau), Craig Warren (City and Borough of Sitka), Aaron Hankins (City of Petersburg), Tammy Young (Sitka Tribe of Alaska), Emily Deach (Municipality of Skagway), and Jeromy Grant (Hoonah Indian Association). Tribal members did not necessarily represent tribal opinions. Agency representatives found this particularly valuable because they are often unaware of the needs of each community. We prompted the discussion with two questions. The following discussion should not be construed as a complete review of needs but rather as an indication of the breadth of issues.

What are the challenges to landslides that you are encountering and what are your needs?

Several themes developed during the discussion of this question including public policy, public safety, and communication. Funding was often cited as there is a need to identify hazards, mitigate hazards, develop response plans, and cover costs associated with landslide response. Important points of the discussion relative to the theme areas are described below.

Public Policy

Panel members immediately identified zoning and insurance issues. Problems with zoning included how to adjust zoning in locations that have already been developed and undeveloped locations. Many communities have significant development in landslide zones. The official designation of high-risk areas

would likely reduce property values for homeowners and tax base for municipalities. The issue with zoning in undeveloped areas is knowing what hazards exist and developing policies to deal with the potential risks. For example, where is it safe to develop new construction? A philosophical issue also exists with notification of new buyers of homes in known landslide zones and whether or not municipalities should ensure they are notified. There was also discussion about the importance and need for homeowners to obtain landslide insurance. This was a topic SSSC and RAND Corp. reported on during the development of the Sitka Landslide Dashboard. There has also been discussion around identifying hazards and understanding how they might be mitigated. An important point was that municipal plans tend to be reactive rather than proactive.

Public Safety

Issues associated with Public Policy had significant overlap with those associated with landslide response. These issues ranged from knowing when it is safe to conduct search and rescue operations following a slide to how to get community members to recognize landslide hazards. People in communities need to feel safe and secure, particularly during extreme weather events, and the risks associated with extreme weather are increasing. The Sitka Landslide Dashboard is an example of how risk can be mitigated. Mitigation is important, but the costs are not trivial and the responsibilities associated with mitigation are long lasting. For example, if the Forest Service were to build a berm to divert landslides they would own that berm, its maintenance, and liabilities in perpetuity. This gets to the point that uncertainty makes it nearly impossible for a government to identify anything as safe. Some community groups, such as Homeowners Associations, have self-funded work and motivated government action to reduce landslide risk.

There is a need to ensure that landslides are incorporated in Hazard Response plans and that plans are updated and accessible. Not all communities have response plans and T&H is helping to rectify this issue. However, landslides are not typically incorporated into emergency response plans even though landslides can cause significant damage to infrastructure. For example, slides on Annette Island cut the Metlakatla community off from the ferry terminal. Response planning and response exercises are expensive and require financial support. If landslides are to be incorporated this will take funding.

There are some resources available to communities for response and planning. The state provides some resources and DOT&PF will work to clear state roads with assistance from DGGS. While the Red Cross works to support people after disasters they do not have volunteers in every community, which means it can take time for them to respond. Communities recognize that resources are available to them, but there are lots of gaps with respect to knowing about the resources and what can be provided. There is a need to list the resources available to people and communities. The panel also acknowledged that improved technology, such as the drone surveys conducted in Wrangell, can offer immense value. However, it is difficult to know who can operate drones and where they are located.

Communication

The communication theme was part of the Public Policy and Safety issues. For example, representatives of the Red Cross noted that what community response plans looked like and where hazards exist is important to their planning. Involving communities in co-stewardship and relying on local knowledge to address public policy and public safety issues is important. The levels of communication also need to be addressed. In some circumstances, there is too little communication but at other times risk is over-communicated. Along those same lines, it is important that when risk is communicated it is done so

in a meaningful way. The Sitka Landslide Dashboard is an example of how risk can be communicated effectively. Communication is also seen as an avenue to gaining community buy-in with respect to policy and adaptation.

What is something that an inter-agency working group address some of these challenges? What can a group like this offer?

The panel identified education as the primary response to this question. Education was considered broadly and encompassed educating adults and children in formal and informal ways. An important outcome of landslide education is to develop a common language among the residents of Southeast Alaska because it will allow us to communicate better. When everyone is communicating with the same terms it is easier to identify a problem and its solution. For example, Juneau rolled out hazard maps for the downtown area based on hazard and frequency, but many in the community misunderstood the maps. Perhaps a different approach in presenting them to the public would have improved their acceptability. Education also includes the people that make up this group. It is important that the scientists and engineers in this group understand community needs by working with communities. DOT&PF's efforts at removing debris during response activities is a good example. Another avenue by which the group can provide an education function is by being a trusted source of information to communities.

Outcomes

The second part of the meeting focused on identifying what we mean by an interagency working group. The US Government Accountability Office has evaluated the features of successful interagency working groups and identified some important components. These include a commonly held set of goals and objectives, strong leadership, incorporation of relevant members, defined roles and responsibilities for members, and a mechanism to ensure accountability. These items were discussed in a roundtable format to allow all the participants to weigh in on each of these items. Notes from these discussions will be used to design a facilitation team for the group.

Mission statement

Attendees agreed to the following mission statement:

A partnership between governments and communities to reduce the risks of landslides to the people and resources of Southeast Alaska through coordinated research, mitigation, communication, outreach, and response.

Southeast Alaska is a Community of Practice

A community of practice is a set of entities working independently but related by their need to reach a similar goal. In addition, the entities need a venue for freely exchanging information about their common goal. The interagency working group can provide the venue that fosters communication between the communities working towards landslide risk reduction. In Southeast Alaska, Tribes and municipalities are finding their own approaches to landslide risk reduction. Some communities have expended significant effort towards risk reduction while others are only just considering how to minimize risk. The geographic isolation of Southeast Alaska communities, most of which are accessible by boat or

plane, can put up barriers to sharing information. Similarly, governmental agencies, nonprofits, and universities engaged in landslide risk reduction through scientific research or emergency planning also represent a community of practice. While the various communities working in the region each have their own vernacular there is a need to express the technical goals, interests, and needs of the communities in a common language so the community of practice can meet the overall goal of risk reduction. Community representatives at the Workshop voiced a desire to share information and approaches so that they build on what has been successful while still creating community-centered systems that reflect their own values and needs. Fostering information sharing and helping agencies co-develop community-centered solutions is an important role for the working group.

Future Direction

Towards the end of the meeting, volunteers agreed to participate in a formation committee. This committee is responsible for developing a structure for moving the working group forward and ensuring the mission is met. Attendees who volunteered for the committee include Derek Poinsette from Haines, Jeromy Grant from the Hoonah Indian Association, KK Prussian from the US Forest Service, and Ron Heintz from the SSSC. After the meeting, the SSSC solicited USGS, DGGS, and AK Division of Homeland Security and Emergency Management to also participate. Margaret Darrow from UAF also indicated her interest in participating. The first meeting of the formation committee was held on April 24.

2024 Southeast Alaska Interagency Landslide Working Group
Attendees List

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