Riverbank erosion forecasts for Alakanuk, Alaska (2020-2050)

Caltech[1]-USC[2]-UAA[3]-YRITWC[4] NNA Team*

PIs: Michael Lamb[1], Woodward Fischer[1], Marie Lowe[3], Edda Mutter[4], Joshua West[2]

[1] Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, CA 91125
[2] Department of Earth Sciences, University of Southern California, Los Angeles, CA 90089
[3] Department of Public Policy and Administration, University of Alaska Anchorage, Anchorage, AK 99508
[4] Yukon River Inter-Tribal Watershed Council, Anchorage, AK 99501

*Data contact: Emily Geyman (egeyman@caltech.edu) & Mike Lamb (mpl@caltech.edu)

Overview

Riverbank erosion can be observed and measured from satellite imagery. Analysis of high-resolution satellite imagery over the period 2016-2022 reveals erosion rates of 0 to 40 feet per year along the Yukon River near Alakanuk, Alaska (Figure 1), and 0 to 19 feet per year along the Alakanuk Pass Slough next to the town of Alakanuk (Figure 2). Here, we extrapolate the erosion rates measured over the period 2016-2022 to make preliminary erosion forecasts for 2030, 2040, and 2050. These erosion forecasts should be viewed only as a reasonable guess—rather than certain predictions—since they rely on the assumption that the river behaves in the same way over the next 30 years as it has behaved over the last 5–10 years.

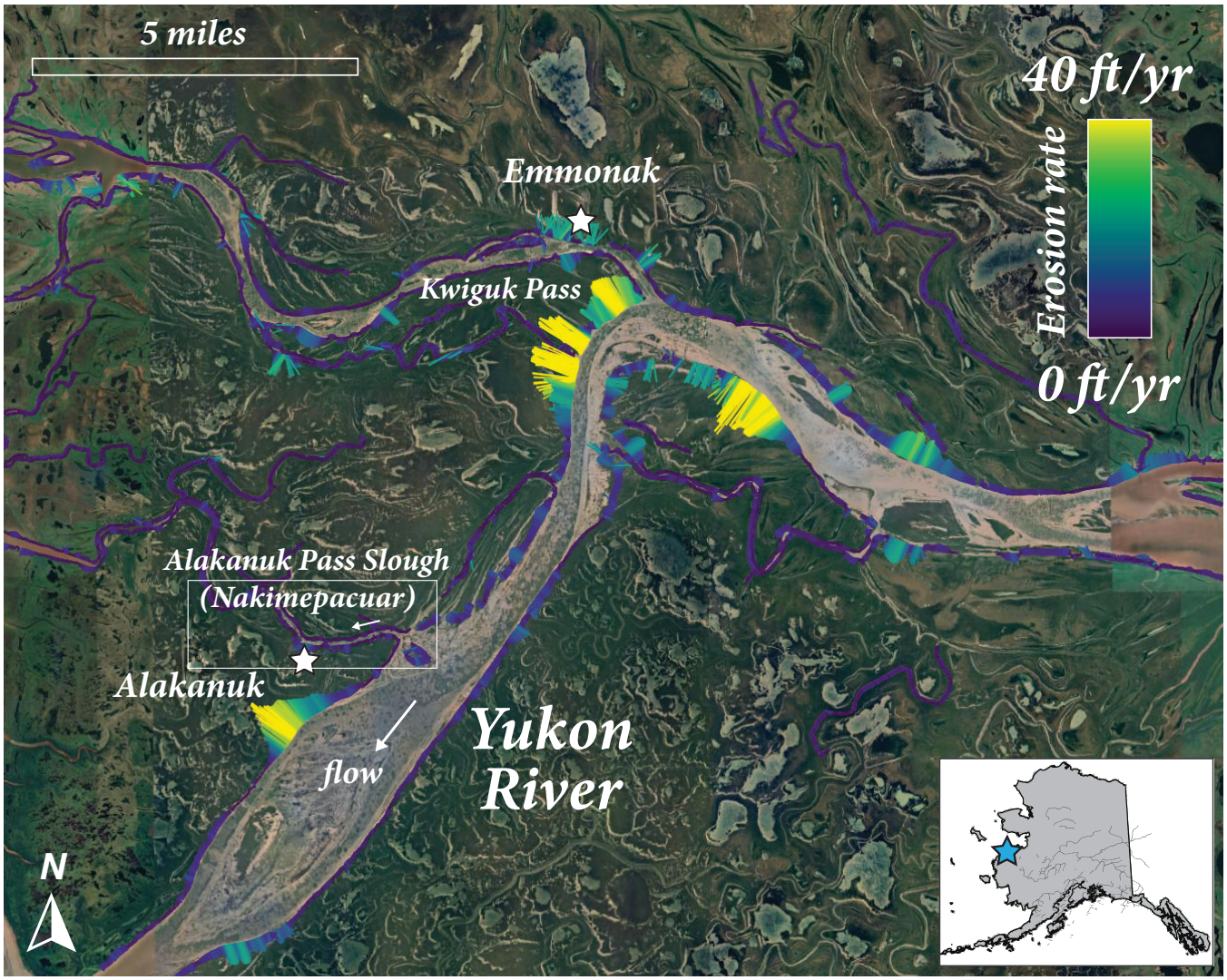

Fig. 1: Average riverbank erosion rates along the Yukon River near Alakanuk and Emmonak, Alaska. The erosion rates are measured from satellite imagery over the interval 2016-2022.[1,2] The white box highlights the region shown in Figure 2 (the Alakanuk Pass Slough).

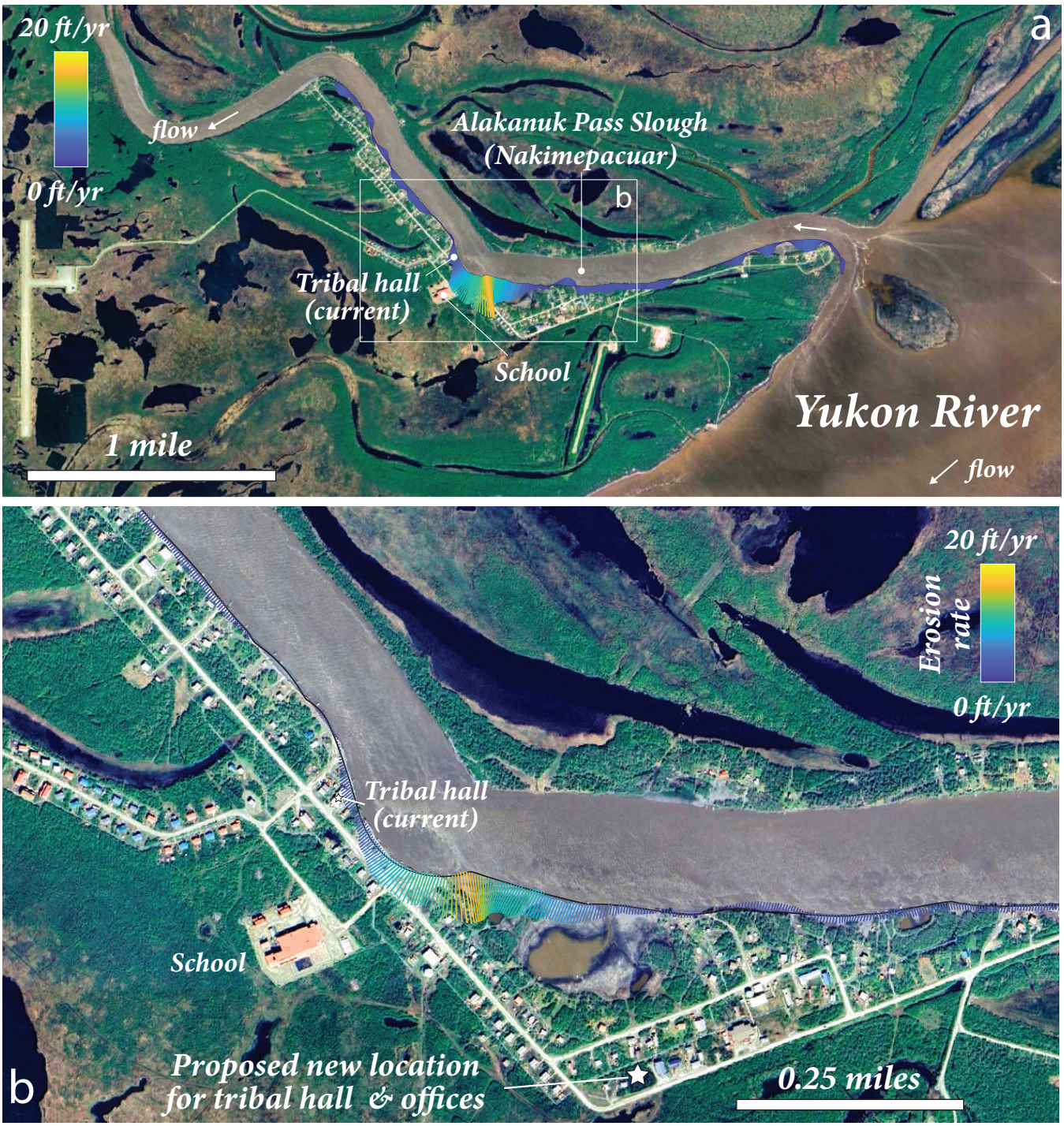

Fig. 2: Average riverbank erosion rates along the Alakanuk Pass Slough (Nakimepacuar). The erosion rates are measured from satellite imagery over the interval 2016-2022[1,2]. These local erosion rates are used to estimate the position of the riverbank from 2020-2050 in Figure 3.

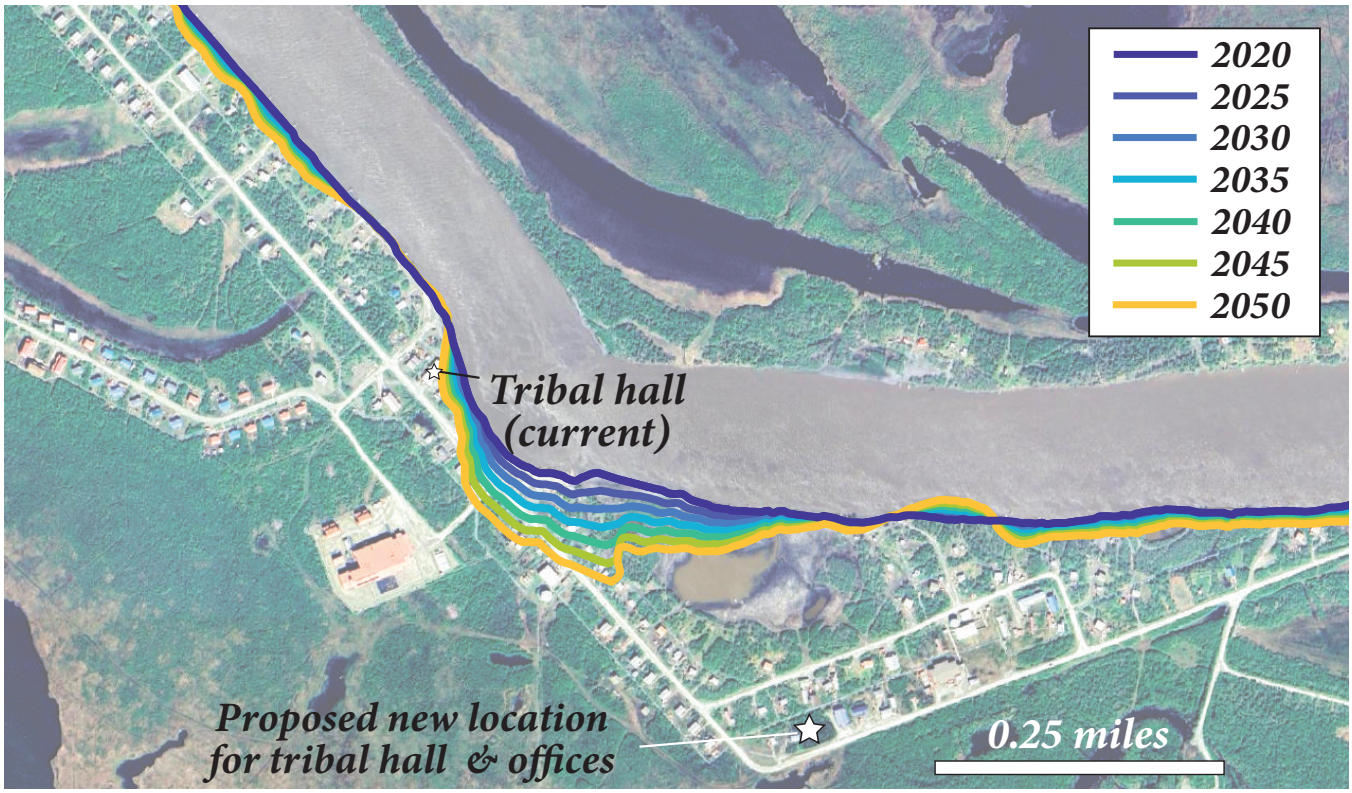

Fig. 3: Forecasted position of the riverbank over the period 2020-2050 based on the modern (2016-2022) riverbank erosion rates shown in Figure 2. At the current erosion rates, the river will reach the edge of the current Tribal Hall building around ∼2035. The proposed location for the new Tribal Hall building appears to be safe from riverbank erosion well beyond the forecasted interval of 2020-2050.

References

[1]. Geyman, E. *et al.* Quantifying river migration rates in the Yukon River Watershed from optical satellite imagery. *Arctic Data Center (doi: 10.18739/A2WW7719J)* (2024).
[2]. Geyman, E. C., Douglas, M. M., Avouac, J.-P. & Lamb, M. P. Permafrost slows Arctic riverbank erosion. *Nature* **634**, 359–365 (2024).