

Appendix 2-A

Modifications to Humboldt Bay

This Appendix briefly summarizes modifications to Humboldt Bay that may have influenced the hydraulic and sediment transport capabilities of Elk River.

Humboldt Bay is the largest shipping port in California north of the San Francisco Bay. The harbor is used for recreation and industry. The Humboldt Bay Harbor, Recreation and Conservation District manages bay uses and is responsible for dredging activities needed to allow large ships access to Humboldt Bay. The most recent channel deepening projects were completed in April 2000 to improve navigation safety and commerce. The need for maintenance dredging is dependent on dredge channel locations and configuration, dredge material, redistribution of bay sediments and new sediment inputs to the bay from tributaries and via the bay inlet. Similarly as management modifications to the bay inlet and shoreline have proceeded, there is a likelihood that those modifications have also influenced the lower Elk River.

Among the modifications to the bay are structural changes to the inlet in the construction of jetties intended to break waves and allow boats safe passage through the inlet, dredging of channels for navigation within the bay, the construction of bridges, dikes and levees around the bay edge to support and protect railroads and roadways, and the construction of docks and marinas for commercial and recreational boats.

The Humboldt County Department of Public Works maintains records of historical conditions in Humboldt County. Regional Water Board staff reviewed historic maps of Humboldt Bay dating back to 1851. These maps generally provide bathymetry information from soundings conducted by the US Coastal Survey and the US Army Corps of Engineers. While the surveys were primarily conducted at low tide, it is likely that varying surfaces were exposed and thus the data is not completely comparable. However when viewed as a set, the maps provide indications of changes in features over time.

The earliest available survey including the Elk River area is from 1851; the jetties were not yet constructed. Elk River is shown with an island approximately one-half mile upstream of its confluence with Humboldt Bay. Additionally, the area just south of Elk River is indicated as having some sort of armoring present. An 1854 map shows an Indian village on a land spit located just upstream of the mouth of the river and a trail across the river; the river entered the bay parallel to the bay inlet. An 1858 map also depicts the land spit and a road where the trail was; a map note states that the bar in the bay is constantly changing, perhaps indicating that it is comprised of mobile material (e.g. sand, gravel). Indian villages were located on either side of the inlet. An 1886 map makes this same statement and shows breakers on either side of the inlet, a lighthouse is mapped at one of the Indian villages, a road was built over Elk River, as well as a road over Martin/Swain's Slough (approximately where Elk River Road now exists). Also it appears that some

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control structures were placed at the mouth of Elk River separating it from the land spit; mud is shown just beyond the mouth. An 1897 map depicts a slight tilt to the south of the mouth of Elk River. A 1901 map depicts construction of jetties and does not include a spit at the mouth of Elk River. A 1903 map shows little change compared to the 1901 map.

The 1911 map shows a railroad line running from Fields Landing to the north with a crossing over the mouth of Elk River. Just to the south of the mouth of Elk River the bay was diked for the railroad line. Another 1911 map includes bathymetry of lower Elk River and includes the railroad crossing at the mouth, a bridge over Elk River, and across Martin Slough the additional of another railroad and two additional bridges. A similar map was published in 1931, also showing bathymetry of lower Elk River, the previous crossing and the newly constructed State Highway to San Francisco. Important notes on this map include the appearance of a sand spit approximately 2500' in length at the mouth of Elk River and a note that Elk River downstream of the Highway crossing is dry at low water. The 1940 map depicts the spit as 5500' in length, parallel to the bay's shore causing the Elk River to deliver into the bay in a more northerly direction toward Eureka. The 1940 map shows the spit as approximately 6300' in length.

As documented in the historical maps, channels within the bay were modified to allow the passage of ships. It is logical to assume that alteration of the bay hydraulics would lead to alteration in water and sediment routing of Elk River. The Humboldt Bay Harbor, Recreation and Conservation District compiled "*Historic Atlas of Humboldt Bay and the Eel River Delta*" which is a GIS comparison of the aforementioned Humboldt Bay maps. These maps indicate the most significant differences to the Elk River spit are observable when comparing the 1855, 1944, 1958, and 2005 shorelines (Figure 1)

The extent to which the bay affects the hydraulics of Elk River is not well understood. Future analyses are necessary to understand how and when the tides of Humboldt Bay cause a tidal back-water effect on Elk River flows.

Prior to the railroad construction up South Fork Elk River, Elk River was used to transport logs to Humboldt Bay for processing and shipping. Historically there was a log pond located on South Fork Elk River where logs were stored until the rains contributed enough streamflow to float the logs downstream. The effects of this practice in unknown, however it likely caused artificial floods and may have contributed both to channel incision and deposition.

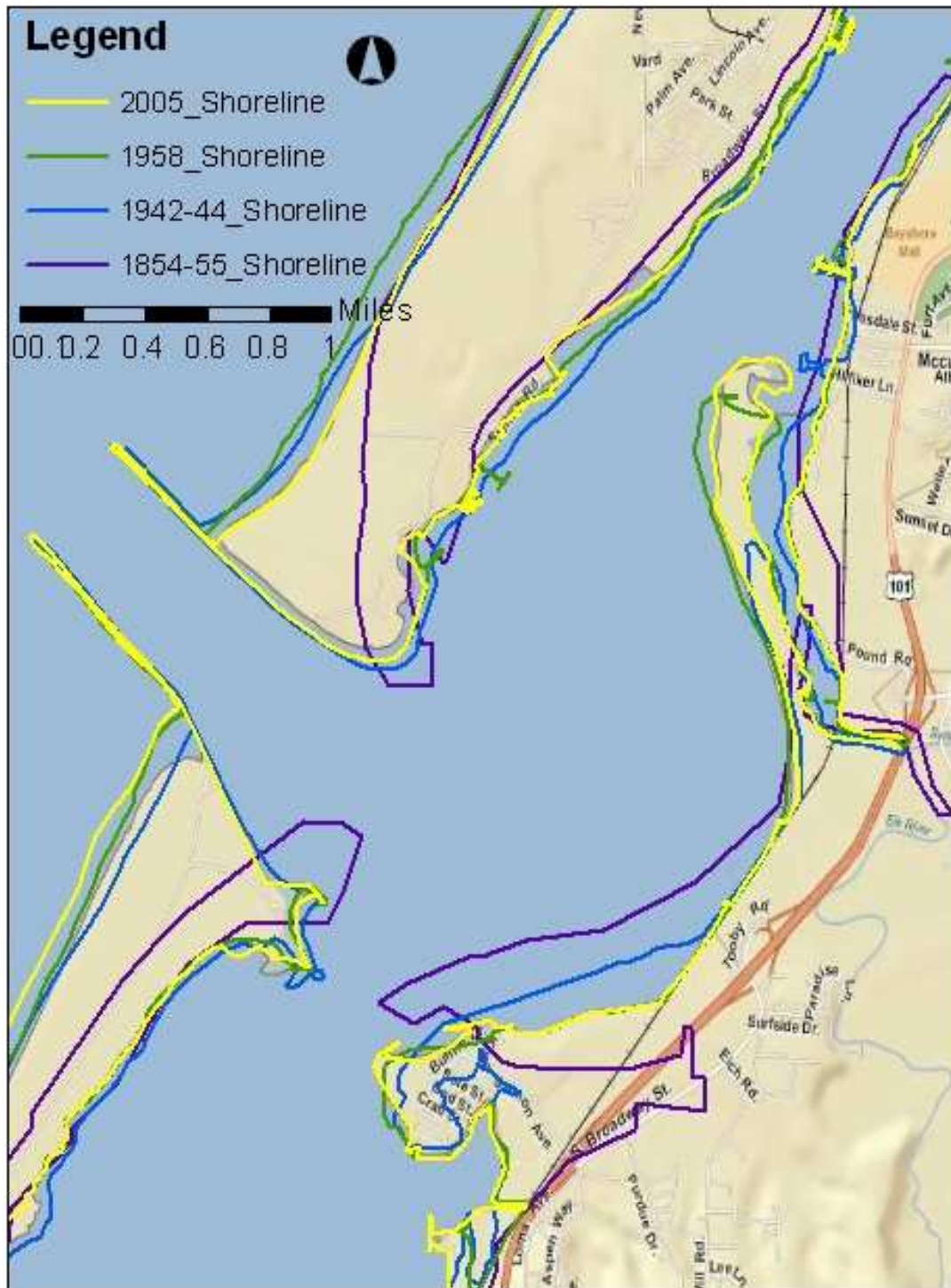


Figure 1. Humboldt Bay inlet and Elk River spit, compared over historic time periods (data from HBHRCD, 2007)