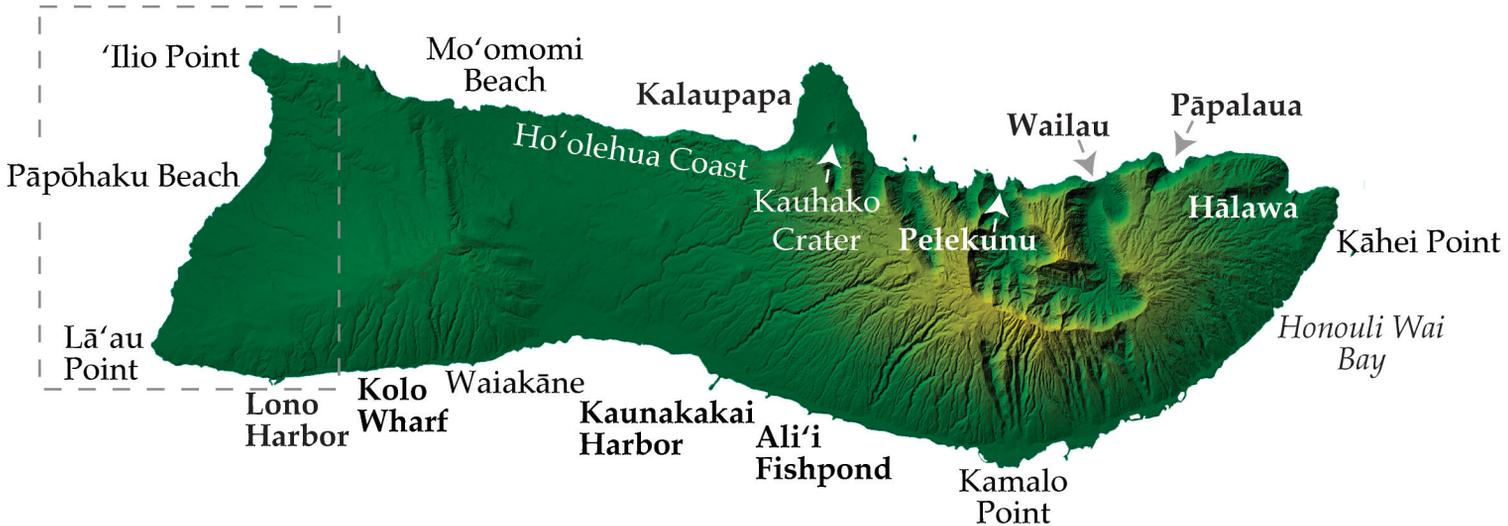
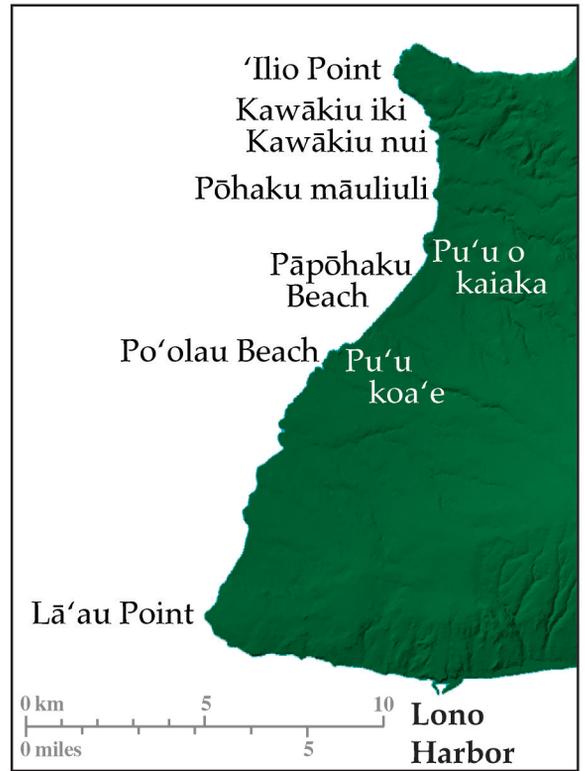
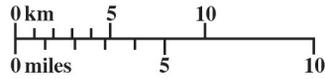


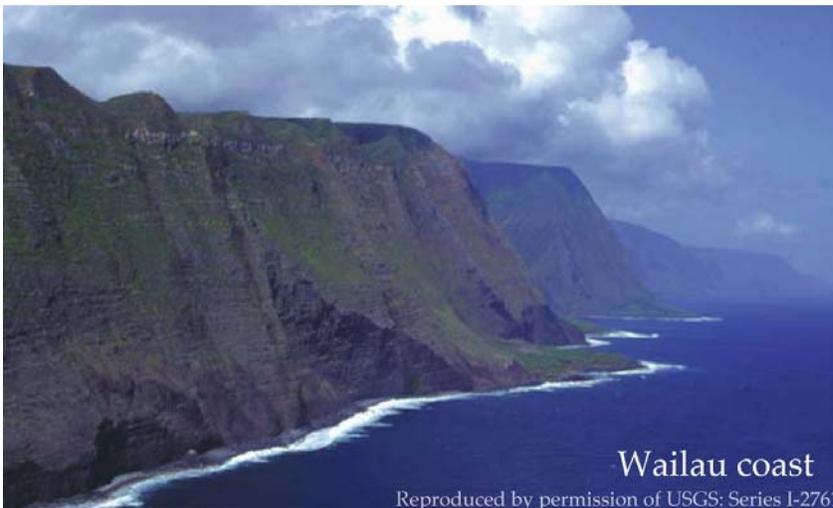
Moloka'i



The island of Moloka'i extends ~62 km east to west and lies ~20 km north of Lāna'i. The island was formed by two main shield volcanoes. Lavas of the younger East Moloka'i (1.52 my in age) flowed into the eastern flanks of preexisting West Moloka'i (1.89 my in age), creating a wide isthmus and producing the elongate island with 142 km of general coastline.

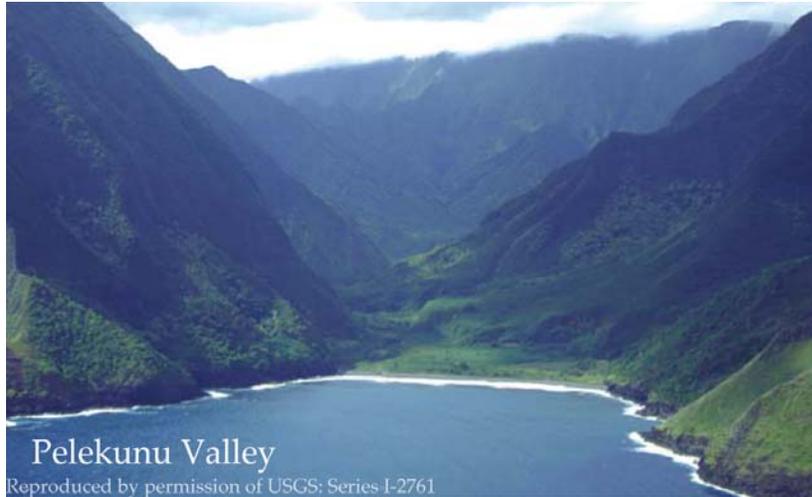
Although close neighbors, the two main shields are dissimilar climatically, and thus morphologically. Maunaloa (420 m), the West Moloka'i volcano, is a dry flat-topped shield partly protected from east and northeast trade winds by East Moloka'i (1,514 m). Maunaloa receives no more than 50 cm of rain annually. Without the orographic ability to catch clouds, West Moloka'i experiences little rainfall. However, due to overgrazing, deforestation, and removal of native plants, West Moloka'i is susceptible to massive erosional events related to heavy rainfall, that have carved deep gullies into the island. The island's rain falls primarily on East Moloka'i, up to 400 cm annually at the summit and 200 cm annually along the north coast. The shield has been cut into deep spectacular valleys and high steep ridges that are lush and vibrantly green.

Most of the north coast of East Moloka'i, from Hālawā to Kalaupapa, has



been sculpted in to sea cliffs (600 – 800 m) that are frequently awash with waves from powerful North Pacific swells. These cliffs are bisected by prominent coastal

ridges and valleys such as Hālawā, Pāpalaua, Wailau, and, Pelekunu, that have been carved by severe stream erosion. Substantial low-lying terrain is found on valley floors

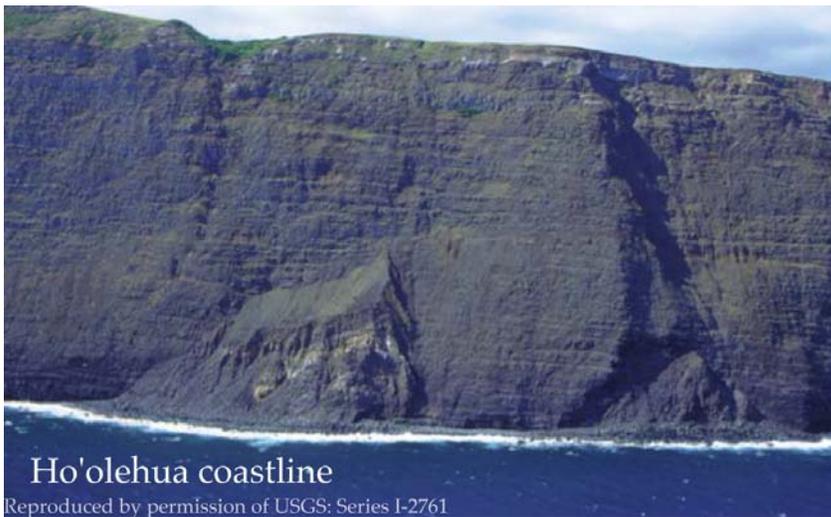


and at the boulder beaches where the valleys meet the sea, accreting dark detrital sand in the summer when North Pacific swell is at a minimum.

A flight over Molokaʻi reveals Kalaupapa Peninsula, a broad coastal plain projecting out from the base of the sea cliffs of northern East Molokaʻi. The peninsula is a basaltic shield of rejuvenated volcanism that erupted from Kauhako Crater centrally located on the peninsusula. The collapsed lava tube through which Kalaupapaʻs lavas flowed is still discernable and extends north at the surface from the crater to the sea. The crater is over 0.5 km in diameter and filled with a pool of brackish water more than 135 m deep. Numerous sea stacks and rock islets lie off the eastern shore of Kalaupapa. These remnants are composed of the same thinly layered flows that make up East Molokaʻi, and have been isolated by the retreating north coast. The east (windward) shore of Kalaupapa extends as a nearly continuous low sea cliff and remains void of sand until the northeast end of the peninsula where it grades to a mixed beach of white sand and coral rubble (Clark 1989).

The northwest edge of Kalaupapa is a graded terrace of stream laid conglomerate lying 30 m above present sea level that was formed at a higher

stand of the sea (Macdonald et al. 1986). Narrow storm beaches at the base of northwest Kalaupapa are maintained by high surf, which transports sand over tide pools and rocky shelves at the shoreline. The western nape of Kalaupapa is generally lined with white sand, increasing in width closer to the main island and transitioning into a long and wide detrital beach where the island and peninsula meet.



West of Kalaupapa along the Ho'olehua coastline, the sea cliffs of East Moloka'i lower and the rocky coast is exposed to consistent trade

winds between 16 and 30 km/h, creating rough offshore conditions and inhibiting any extensive development of coral reef. Another result of intense and consistent winds, over long durations, is the dry sandy shoreline of west Moloka'i, extending from Mo'omomi at the east to 'Ilio Pt. in the west.

Mo'omomi is an area of active dune formation where unconsolidated sand lies anchored by modest vegetation atop older Pleistocene dunes now cemented to eolianite. Moderately steep headlands, less than 30 m high, line the windy northwest Moloka'i coast from the western edge of the Mo'omomi dune area to 'Ilio Pt. Only a few calcareous beaches backed by vegetated dunes exist at the shoreline. In places the headlands have been cut into gulches by flash

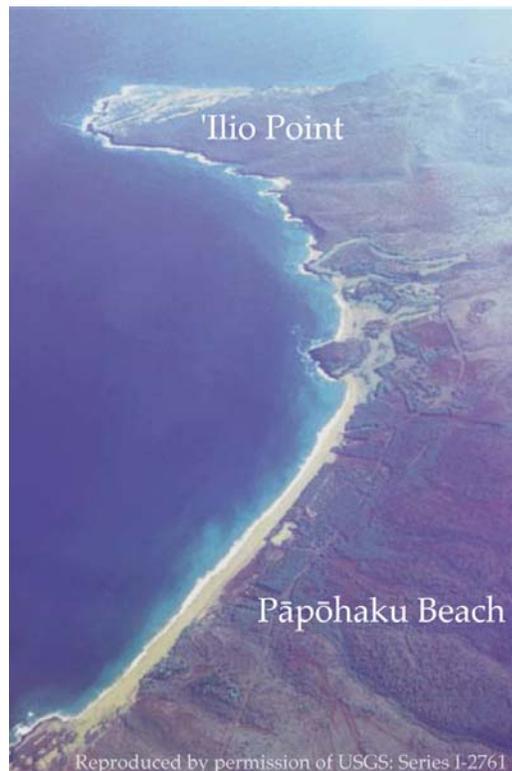
flooding, however constant winds and the low elevation in this area keep this side of Moloka'i generally dry.

An extensive sandy dune complex occupies the northwest corner of Moloka'i, inland of Mo'omomi Beach. This Desert Strip contains an abundance of both unconsolidated calcareous sand and carbonate eolianite that forms a belt of dunes extending up to 18 m high, 0.8 km wide and which reaches over 6 km inland from the coast (Macdonald et al. 1986). Active dunes accrue sand from older eroding lithified dunes in the area that have been dated to the late last interglacial (Hearty et al. 2000) ; however most of the loose sand is transported by wind from the northwestern shores (Clark 1989; Macdonald et al. 1986).

The west coast from 'Ilio Pt. to Lā'au Pt. spans the distance between the northwest and southwest rift zones and is rocky terrain with wave cut headlands and terraces

interspersed with long sections of embayed calcareous beach at the shoreline. South of 'Ilio Pt. the coast curves gently inland to small rocky embayments at Kawākiu iki and

Kawākiu nui, Pōkaku māuliuli, Pu'u o kaiaka, that protect small calcareous pocket beaches. Landward of the embayments are intermittent stream gulches that feed small wetlands in the vicinity.

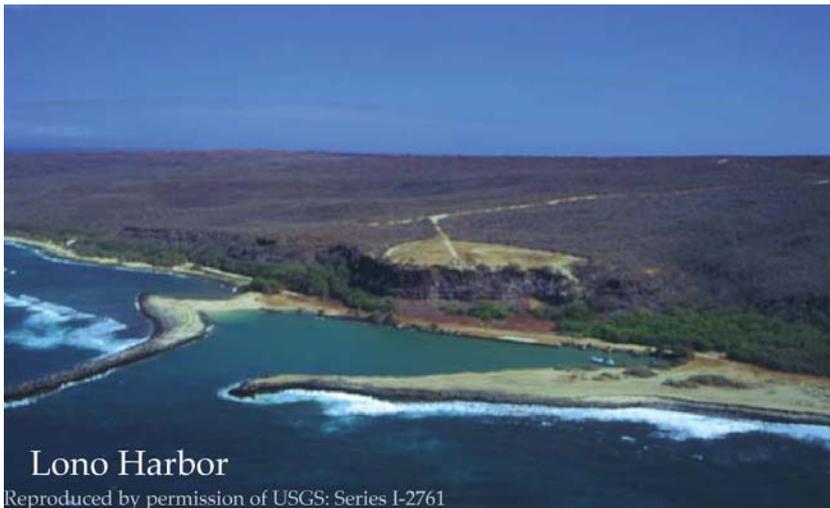


Further south is the largely unvisited calcareous Pāpōhaku Beach.

Stretching over 3 km of the pristine western shoreline, the beach averages almost 100 m wide is backed by a cinder cone headland to the north, and an eolianite and lava headland to the south. The ample beach at Pāpōhaku, and the large sand field just offshore, exist here despite little significant development of coral reefs along the west coast (Fletcher et al. 2002). Pāpōhaku has been mined in the past as a source of sand.

Rocky headlands such as Pu'u koa'e lie to the south of Pāpōhaku. These headlands and the small rocky islets off the west coast indicate the erosive power of the heavy surf that pounds this side of Moloka'i in the winter and spring.

Lā'au Pt. is located at the southwestern corner of the island and extends underwater for 65 km as the broad Penguin Bank shoal. The shoal is probably a separate shield that grew along the trend of the southwest rift zone. Although the shoal was cut by wave erosion, it lies 54 m below sea level, indicating that it was at or near the surface at a lower stand of the sea (Macdonald et al. 1986).



The arid south shore of west Moloka'i, from Lā'au Pt. to the west border of Pākanaka Fishpond, has a gentle slope and is shallow and

rocky between the shoreline and offshore reef. Broad sections of fringing reef extend from either side of Lono Harbor, widening toward the east toward Kolo Wharf. The fringing reef on the south shore of Moloka'i is the largest in the main

Hawaiian islands, extending ~53 km along the coast.

Mangroves were introduced to this coast to head off coastal erosion, but have instead intensified the problem of terrigenous mud deposition forming extensive mud flats. Mangroves, and the inland wetlands they encourage, span much of the south coast on west Moloka'i. Ultimately, the result of sedimentation and mangrove proliferation is the formation of a prograding shoreline and the development of interior wetlands that extend east on the southern Moloka'i coast, toward Kaunakakai Harbor (Fletcher et al. 2002).

Coastal erosion affects long sections of the south Moloka'i shoreline as indicated by



scarped dunes, fallen trees, and extensive outcrops of beachrock, as seen at Kolo Wharf.

Widespread upland erosion on west Moloka'i has developed as a result of poor land management practices. Over grazing, deforestation, and invasion by alien species has resulted in sedimentation of nearshore waters and the seaward migration of a muddy coast onto live reef.

The coastal highway that runs along south Moloka'i is built on a low terrace formed by the Kapapa high stand of the sea ca. 3000 yrs BP.

Almost 50 ancient Hawaiian fish ponds were built on south Moloka'i between Kolo and Honouli Wai on the east side of the island, however most have

been infilled by muddy alluvium and populated by the troublesome mangroves. Along the southeast facing coast of Moloka'i, the shore is skirted by narrow sand and detrital beaches that are fronted by shallow waters with rocky nearshore bottoms leading out to shallow offshore reef.



Mangrove forests have also invaded the shallow shoreline east of Kaunakakai. From Kawela to Kamalō, to Pūko'o, the coast is shallow sloped

with shallow offshore waters. Waters between the shoreline and the fringing reef offshore are frequently muddy with sediment and silt washed down from the island's interior.