

EROSION EXPOSURE ASSESSMENT—KOYUK

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Koyuk, Alaska, in 2015. Photo: ShoreZone, shorezone.org.



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EROSION EXPOSURE ASSESSMENT—KOYUK

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KOYUK EROSION EXPOSURE ASSESSMENT

This is a summary of results from an erosion forecast near infrastructure at Koyuk, Alaska. We conduct a shoreline change analysis, forecast 60 years of erosion, and estimate the replacement cost of infrastructure in the forecast area. Buzard and others (2021) describe the method and guidance for interpreting tables and maps.

Source data for this summary include the following:

- Delineated vegetation lines and change assessment by Buzard and others (2021) following the methods of Overbeck and others (2020).
- Infrastructure AutoCAD outlines and metadata from Division of Community & Regional Affairs (2004) Community Profile Map series.
- Added infrastructure such as roads, water and sanitation facilities, and outbuildings, delineated if visible in the most up-to-date high resolution (≤ 0.66 ft [20 cm] ground sample distance) aerial orthoimagery (Overbeck and others, 2016).
- Computed infrastructure cost of replacement based on square or linear footage from Buzard and others (2021).

Koyuk is located at the northeastern side of Norton Sound in Koyuk Inlet at the mouth of the Koyuk River. Koyuk experiences riverine erosion and erosion from storm surge, high tides, and waves



(U.S. Army Corps of Engineers [USACE], 2007). From 1950 to 2015, the shoreline eroded up to 3.3 feet per year (Overbeck and others, 2020). The greatest erosion occurred in front of the community, but the surround shoreline is mostly stable. A berm was built in front of the retail store but has not stopped erosion (USACE, 2007).

We forecast erosion 60 years from the most recent shoreline (2015) at 20-year intervals to identify the exposure of infrastructure to erosion. One road on the eastern side of town is within the 2075 erosion forecast area (tables 1 and 2). The total estimated cost of replacement due to exposure of the road to erosion is \$200 thousand (\pm \$60 thousand) by 2035 (table 2).

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Table 1. Quantity of infrastructure with estimated erosion exposure by linear footage (LF) or count (n).

Quantity of Exposed Infrastructure					
Erosion Forecast Date Range	Buildings & Tank Facilities (n)	Power Lines (LF)	Fuel Lines (LF)	Water Lines (LF)	Roads (LF)
2015 to 2035	0	0	0	0	13
2035 to 2055	0	0	0	0	21
2055 to 2075	0	0	0	0	20
Combined Total	0	0	0	0	54

Table 2. Replacement cost of infrastructure exposed to erosion per 20-year interval.

Quantity of Exposed Infrastructure							
Erosion Forecast Date Range	Buildings & Tank Facilities	Power Lines	Fuel Lines	Water Lines	Roads	Other	Sum
2015 to 2035	\$0	\$0	\$0	\$0	\$200,000	\$0	\$200,000
2035 to 2055	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2055 to 2075	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Combined Total	\$0	\$0	\$0	\$0	\$200,000	\$0	\$200,000

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Erosion Exposure Koyuk, Alaska

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Projection: NAD83 UTM Zone 4N. Orthimagery year: 2015. Orthimagery available from elevation.alaska.gov

Erosion and accretion of coasts and rivers result in shoreline change. These rates of shoreline change at Alaska communities are calculated from historical and modern shorelines (shorelines shown as lines in pinkscale and labeled by year). The long-term (1950 to 2015) shoreline change rate is used to forecast where erosion could impact community infrastructure. Erosion is forecast to year 2075 (dark blue) with a 90 percent confidence interval area of uncertainty (light blue). Buildings forecast to be impacted by erosion are colored by the range of years when the impact is forecast to occur: 2015 to 2035 (purple), 2035 to 2055 (orange), 2055 to 2075 (yellow), and no impacts expected by 2075 (gray). For more detailed information about the impacts to infrastructure from erosion at Koyuk, refer to the Koyuk erosion exposure assessment report.

This work is part of the Coastal Infrastructure Erosion Vulnerability Assessment project funded by the Denali Commission Environmentally Threatened Communities Grant Program. Components of this map were prepared by the Alaska Department of Commerce, Community, and Economic Development (DCCED) using funding from multiple municipal, state, federal, and tribal partners. The original AutoCAD drawing of the infrastructure data layers was converted to ArcGIS.