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*Supplement of*

# Dam type and lake location characterize ice-marginal lake area change in Alaska and NW Canada between 1984 and 2019

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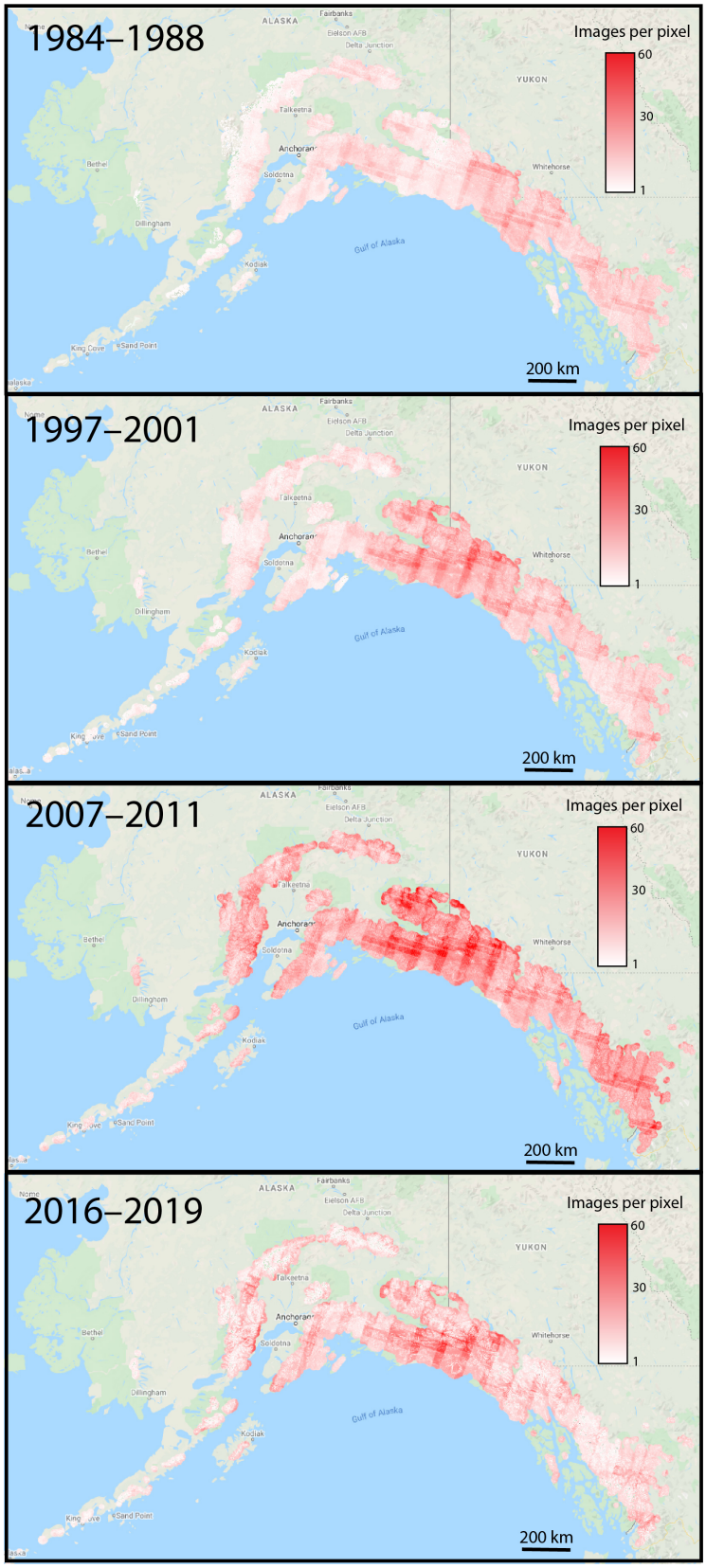


**Fig. S1.** Images per pixel per time period for each mosaic (median of each pixel value) used in analysis. Maps created in © Google Earth Engine (Gorelick et al., 2017).

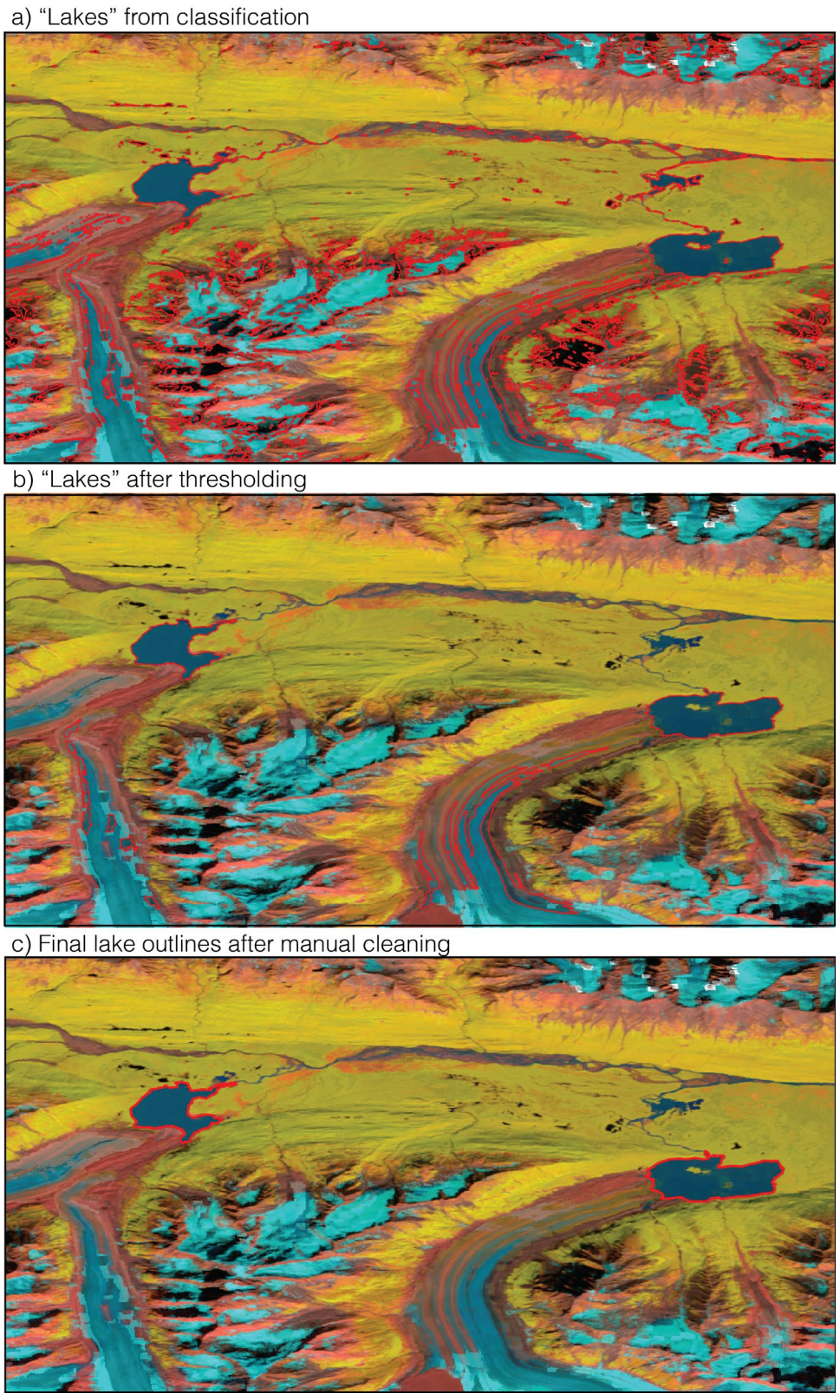


**Fig. S2.** Example of lake polygons after supervised classification (a), after applying slope, area, distance, and length:area ratio thresholds (b), and after manual verification. Polygon outlines are in red. False color images using Landsat bands for shortwave infrared (SWIR), near infrared (NIR), and red.

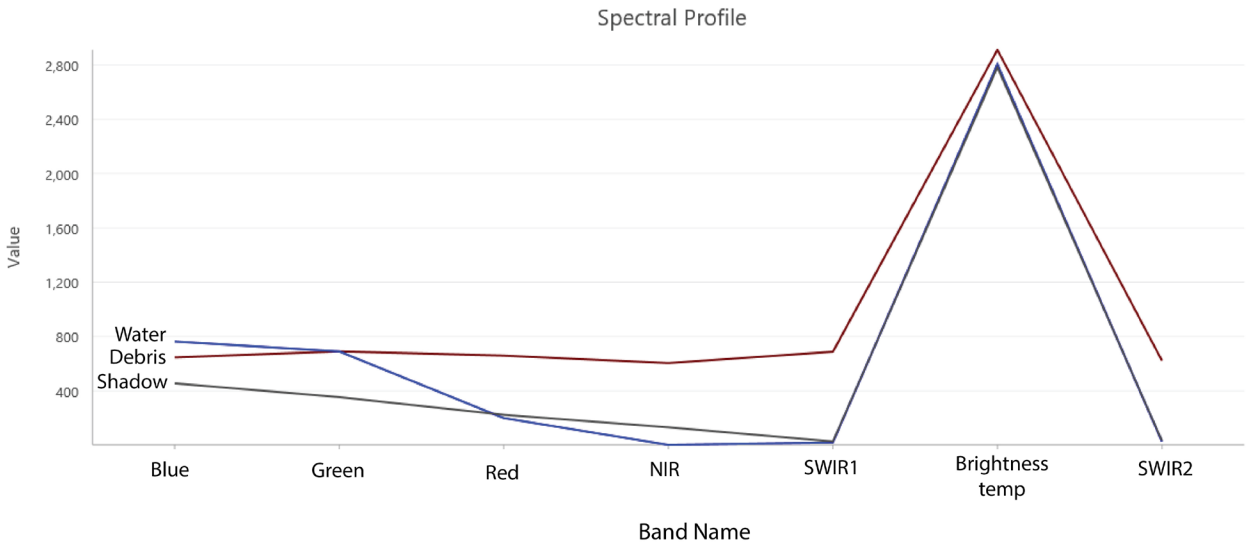


**Fig. S3**. Spectral comparison of water, mountain shadow, and a debris band.

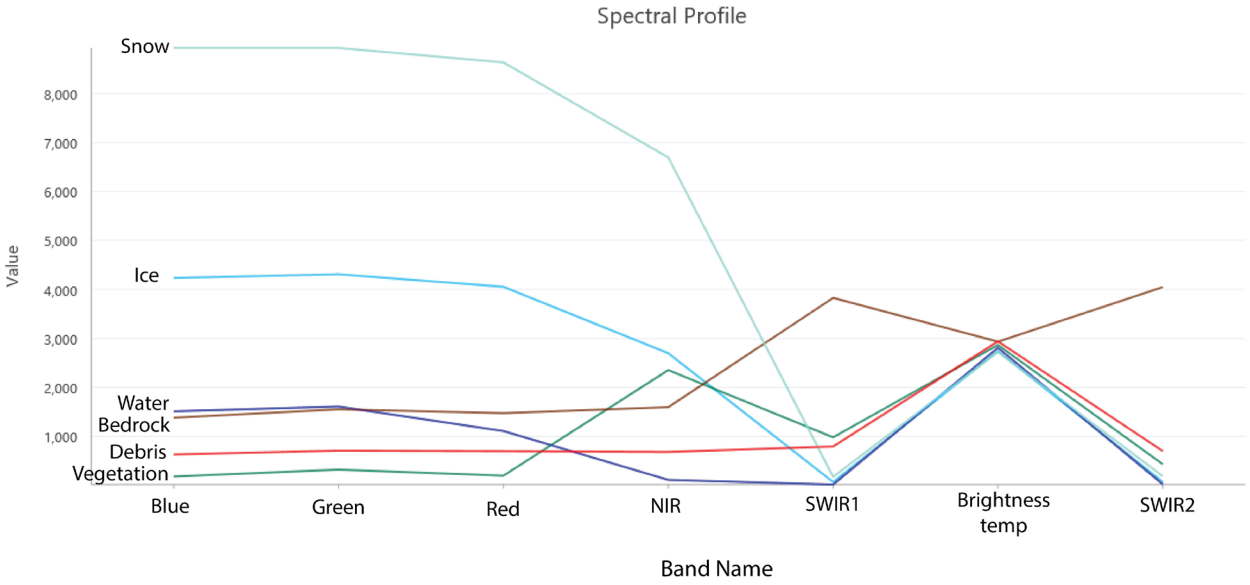


**Fig. S4.** Example spectral profiles for each landcover type (snow, ice, water, bedrock, debris, and vegetation) used in supervised classification.

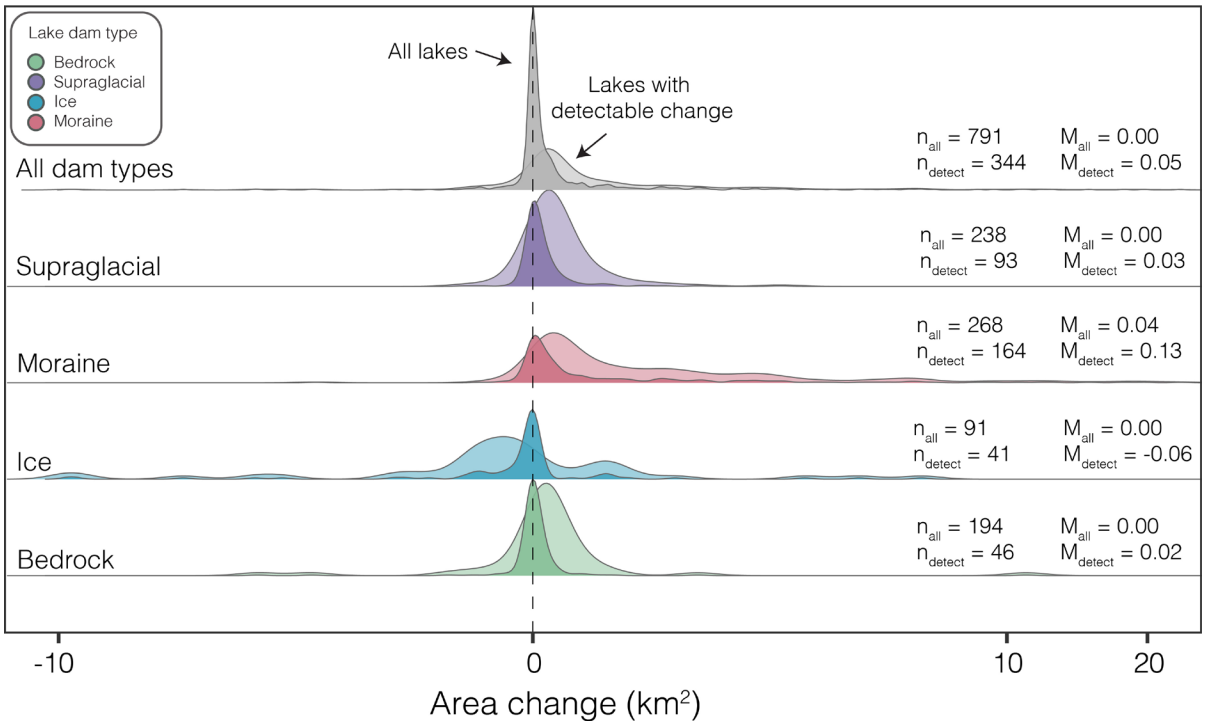


**Fig. S5**. Smoothed density distribution (normalized to 1 for each dam type) of absolute lake area change for all lakes (dark curves) and lakes with detectable change (light curves) for each dam type, with number of lakes (n) and median lake area change (M).

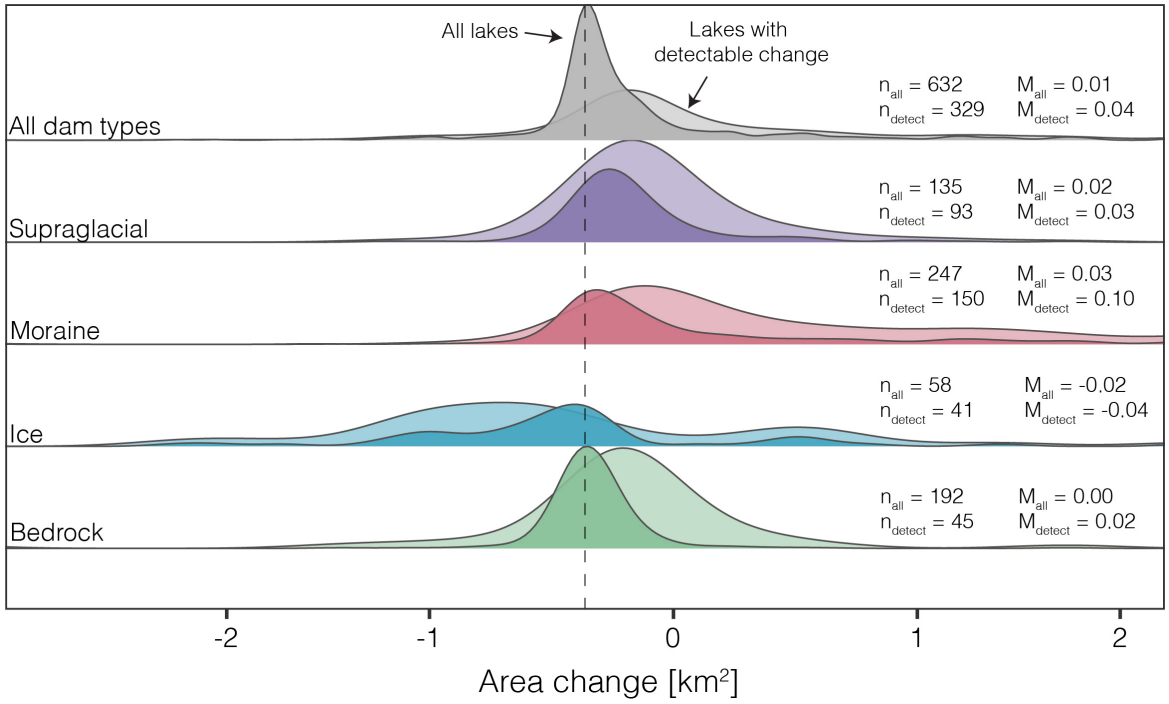


**Fig. S6.** Smoothed density distribution (normalized to 1 for each dam type) of absolute lake area change for all lakes with an area less than 10 km$^2$ in 2016–2019 (dark curves) and lakes with detectable change (light curves) for each dam type, with number of lakes (n) and median lake area change (M). Note that the x-axis has been limited to –2 and 2 km$^2$.

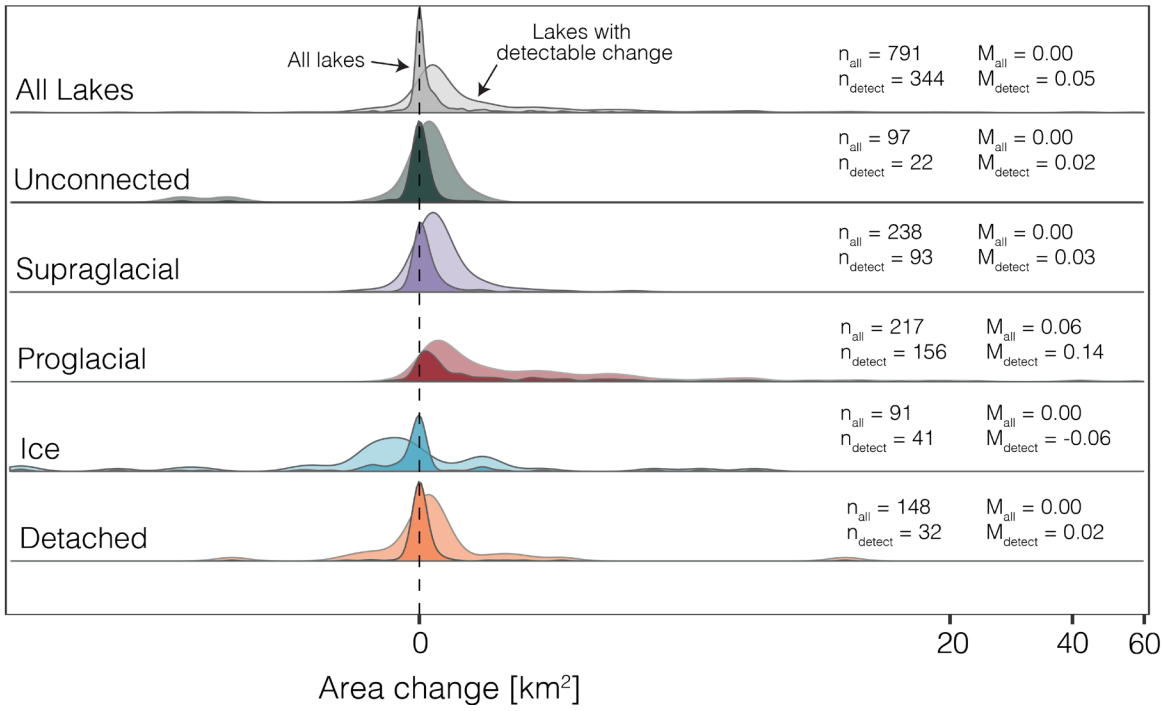


**Fig. S7.** Distribution of lake area change (km$^2$) for all lakes (dark curves) and lakes with detectable change (light curves) for each topological position, with number of lakes (n) and median lake area change (M).

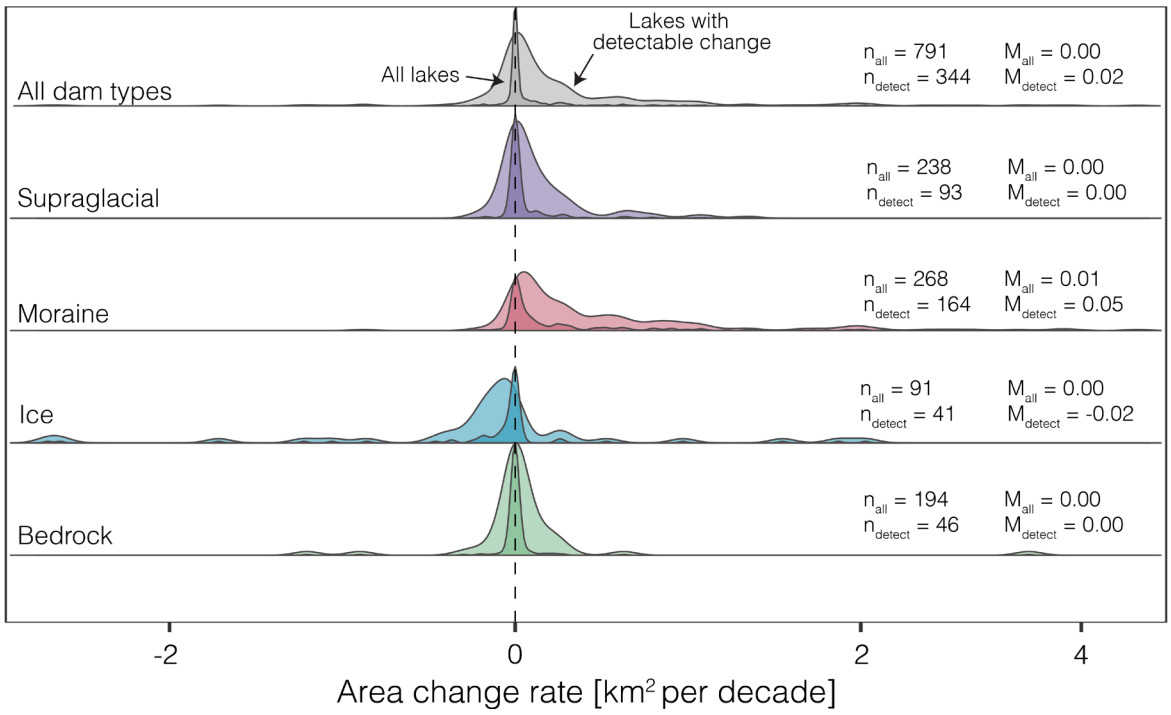


**Fig. S8:** Distribution of lake area change rate (km$^2$ per decade) for all lakes (dark curves) and lakes with detectable change (light curves) for each dam type, with number of lakes (n) and median lake area change (M).

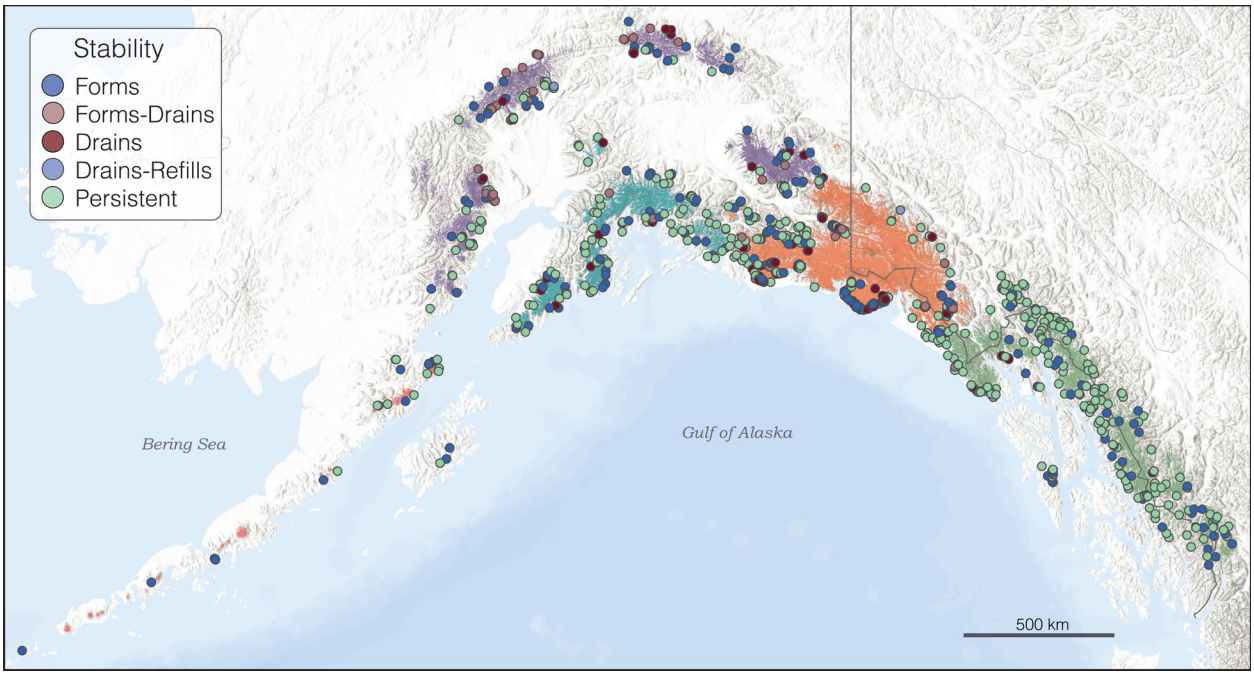


**Fig. S9.** Lake stability distribution across Alaska. Each dot represents an individual lake. Colored areas refer to the RGI subregions (see Fig. 1) (basemap provided by ESRI, 2021).

**Table S1:** Attributes of the 19 lakes with area greater than 10 $km^2$.

| LakeID | GlacierName | Area 1984-1988($km^2$) | Area 1997-2001($km^2$) | Area 2007-2011($km^2$) | Area 2016-2019($km^2$) | Position | Dam Type | Elevation (m) | <2 m asl | PiedmontBasin | O2Region | Stability | Area Change 1984-2016($km^2$) | Change Rate ($km^2$/decade) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RGI60-01.10006n50 | Colony Glacier | 25.43 | 26.35 | 26.73 | 27.71 | proglacial | moraine | 62.00 | N | Y | 4 | Persistent | 2.28 | 0.71 |
| RGI60-01.13538n432 | Tana Glacier | 1.45 | 2.93 | 1.93 | 13.31 | proglacial | moraine | 481.00 | N | N | 5 | Persistent | 11.86 | 3.71 |
| RGI60-01.13531n428 | Miles Glacier | 31.62 | 40.07 | 31.22 | 40.26 | proglacial | moraine | 39.00 | N | Y | 5 | Persistent | 8.64 | 2.70 |
| RGI60-01.14883n431 | Steller Glacier | 21.98 | 16.32 | 17.15 | 12.78 | ice | ice | 132.00 | N | N | 5 | Persistent | -9.20 | -2.88 |
| RGI60-01.14883n430 | Steller Glacier | 10.11 | 15.77 | 15.95 | 22.58 | proglacial | moraine | 8.00 | N | Y | 5 | Persistent | 12.48 | 3.90 |
| RGI60-01.16545n457 | Lowell Glacier | 7.52 | 11.19 | 18.47 | 22.51 | proglacial | moraine | 514.00 | N | Y | 5 | Persistent | 14.99 | 4.68 |
| RGI60-01.13635n325 | Bering Glacier | 91.19 | 87.38 | 143.11 | 131.82 | proglacial | moraine | 0.00 | Y | Y | 5 | Persistent | 40.63 | 12.70 |
| RGI60-01.09471n48 | Excelsior Glacier | 7.94 | 11.59 | 14.74 | 17.31 | proglacial | moraine | 0.25 | Y | Y | 4 | Persistent | 9.37 | 2.93 |
| RGI60-01.17803n310 | Bear Glacier | 7.98 | 10.57 | 17.08 | 18.61 | proglacial | moraine | 0.00 | Y | Y | 4 | Persistent | 10.63 | 3.32 |
| RGI60-01.12645n433 | East Yakutat Glacier | 53.84 | 61.52 | 62.84 | 96.61 | proglacial | moraine | 28.00 | N | Y | 5 | Persistent | 42.77 | 13.37 |
| RGI60-01.13696n454 | Malaspina Glacier | 30.08 | 43.43 | 72.51 | 87.03 | proglacial | moraine | 1.80 | Y | Y | 5 | Persistent | 56.95 | 17.80 |
| RGI60-01.21081n455 | Alsek Lake | 45.75 | 55.64 | 61.95 | 69.27 | proglacial | moraine | 21.00 | N | Y | 6 | Persistent | 23.52 | 7.35 |
| RGI60-01.01514n459 | Twin Glacier Lake | 12.04 | 12.44 | 12.54 | 12.53 | proglacial | moraine | 6.00 | N | Y | 6 | Persistent | 0.49 | 0.15 |
| RGI60-01.04532n319 | NA | 4.74 | 5.36 | 6.83 | 11.07 | proglacial | moraine | 105.00 | N | Y | 6 | Persistent | 6.33 | 1.98 |
| RGI60-01.03741n51 | Great Glacier | 11.60 | 12.83 | 13.58 | 13.60 | proglacial | moraine | 18.00 | N | Y | 6 | Persistent | 1.99 | 0.62 |
| RGI60-01.01522n703 | Llewellyn Glacier | 4.82 | 7.30 | 9.73 | 11.34 | proglacial | moraine | 702.00 | N | N | 6 | Persistent | 6.52 | 2.04 |
| RGI60-01.20748n688 | NA | 12.58 | 24.95 | 29.05 | 30.41 | proglacial | moraine | 193.00 | N | N | 6 | Persistent | 17.83 | 5.57 |
| RGI60-01.20985n434 | Grand Plateau Glacier | 25.27 | 33.05 | 39.07 | 44.94 | proglacial | moraine | 22.00 | N | Y | 6 | Persistent | 19.67 | 6.15 |
| RGI60-01.12397n47 | Barrier Glacier | 74.36 | 79.45 | 82.67 | 85.35 | detached | bedrock | 346.00 | N | N | 2 | Persistent | 10.99 | 3.44 |