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SHEET 3 OF 3
Explanatory report accompanies map
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Debris Flow Susceptibility Map for Haines, Alaska

by

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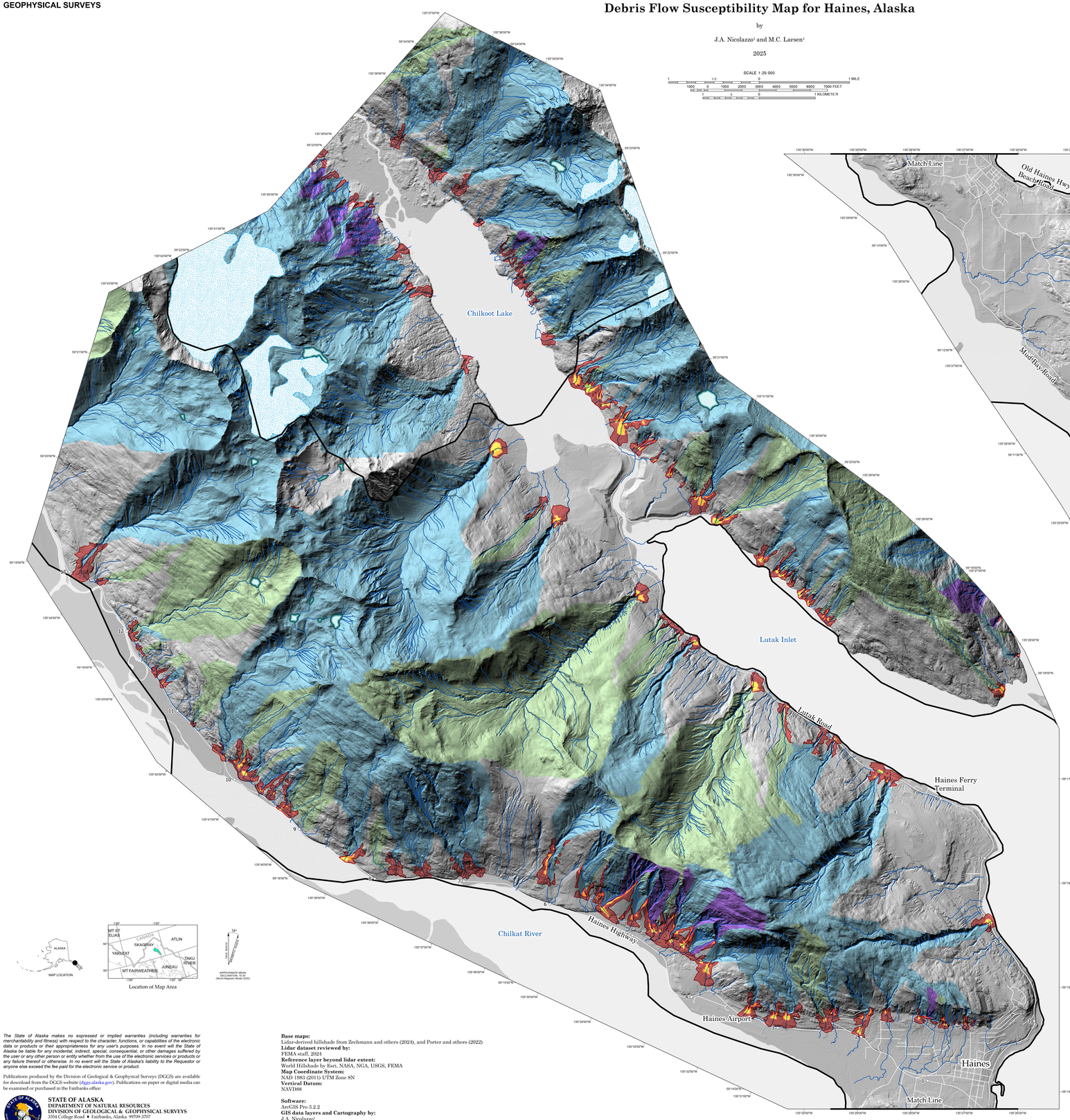
2025

SCALE 1:25 000

1 MILE
1 KILOMETE R



EXPLANATION

This map depicts modeled debris flow initiation and transport potential as watershed catchments, and the extents of debris flow deposits (inundation) within a portion of the Haines Borough. These zones were simulated following protocols by Burns and others (2022) and are derived from digital terrain models (DTMs). Several iterations were performed to find the input parameters that best matched debris flow deposition after the December 2020 storms that caused widespread flooding and debris flows in Haines.

Initiation Potential is based on the slope and curvature characteristics of the input DTM, and the distance of each raster cell to an identified drainage. This delineates the areal extent of each watershed contributing to each drainage channel. It does not take into account how much material could accumulate, or how long it might take for material to accumulate again after an event.

Transport Potential is modeled using the gradient and curvature characteristics of a drainage channel, and it depicts the likelihood that a debris flow, once initiated, will continue to flow downslope.

Deposition occurs where the slope flattens and the Transport Potential changes from "high" or "moderate" to "low" or "very low to none". The two modeled inundation scenarios shown here are the "typical" and "extreme" events. The typical event has a relatively low-impact that might occur every few years or decades. Once these parameters are selected, they are scaled-up to model the extreme event, which is a high-impact event that might occur once per millennia or less frequently. The final output rasters were converted to polygons to smooth their edges and remove erroneous spikes. Because of how the model calculates runout, deposition areas that terminated in water tended to spike across the DTM; we truncated these spikes to the shoreline.

Channelized debris flow susceptibility was modeled using raster images derived from a 2022 lidar dataset produced by Zechmann and others (2024). Outside the limit of this 50-cm resolution dataset, we used the ArcticDEM (Porter and others, 2022). The ArcticDEM was compiled from several different sources, collected at different times, and at different resolutions, so results from this dataset have a lower confidence.

- EXTENT OF LIDAR COVERAGE (ZECHMANN AND OTHERS 2024)
- 1 ◇ MILEPOST
- ROAD CENTERLINES
- GLACIER
- POND
- DRAINAGE CHANNELS DERIVED FROM ZECHMANN AND OTHERS (2024) AND PORTER AND OTHERS (2022)

CHANNELIZED DEBRIS FLOW SUSCEPTIBILITY

WATERSHED INITIATION AND TRANSPORT POTENTIAL

- HIGH
- MODERATE
- LOW

DEPOSITION EXTENT

- EXTREME EVENT high volume, low frequency
- TYPICAL EVENT low volume, high frequency

LIMITATIONS

This debris flow susceptibility map was developed using the best available data with input from many sources. Several limitations are worth noting and underscore that this hazard map was designed for regional application and should not be used as an alternative to site-specific studies.

- Lidar provides a "snapshot" view of the landscape at the time of data collection; therefore, maps based on lidar data interpretation may become less accurate as new landslides or other changes to the landscape occur or new technology that would improve the data products becomes available.
- Inundation extents are based on estimates of the debris flow's growth factor and volume. While we did our best to match these values to real events, differences between the model and actual debris flow runouts are likely.
- Interaction of debris flows with buildings and any changes to grade or other mitigation measures can change the direction of flow. Large trees in a debris flow can also affect its runout length and width and could not be accounted for in the modeling.
- This map is intended for regional-scale purposes and to assist state and local agencies in land-use planning. The map does not replace site-specific investigations and is not suitable for land-use regulation, building-code development, or to answer legal questions. It should not be used to assess the hazard to any one property. However, the map can serve as a useful tool for estimating the regional slope failure hazard and as a starting place for future site-specific maps.
- This map does not predict debris flows; it simply shows areas that might be more susceptible compared to areas that are less susceptible.
- This map is non-regulatory.

REFERENCES CITED

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Base maps:
Lidar-derived hillshade from Zechmann and others (2024), and Porter and others (2022)
Lidar dataset reviewed by:
FEMA staff, 2024
Reference layer beyond lidar extent:
World Hillshade by Esri, NASA, NGA, USGS, FEMA
Map Coordinate System:
NAD 1983 (2011) UTM Zone 8N
Vertical Datum:
NAVD88

Software:
ArcGIS Pro 3.2.2
GIS data layers and Cartography by:
J.A. Nicolazzo[1]
Cartographic review by:
A.E. Macpherson[1]

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