Figure I-2-11. Morgan Peninsula, Alabama, about 10 km east of the mouth of Mobile Bay (21 April 1998). This is the back side of the barrier island, with Mobile Bay in the right side of the photograph. The dead trees clearly show that the shore has retreated within the last few years. In this portion of the Alabama shore, erosion on the back side of the barrier is a more serious threat than on the ocean side

Table I-2-1
Age and Sandy Shores of the Major Hawaiian Islands

Island	Age (million years)	Total Shoreline (km)	Sandy Shoreline (km)	Percent Sandy Shoreline
Kauai	5.1	182	80	44
Oahu	3.7 to 2.6	319	90	28
Molokai	1.5 to 1.9	170	40	24
Lanai	NA	84	29	35
Maui	1.3 to 0.9	256	54	21
Hawaii	Active	492	35	7

Based on Campbell & Moberly 1985.

Figure I-2-12. Dulac, Louisiana (March 1981). Located near the Gulf of Mexico entrance to the Houma Navigation Channel, many residents of Dulac and other towns in the Acadian parishes of southern Louisiana depend on the water for their livelihoods - shrimping, fishing, and servicing the offshore petroleum industry. Although about 25 km from the Gulf, Dulac, at an elevation of 1-2 m above sea level, is highly vulnerable to hurricanes and flooding

1964). The coastal geology of each island is derived from the erosion of the island shield and subsequent volcanic activity (Campbell and Moberly 1985).

j. Great Lakes of North America. The five Great Lakes, Ontario, Erie, Huron, Michigan, and Superior, are located along the Canadian and U.S. boundary, except that Lake Michigan is totally within the United States (Figure I-2-20). They have a combined surface area of 245,300 km^2 (94,700 miles^2), making them the largest freshwater body in the world. Together with the Saint Lawrence Seaway, they form a major shipping artery that is navigable inland for 3,770 km from the Atlantic by ocean-going vessels, except from about December through April when shipping is blocked by ice (Figures I-2-21, I-2-22, and I-2-23). The lakes range in elevation from about 183 m for Lake Superior (International Great Lakes Datum 1985) to about 75 m for Lake Ontario, with the largest drop in elevation, 51 m between Lakes Erie and Ontario at Niagara Falls (CCEE 1994). Geologically, the Great Lakes are relatively young, having been formed by glacial action during the Pleistocene period. Prior to the glacial age, the area occupied by Lake Superior was a broad valley and the area occupied by the other lakes was a spreading plain. During the ice period, glaciers deepened the bed of Lake Superior and gouged deep depressions forming the beds of the other lakes. As the ice sheet retreated, fingers of ice remained in the depressions, rimmed by glacial moraines and outwash plains. Lakes were formed when the ice melted. Successive advances and retreats of the ice caps changed the drainage of the lake region until about 10,000 years ago. Then, the northern part of the area up warped or rebounded causing the lakes to drain into the St. Lawrence through what is now the Niagara River.

The shores of the Great Lakes and other freshwater lakes in the United States and throughout the world are as diverse as the ocean shores, featuring high and low erosive and non-erosive cliffs and bluffs, low plains, sandy beaches, dunes, barriers and wetlands (Figure I-2-24).

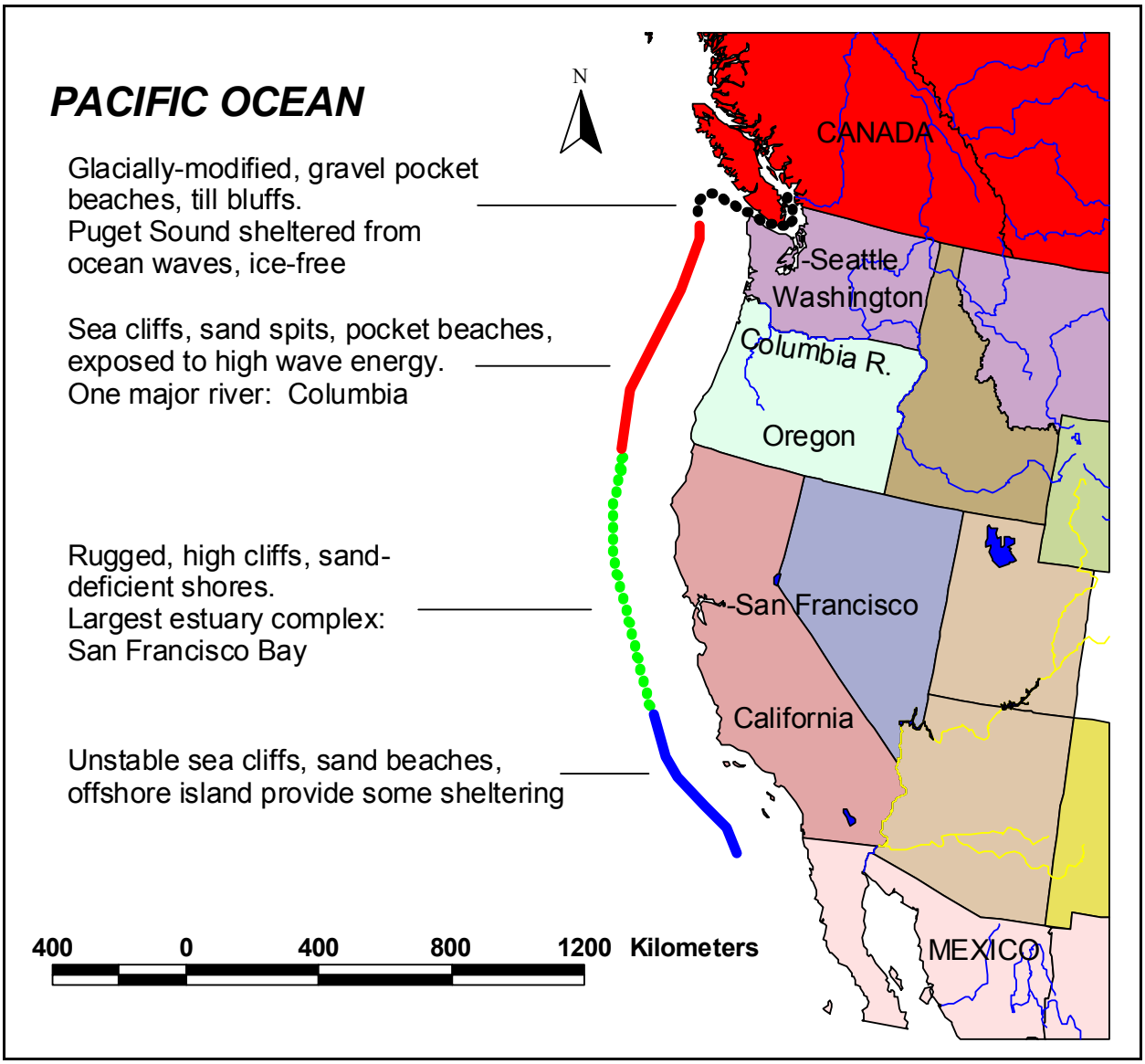

Figure I-2-13. Pacific coastal characteristics

I-2-3. Stability

Not all shores are in equilibrium with the present littoral processes. Shores with a character inherited from previous non-littoral processes (i.e., glacial or river deposited materials) maybe doomed to significant rates of erosion under present conditions, such as the Mississippi delta of Louisiana and portions of the Great Lakes. Some shores exhibit short-term seasonal or episodic event-driven cyclic patterns of erosion and accretion (e.g., the southern U.S. Atlantic coast). Other shores demonstrate long-term stability due to balanced sediment supply and little relative sea level rise influence, such as the west coast of Florida. For some shores, very little beach-building material is available, and what little is available may be prone to rapid transport, either alongshore or offshore (e.g., the Great Lakes). Shores that have been heavily modified by man's activities usually require a continuing commitment to retain the status quo. Prime examples are New Jersey, which was extensively modified during the 20th century and is now undergoing several major