REPORT OF INVESTIGATION 2026-2
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SHEET 2 OF 3
Explanatory report accompanies map
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Shallow Landslide Susceptibility Map on Wrangell Island, Alaska

by
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Scale 1:25,000 at full-size print (original format)
Scale ~1:26,600 when reduced to 48-inch sheet

EXPLANATION

This map depicts the relative susceptible of slopes on Wrangell Island to shallow landslide initiation based on the mapped landslide inventory and frequency ratio (FR) analysis. FR is a statistical method that evaluates the association between conditioning factors and landslide occurrence by comparing the proportion of landslides within each factor class to the proportion of the study area occupied by that class. The resulting FR values are summed to produce the final susceptibility score.

$$FR\ Value = \sum \frac{N_{pi}/N}{A_{pi}/A}$$

N_{pi} = number of landslides in evaluated bin
N = total number of landslides evaluated
A_{pi} = area of the bin
A = total area evaluated

We evaluated several common landslide conditioning factors including: slope angle, slope aspect, curvature, distance to drainage, distance to roads, geology, and topographic wetness index. After calculating FR values and evaluating model performance, only four factors were summed in the final susceptibility map shown here: slope angle, slope aspect, distance to drainage, and geology. We evaluated model performance using receiver-operating characteristics (ROC) analysis and area under the curve (AUC). The resulting AUC of 0.88 indicates very good agreement between the model and the mapped landslide inventory.

More than 90 percent of the landslide inventory is classified as debris flow, and 60 percent are not associated with drainage channels. Consequently, the susceptibility model is dominated by non-channelized debris flow initiation sites and the results reflect susceptibility to shallow slope failures that transition to debris flows.

All raster products were derived from a digital terrain model produced by Zechmann and others (2023).

LANDSLIDE INITIATION SITE
Undifferentiated, see Map Sheet 1
STUDY AREA
POND
MILEPOST

ROAD CENTERLINES
Active
Inactive
Closed
Status Unknown

LIMITATIONS

This shallow landslide 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 occur or improved technology becomes available.
- The FR analysis used post-landslide lidar data; therefore, mapped landslide initiation sites may not represent pre-failure slope conditions.
- FR is a statistical method that identifies associations rather than causation, and the resulting susceptibility values represent relative likelihood rather than absolute probability.
- FR assumes the selected conditioning factors are independent of each other and does not capture more complex interactions between factors.
- 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 landslides; it simply shows areas that might be more susceptible compared to areas that are less susceptible.
- DGGS is not a regulatory agency; therefore, this map is non-regulatory.

SHALLOW LANDSLIDE SUSCEPTIBILITY

VERY HIGH Likely as rock fall and rock topple from steep bedrock source
HIGH FR is ≥ 9.90
MODERATE FR is 4.72 < 9.90
LOW FR is 3.20 < 4.72
VERY LOW TO NONE FR < 3.20

REFERENCES CITED

Zechmann, J.M., Wikstrom Jones, K.M., and Wolken, G.J., 2023, Lidar-derived elevation data for Wrangell Island, Southeast Alaska, collected July 2023: Alaska Division of Geological & Geophysical Surveys Raw Data File 2023-28 v. 1.1, 14 p. https://dggs.alaska.gov/pubs/id/31098

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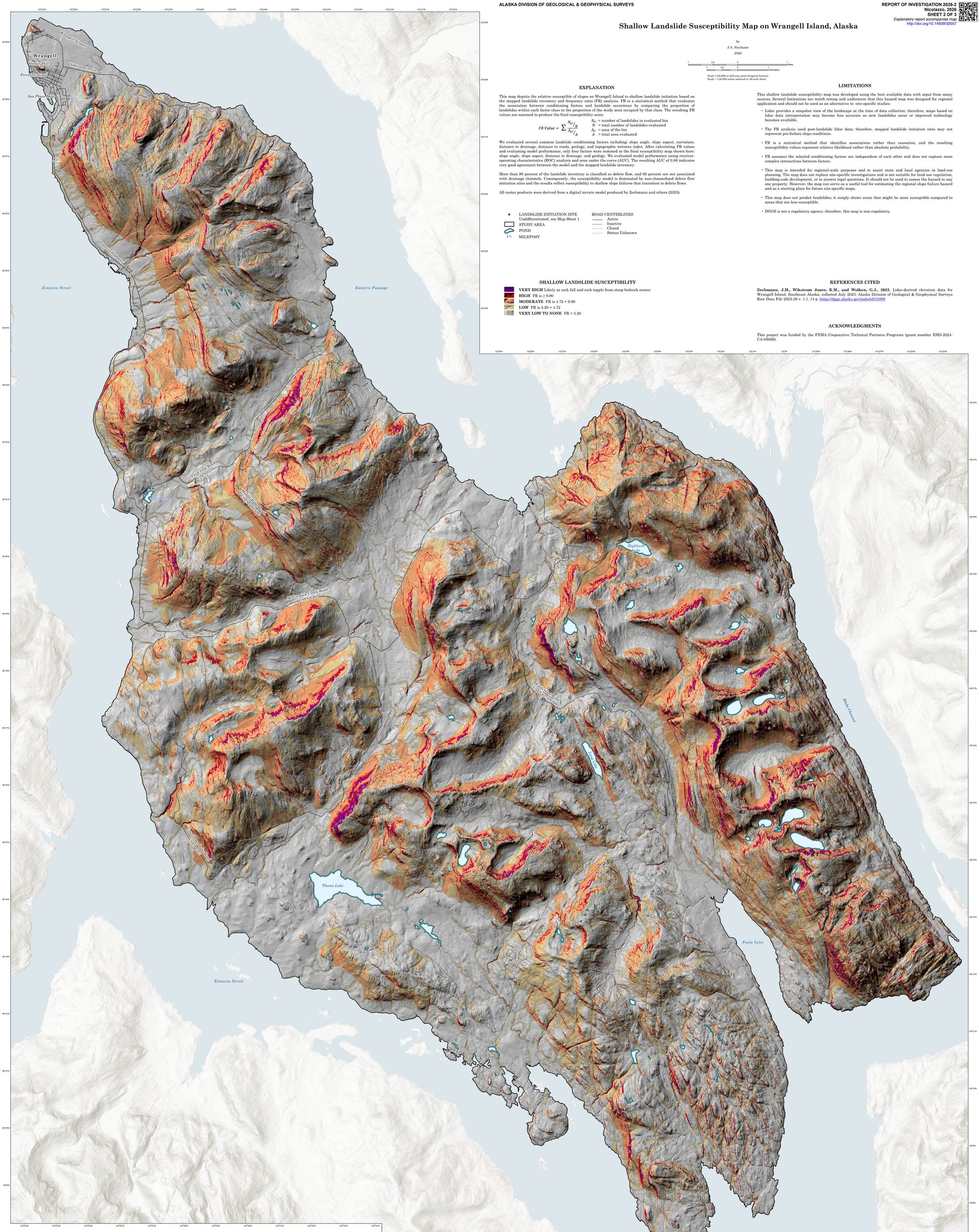

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Map Location

Location of Map Area

Base maps:
Lidar-derived hillshade from Zechmann and others (2023)
Reference layer beyond lidar extent:
Esri's World Hillshade and World Terrain Base
Map Coordinate System:
NAD 1983 (2011) UTM Zone 8N
Vertical Datum:
NAVD88

Software:
ArcGIS Pro 3.6.2
GIS data layers and Cartography by:
J.A. Nicolazzo
Cartographic review by:
A.E. Macpherson