U.S. Army Corps
of Engineers

Explore 2

The California Coastline
Klamath River to Punta Gorda

The Year of the Coast

The beauty and physical diversity represented by California's coast, bays, harbors and estuaries are exceptional. Uniquely spectacular scenery features mountains dropping steeply to rocky shores, rolling headlands and bluffs, fertile marshes, wide sandy beaches and dramatic vistas extending some 1,100 miles from Oregon to the Mexican border.

The sea acts as the coast's chief architect, and continual changes take place as waves, rains and winds reshape shoreline contours. Currents and tides continually refresh and nourish coastal lands and waters, where life forms are as diverse as their habitats. Here the mighty whale and the tiniest of organisms, salt marsh plants and towering redwoods, live together with man in an intricately balanced state of interdependence.

The coast means something different to each individual. Some cherish the fresh salt air, the sea breezes and the opportunities for contemplative solitude. Others enjoy the coast as a place to picnic and swim, to fish, sun or sail, while many choose to search for driftwood or study the mysteries of rocky tide pools. Many choose bird-watching in coastal bays, marshes and lagoons, while others value the potential for commercial and recreational development.

To the U.S. Army Corps of Engineers, California's bay and coastal areas mean a continuing dedication to management and preservation through effective coastal engineering, interdisciplinary investigations, exercise of regulatory authority, flood prevention and water quality control, harbor development and protection, and conservation of fish and wildlife.

To assist you in developing a greater knowledge and appreciation for California's coastline and its valuable resources, the Corps of Engineers has prepared a series of brochures which highlights both natural and man-made features. The sites included in each brochure were selected for their unique scenic significance, recreational opportunities and accessibility. Related information on various natural phenomena such as tidal action, beach formation and movement of currents has also been included, along with reference to numerous indigenous plants and animals. Such detail provides the visitor with the opportunity to gain an increased understanding of the many fascinating aspects of coastal areas.

Bring your camera and binoculars, your curiosity and sense of adventure and join us in exploring nature's wonderful gifts.

Klamath River to Punta Gorda

From the Klamath River, near the southern border of Del Norte County to Punta Gorda, the rocky headland about 12 miles south of Cape Mendocino, the coastal scenery is rich and diverse.

Much of the coast here is crowned by redwood forests that appeared before the emergence of man. These coast redwoods, *Sequoia sempervirens,* are one of the most beautiful and well-known natural attractions in the world. Indigenous to the Northern and Central California coast, the redwoods thrive on the temperate climate and plentiful moisture provided by rains and fog characteristic of this coastal area. Many of the redwoods have been growing here for over two thousand years. The deep silence of the lush undergrowth beneath these magnificent giants elevates the spirits of all who come here.

The hardy redwoods attracted early pioneers who established the lumbering activities which continue to be the region's most important industry. The prospect of finding gold and amassing easy wealth also lured thousands of fortune-hunters to the area during the mid-1800s.

The beaches and freshwater lagoons along this region of the coast present a variety of visual and recreational pleasures. Agate Beach, at Patricks Point State Park, yields bits of agate, jasper and jade to persistent rock collectors. Driftwood of numerous sizes and shapes floats in nearshore waters and is carried onto area beaches by the north coast's high-energy waves. Sport fishermen are drawn to these freshwater lagoons and rivers, seeking catches of salmon and trout, while commercial fishermen ply the deeper ocean waters, offloading abundant catches at Trinidad and Humboldt Bay harbors.

In Prairie Creek Redwood State Park, one of three state parks within the boundaries of Redwood National Park, herds of Roosevelt elk roam freely across a broad expanse of meadowland, feeding on grasses and low vegetation.

Eureka, the largest city on the north coast of California, is the area's lumbering and fishing capitol. In the midst of such commercial activity the lush wetlands and mudflats of Humboldt Bay serve as natural habitats for an innumerable variety of plants and animals. The broad, fertile flood plain of the Eel River and the high, rugged cliffs of Cape Mendocino lend geographic diversity and richness of character to the area's multifarious quality.

The Corps of Engineers hopes that this brochure will enhance your explorations of this coastal region and help you to gain a greater appreciation of its many natural wonders.

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1 Prairie Creek Redwoods State Park

After crossing the Klamath River, travel south on U.S. 101 to the north entrance of Prairie Creek Redwoods State Park. This magnificent park, encompassing 16 square miles of virgin forest, runs along the coast from just south of the Del Norte-Humboldt county line to the mouth of Redwood Creek, near Orick.

Most of the park is pristine, unaltered from its natural state except for a 29-mile network of trails that winds from park headquarters near U.S. 101 into the roadless hillsides. More than a hundred campsites are available.

The entire east side of the park is an enormous redwood forest. Many other types of trees also grow here, including the Douglas fir, Western hemlock, red alder and California laurel. In addition, the forest supports numerous varieties of mosses, lichens and ferns. The coast redwoods, however, are the greatest attraction. Besides their natural beauty, these magnificent trees possess a number of unusual characteristics. They are extremely long-lived and have a remarkable resistance to fire, disease and insects. They also have great self-healing powers that are thought to be a result of the presence of tannin in the tree's bark and wood. Tannin is the agent that provides the redwood's rich, red color.

The tallest tree believed to be in existence is located in Prairie Creek Redwoods State Park in the grove called the "World's Tallest Trees." The tree is almost 368 feet tall.

2 Prairie Creek Fish Hatchery

To reach the Prairie Creek Fish Hatchery, continue south on Highway 101, also called the Redwood Highway, and turn left at the large wooden sculpture of a trout, about five miles north of Orick. The hatchery is located in a magnificent setting of redwoods, alders and Douglas fir. This is the only county-owned-and-operated fish hatchery in the United States that raises anadromous fish—fish that live in salt water, but enter freshwater streams and rivers to spawn.

Eggs for the Prairie Creek Fish Hatchery are taken from fish returning to spawn in Lost Man Creek. The newly-hatched fish are then raised under carefully controlled conditions in hatchery tanks. Different tanks are used for successive stages in the fish's

Lumbering
Using ox teams, two-man saws and donkey engines, the early lumberjacks supplied wood to meet the demands of a growing nation. In the mid-1800s, and especially during the time of the Gold Rush, timber was harvested using a method called "clearcutting," or harvesting all the timber within a given area.

Today, the method of "selective cutting" is predominant. This process removes the larger trees, leaving the smaller ones to grow to maturity. In addition, lumber companies continually plant new trees that will one day replace those currently being harvested.

Migratory Fish
Steelhead trout and silver salmon are two of the area's most common migratory fish. The steelhead trout, a native to Pacific coast streams, is a seagoing subspecies of rainbow trout. In the ocean, the steelhead's back appears bluish or green in color. After spending from one to three years at sea, steelhead return to freshwater streams to spawn—nearly always to the streams in which they were hatched.

The silver, or coho, salmon is differentiated from the king salmon by the white lining over its gums. The average silver salmon caught in Northern California weighs from six to nine pounds and measures up to 24 inches. Like the steelhead, it is an anadromous fish that spawns in freshwater streams and rivers. The young fish spend about a year in fresh water before returning to the sea. Most spawning occurs from November through January.

Steelhead Trout

Silver Salmon

growth. Long indoor tanks hold the smallest fish, and outdoor tanks of circulating water contain those nearly ready to be returned to their natural environment. Improving on nature, water temperature, diet and other factors are carefully controlled, resulting in a high survival rate.

Four fish species are raised at the Prairie Creek Fish Hatchery: silver, or coho salmon; king or chinook salmon; a variety of domestic rainbow trout; and steelhead trout. After spending from 11 to 15 months in hatchery tanks, the fish, called "yearlings," are released into the lakes, landlocked lagoons, streams and rivers of Humboldt County. In this way, the hatchery helps to ensure that area fish populations are not depleted by fishermen, natural causes or man-made hazards.

Misty morning at Gold Bluffs Beach

3 Gold Bluffs Beach

Gold Bluffs Beach can be reached by turning right from Highway 101 onto Davidson-Fern Canyon Road. This four-mile-long, narrow, winding dirt and gravel road is not recommended for autos during the rainy season, and trailers will find the road difficult any time of the year.

Gold Bluffs Beach bears the name given it during the early 1850s when fortune-seeking adventurers sifted the sands and sediments along the beaches and the bluffs in search of gold. Most of them left in frustration, and the gold remained behind, finely mixed with vast amounts of sand and rock.

The driftwood that lies on the backshore of this wide, wave-fronting beach indicates that during severe winter storms waves wash inland to the foot of the bluffs. The area's relatively

Caution
High waves and cold waters are predominant along this area of the California coast. Driftwood floating in the waters just offshore presents an additional hazard to swimmers and divers. Waves are capable of driving logs ashore with great force, unexpectedly. For this reason, visitors should exercise great caution when swimming, wading or even walking along the shoreline.

Many of the roads are isolated and rough, and visitors should be certain that their vehicles are appropriate to such travel. Service stations are few and far between. Also, pulling on and off the narrow roadways can be dangerous due to the numerous heavy vehicles traveling the roads day and night.

Freshwater marsh behind beach

Truck loaded with redwood logs

Looking upstream from Redwood Creek revetment

young vegetation indicates that the backshore area is periodically washed away.

The beach campground serves as the trailhead for several nearby paths that can usually be traveled in half a day. The Boat Creek Trail, which begins at the Fern Canyon parking area, provides an opportunity to walk along one of Northern California's last truly wild beaches. Roosevelt elk can often be spotted in this unspoiled natural area.

Dry Lagoon wetlands

Roosevelt Elk
The Roosevelt elk, a member of the deer family, is sometimes called "the monarch of the wild." Mature bulls weigh from 500 to 1,000 pounds, while the weight of the cows ranges from 400 to 700 pounds. Only the males grow antlers, which appear when the bulls are between 10 and 11 months old.

A bellowing, bugle call, the best known of all elk sounds, is most often heard during mating season when an elk bull announces his dominance over a herd of cows. When bachelor bulls try to steal cows away from the harem, the herd bull remains vigilant. Antlers are then often locked in brutal contest.

Four of California's Roosevelt elk herds, totaling about 200 head, roam in Prairie Creek Redwoods State Park.

4 Dry Lagoon State Park and Big Lagoon

From the junction of Davidson-Fern Canyon Road and Highway 101, continue south for about nine miles. Note the Corps of Engineers rubblemound revetments along Redwood Creek, north of the town of Orick. Pass by Freshwater Lagoon, cross McDonald Creek, and turn right toward Dry Lagoon State Park.

Dry Lagoon is a classic example of a lagoon that has been slowly transformed into a marshland. A sandbar barrier, formed by the deposition of sediment, once separated the lagoon from the ocean. The resulting reduction in the salinity of the lagoon's waters, as well as the loss of tidal effects, attracted animal and plant life more suited to the changing environment. Over time, increasing amounts of sediment were trapped, which eventually filled-in the lagoon area—transforming it into marshland. If this transitional

Sharp Point and beach at Dry Lagoon

Big Lagoon

Wave Classification
The types and sizes of waves that move across the ocean's surface are as numerous as the points from which they come. Scientific wave classification can be a complex problem. One widely accepted and simple classification method relates to the wave's *period*. The period is the time it takes a wave to travel the distance of one "wave length" past a fixed point. Wave length is defined as the distance between successive peaks of the wave.

process remains uninterrupted over the next hundred years or more, Dry Lagoon will eventually become a fully developed coastal plain.

At this time, the marshes at Dry Lagoon support an extensive community of animal and plant life. The waters serve as a spawning ground for shellfish, crabs and shrimp. Dense growths of green and blue algae and eelgrass are present. The marsh is backed by hills covered with low vegetation and a few pine trees.

On the beach adjacent to the marsh, agates, black jade and other semi-precious stones are often exposed by the high-energy waves of winter storms. Driftwood, some of which results from early logging activity, is also plentiful here. The rock visible upcoast from Dry Lagoon State Park is known as Sharp Point.

Continue south on Highway 101 to reach Big Lagoon, a 1,370-acre lagoon flanked on the ocean side by a barrier beach. According to an 1870 navigation chart, an opening once existed at the north end of the barrier. The barrier, which grew from a small sand spit over thousands of years, is today a 350-foot-wide formation of sandstone and gravels—probably the result of ancient river deposits. Natural runoff from surrounding hills feeds the freshwater lagoon.

Big Lagoon's relatively warm waters are popular with swimmers, and nearby Big Lagoon Park is said to have the safest swimming beach in Humboldt County. Boat launching facilities are available, and the beach yields bits of jade, jasper, agate and petrified wood to the persistent rock hound. Trout fishing is also a popular pastime.

5 Patricks Point State Park

From Highway 101, exit on Patricks Point Drive and continue to the entrance of Patricks Point State Park. Within this beautiful 425-acre park, several trails provide outstanding views of the rugged Pacific shoreline, sea stacks and offshore rocks. Rim Trail follows an old Yurok Indian trail from Agate Beach along precipitous cliffs to Palmers Point. The thick patches of huckleberry, blackberry, azalea and rhododendron are nearly impenetrable in some areas, providing a sense of isolation and solitude for the hiker.

Patricks Point itself consists of a 180-foot thickness of sandstone, clay and gravel beds that tilt predominantly to the northeast. These sediments were deposited between 140 and 175 million years ago in a deep trench at the edge of

Transition from Lagoon to Meadowland
The formation of a coastal lagoon begins with the development of a barrier sand spit parallel to the shoreline. As it grows in length and width, the spit increasingly excludes ocean swells and tides. This results in a change in the salinity of the lagoon's waters and contributes to an accumulation of sediments that promotes plant growth. Gradually, increasing varieties of vegetation bind the soil with a network of roots that traps more sediments. These plants also contribute organic matter to create a slowly building soil base. A marsh is eventually formed.

The unimpeded deposition of silt eventually fills the marsh, transforming it into meadowland.

Agate Beach

Wedding Rock

Dense coastal vegetation

the North American continent. Later uplifted and eroded, they formed what is today called the Franciscan formation. Now covered with lush vegetation, these ancient beds represent a shallow marine and beach environment similar to that at Agate Beach.

Agate Beach lies at the southern end of a long, wave-fronting beach that began seven miles upcoast at Sharps Point. Near the upcoast end of the beach, the waters are dominated by a strong rip current, sometimes identifiable by the deep, reddish-brown color extending seaward from the beach. The rip current is extremely dangerous, and even wading in the shallow, nearshore waters is discouraged.

Agate Beach is strewn with driftwood and semi-precious stones deposited by the strong winds and high tides of winter. This beach, and others in this area, also has quantities of jasper, jade and petrified wood buried under the sands.

Southward along the point, the shoreline changes to one typified by steep, craggy inlets and rugged promontories. At Wedding Rock, one of the park's most dramatic features, the vegetation is thick and dense. From here, the upcoast barrier beach at Big Lagoon and the bluffs extending along Gold Bluffs Beach are visible in the distance.

Trinidad's Little Head and pier

6 Trinidad Head and Bay

After leaving Patricks Point State Park, turn right onto Patricks Point Drive toward the town of Trinidad. Continue for about five miles, then turn right on Main Street. The Trinidad State Beach overlook, to the right, is followed by a left turn into a cul-de-sac at McKinley Vista Point. A pleasant hiking trail leads from the ocean side of the parking area. The trail offers wide, sweeping views of the beach and Trinidad Head, a massive rock that rises 360 feet above the water at the outer edge of Trinidad Harbor.

Return to Main Street and turn right to reach downtown Trinidad. Discovered by a Spanish explorer in 1775, and settled as a port in early 1850, Trinidad is the smallest and second-oldest incorporated town in California. As a shipping port, Trinidad served the

Coastal Vegetation
Coast redwood, red alder and deer fern are among the most plentiful vegetation found in this area of the California coast.

The coast redwoods are among the tallest, largest and oldest trees in the world. Their size, age and stately beauty make them famous worldwide. The average life span of a coast redwood is one thousand years and their ancestry dates back millions of years—in an unbroken line of descent that links the present age with the age of reptiles.

The red alder, a beautiful slender tree with spreading branches and a grayish-white outer bark, is a member of the birch family. These trees grow rapidly during their early years, growing to a height of 15 feet in the first five years. Within ten years the tree may be from 35 to 40 feet tall. The alder's dark green leaves are from three to six inches long, with saw-toothed edges.

The deer fern is a beautiful, hardy plant that thrives in damp coniferous forests, swamps and creek banks along the California coast. The fern is a striking deep-green color with numerous long, finger-shaped fronds that spiral upward from its crown, or root base.

Trinidad Lighthouse

View of Trinidad State Beach from overlook

mines in the Trinity Alps and Weaverville areas. Shipments to ports around the world included animal hides, gold, lumber and products of the north coast fishing industry.

Trinidad Bay has the only pier north of Point Arena that is located in a semi-protected harbor, making it an important port for commercial and sport fishermen. From the Trinidad Memorial Lighthouse, located on the cliffs above the bay, one can watch dinghies going to and from the fishing boats anchored in the harbor. During summer, when waters are calm, the shallow bay supports the growth of bull kelp.

Trinidad Head is connected to the mainland by a narrow tombolo, or sand barrier, to form a headland that protects the harbor from all but large southerly waves. When storm winds blow from the south, the combined energy of wind and waves creates difficult anchoring and mooring conditions in the harbor.

Downcoast, dozens of offshore rocks face a shoreline of rocky beaches and gently sloping, tree-covered hills. The Trinidad area is one of the most picturesque on the North Coast.

Humboldt Bay Coast Guard Station

7 Humboldt Bay North Spit

To reach Humboldt Bay, turn right from Trinidad's Main Street onto Highway 101 south. After crossing the Mad River, take the Samoa exit. While traveling over the Arcata mudflats, part of the old Mad River floodplain, notice the clumps of freshwater marsh grasses which indicate that the transition of marshland to meadowland is in process. The mudflats in this area are covered with green algae and etched with drainage channels.

At California Highway 255, turn south toward the Humboldt Bay North Spit. Humboldt Bay is a 13-mile-long embayment separated from the Pacific by two wide barrier beaches called the North and South Spits. The natural gap in the barrier, which forms the entrance to the bay, has been stabilized by jetties extending from the

Reading a Beach

While walking along the shoreline, several minor, wave-related beach features will be noticeable to the sharp-eyed observer. These include swash marks, backwash marks, rill marks, and pinholes. A good time to note these interesting beach features is in early morning after a high tide.

Swash marks are thin lines of sand left by the upward reach of incoming waves. The uprushing water, called a swash, spreads out into a thin film. As it travels up the beach face, a line of sand particles is pushed along and left behind at the point where the swash expends its energy.

Backwash marks are shallow triangular gullies cut by the force of the backrushing water as it slides down the beach. These marks can crisscross into six-inch-long, diamond-shaped patterns. Backwash marks are usually found on beaches that have an intermediate slope composed of moderately coarse sand.

As low tide approaches, water that has sunk into the sand seeps out and flows down the beach face back into the ocean. This drainage pattern results in *rill marks*. As the pattern nears the water, a single arm branches into many arms, similar in appearance to the branches of a tree.

Pinholes are created when water sinks into dry sand and displaces the air between the grains. The displaced air rises to the surface in a series of bubbles which create small pinholes.

Swash Marks

Backwash Patterns

Pin Holes

View of bay from Samoa boat launch

North Spit lumber and pulp mills

Coastal sand dunes on North Spit

ends of both the North and South Spits. The jetties were initially constructed by the Corps of Engineers in the 1880s to protect the bay's entrance. Without the stabilizing effect of these jetties, natural erosion from wind and wave activity would shift and change the shape of the opening, creating hazards for ships entering and leaving the harbor.

Due to the strong wave action typical of this area, the north and south jetties have been rebuilt several times. They were most recently improved in 1971, when dolosse armor units were placed to ensure additional protection from storm waves. The interlocking nature of the shape of the 42-ton dolosse and the open spaces between them make these armor units about 10 times more effective than natural rock in withstanding wave forces.

Woodley Island marina

Milled lumber in Arcata area

Humboldt Bay's North Spit is about 4,000 feet wide, while the South Spit averages about 1,400 feet. The wide beach backing the North Spit is bordered by extensive northwest-southeast trending sand dunes. Sand dune tracts on the south spit are substantially smaller. Deposition of sediments is also greater along the North Spit, an indication of the predominance of south-flowing coastal currents and the littoral drift.

As you travel along the Spit, watch for the historic Samoa Cookhouse. Once the site of many meals for hungry timber workers, the cookhouse now houses a museum featuring lumbering industry artifacts.

To reach the north jetty, turn right just before the U.S. Coast Guard station. Just past the station, turn left and continue out toward the jetty. If the

Eel Grass and Sea Lettuce

Eel grass is a flowering marine plant that lives in quiet waters. It is common to the shallow waters of tidal mudflats, bays and estuaries. At times, these sea grasses form extensive, dense beds that virtually exclude the growth of other plants. Eel grass beds serve as an important food source for certain waterfowl, such as the black brant, and a variety of marine organisms. They provide habitats for fish, crabs, snails, shrimp and other marine life.

Sea lettuce is among the most conspicuous of shallow-water marine algae because of its bright green color. It is especially abundant in the quiet, shallow water of bays, lagoons, harbors and marshes. Sea lettuce, recognizable as a thin green membranous algae only two cell layers thick, often forms large detached sheets that spread in broad expanses throughout its environment.

Sea Lettuce

Eel Grass

Dolosse

Dolosse, gigantic structures used to dissipate the force of waves, each contain more than 19 cubic yards of concrete. These massive structures were used for the first time in the United States in 1971, when 5,000 interlocking dolosse were added to the north and south jetties of the Humboldt Bay entrance.

Dolosse originated in South Africa. Their name comes from the Afrikaans word for the ankle bone of a small goat, which is similarly shaped. Each dolos is shaped like an enormous H with one side turned 90 degrees. Wave energy is dissipated by the interlocking complex of shapes and spaces created by placing many dolosse together.

Prior to their application at Humboldt Bay's entrance, the jetties suffered extensive damage as a result of severe wave conditions. Some years before, the entrance was improved by armoring the heads of the two parallel jetties with heavy stone and 100-ton concrete cubes. Even these materials failed. The dolosse, each measuring 15×15×15 feet, and weighing over 42 tons, provided the additional protection needed.

roadway is wet, walking, rather than driving to the jetty, is advisable due to deep sands and mud.

Returning to the paved road, turn right, toward Eureka, at the traffic signal. Crossing the bridge, note Indian Island, a nesting site for snowy egrets. Once you reach Eureka, turn right on Fourth Street, then make an immediate left on Myrtle. Turn right onto M Street, where you will pass the famous Carson Mansion, one of the finest examples of Victorian architecture remaining in the United States today.

At the end of Fourth Street, turn left on Second to pass through Eureka's Old Town. A right turn on H Street, a left on First and a right on D Street leads to the town's waterfront area, home of many of the area's fishing boats. From the waterfront return to Highway 101 south.

8 Fort Humboldt State Historical Park

Continue south on Highway 101 past the Eureka Chamber of Commerce to Highland Avenue. Turn left and follow the signs to Fort Humboldt, located on the south side of Eureka.

Fort Humboldt is an interesting and worthwhile stop for those who wish to take time to learn about the history of this area. The original fort was built in 1853 to protect early settlers from Indian attack, during the period when Eureka area settlements were expanding into the wilderness of the Mattole, Eel, Klamath and Trinity Valleys. By 1864, hostilities declined and by 1870 the fort was abandoned.

In 1955, the State of California designated the immediate area surrounding the fort as a Historical Park. Today, the park exhibits one of the finest collections of early logging tools and equipment in the country.

Steam engine at Fort Humboldt Historic Park

Fishing boats moored along Eureka waterfront

Another reminder of early lumbering days

Carson Mansion

Channel Markers

Shipping channels in the United States are marked by a federally-designated system of channel markers, or navigation aids. The markers consist of buoys and day beacons exhibiting varying light patterns, shapes and colors. Such information tells mariners of dangers, obstructions, or changes in the channel bottom. Numbers, used in the lateral system of buoys, are printed on the markers. The numbers increase in sequence as one proceeds toward port. Even numbers are used on the right sides of channels; odd numbers are on the left.

Seafarers have long used the expression "red right returning." This phrase serves as a reminder that when traveling into port red buoys should be on the starboard, or right, side and black buoys on the port, or left, side. The black port-side buoys are can-shaped with flat tops, and the starboard-side buoys, called nuns, are cone-topped.

Day beacons are fixed, usually pile-mounted markers. Black-and-white vertically striped buoys mark the center of a channel.

At a junction where a shipping channel branches to the right and left, a black-and-red horizontally banded buoy will be found. If the buoy has a red band on the top, the preferred channel is to the left. One with a black top band indicates that the preferred channel is to the right.

9 Humboldt Bay South Spit and Jetty

Continue south on Highway 101 to visit the Humboldt Bay South Spit. Just beyond the southern tip of the bay, follow Hookton Road for approximately 10 miles west toward the bay's south jetty. Enroute, Hookton Road becomes Table Bluff Road. Ascending the bluff, the Hookton and Southport Channels can be seen winding through the mudflats in the southern portion of Humboldt Bay. At the top of Table Bluff, the delta of the Eel River, downcoast, comes into view.

Continue past the Table Bluff Lighthouse. Follow the switchback down the bluff and onto the South Spit, the four miles of sand barrier that enclose the southern half of Humboldt Bay. Occasionally, hang gliders can be seen here soaring high into the air as they take advantage of the updrafts created as the wind strikes the bluffs. Once you reach the parking lot, at the jetty, stop. Driving further is discouraged due to the deep, soft sand that lies beyond.

Humboldt Bay is a naturally protected embayment which has been dredged to accommodate increasing vessel traffic and ship size. The north and south jetties were constructed to stabilize the entrance to the bay. The channel's widths and depths have been progressively increased to accommodate larger ships. The southern half of the entrance channel is currently dredged to a depth of 40 feet and the northern half has water depths ranging from about 15 to 30 feet at low tide.

Unique wave patterns can be observed as waves entering the harbor bend and spread into the northern half of the channel. Inside the bay, channel depth varies from 26 to 35 feet. Those wishing to walk out on the jetty should wait for low tide and be alert for large "sleeper" waves. Climbing on the rocks and dolosse armor units is not advised.

Return from the jetty on South Jetty Road, follow Table Bluff Road, and turn right on Copenhagen Road. In the distance lies the floodplain of the Eel River. Continue on Copenhagen to Loleta and Eel River Drive. Follow Eel River Drive to Mattole Road and return to the highway.

Mudflats as Habitats
As streams deposit sediments at their juncture with the sea, mud and silt accumulate. The resulting tidal mudflats provide a valuable, ecologically rich habitat for an abundance of life that thrives on nutrients brought in by the tides.

The moon snail, one of the larger gastropods, is common to mudflats. It uses its *radula,* or tongue, to drill holes in the shells of its prey and consume the contents. The moon snail preys primarily on soft-shelled clams.

The soft-shelled clam, also known as the soft clam or mud clam, is another typical mudflat inhabitant. Edible and egg-shaped, it was introduced from the Atlantic coast in the late 1800s. Its brittle, whitish shell can measure up to five inches across.

One of the most common mudflat worms is the bristle worm, which often inhabits curious-looking gray tubes. The tube sometimes measures two feet in length. The bristle worm feeds by extending its tentacles to reach small organisms found on the surface of the mud.

Dolosse on Humboldt Bay south jetty

Mouth of the Eel River floodplan

Ferndale Bridge

10 Eel River Floodplain

The vast Eel River floodplain can be seen from Highway 101 while traveling south from Humboldt Bay. The low elevation of the land and year-round freshwater flows create an estuary at the mouth of the river, where fresh and salt water mix.

Sediments deposited by the river have filled most of the estuary that at one time extended 14 miles inland. Much of the land comprising this flat, fertile plain was reclaimed through the use of levees. The area, now used primarily for agriculture and cattle raising, is subject to the effects of the river's intermittent flooding. A major flood has occurred here approximately every 10 years. Because of this, the landscape is in a constant state of change.

The wild and scenic Eel River is the largest of the rivers entering the Pacific from Northern California coastal ranges. Named for the graceful curves of its course, the Eel splits into many branches in summer because of its wide floodplain channel. During the rainy season, the water fills the entire channel. Steelhead and trout fishing are important activities during this time.

Critical erosion threatens the northernmost part of the river basin, which receives about 10 percent of California's runoff. The river carries an extremely high load of suspended sediment. A plume of silt and clay sediments extends from the Eel's mouth out into the ocean for more than 100 miles.

11 Cape Mendocino

A 70-mile, four-hour drive along rough, winding Mattole Road leads past Cape Mendocino, the westernmost point of California. An alternative to this scenic route, which has virtually no public services, is Highway 101, which runs through numerous groves of coastal redwoods. Both routes lead to the south fork of the Eel River near Humboldt Redwoods State Park.

Mattole Road winds along the sides of tree-filled canyons and grassy hills, and along the tops of high ridges. From the road, visitors will enjoy outstanding vistas of the Pacific Ocean, and occasionally, the Eel River floodplain.

After crossing the Bear River, the road winds down to the coast on the south side of Cape Mendocino. Directly offshore, 326-foot-high Sugar Loaf Rock

Channel Design

Two of the most important, and obvious, considerations in the design of ship channels is determination of necessary width and depth. A channel's depth is engineered based upon the characteristics of ships using the waterway. As ships move through the water, various factors influence the depth necessary to safe passage.

Draft refers to the ship's depth in the water when stationary. The numbers on the hulls of many ships indicate the actual draft with a given load. Since fresh water is less dense than sea water, a ship will have a deeper draft as it moves to a freshwater port. Ships are loaded, or trimmed, so that they remain level. If only partially loaded, the ship's *trim* is lower at the stern than at the bow. Because both the steerage and the power are in the stern, this trim improves maneuverability.

Differences in water pressure along the hull will cause the ship to sink, or squat. The degree of *squat* is also pertinent to channel depth engineering. If large waves are present, the ship will ride up and down, or pitch and roll, with the waves. Channel depth must be determined based on the lowest part, or the *trough*, of the waves.

A ship pushes aside water as it moves through a channel. If there is very little room between the bottom of the ship and the bottom of the channel, the ship experiences *drag*, or added resistance to moving. Adequate clearance space is added to the channel's design to reduce drag and increase the ship's maneuverability.

Brackish Marshes

The perimeters of Humboldt Bay are characterized by a variety of wetland types. Each is distinguished by its water chemistry, soil composition and vegetation. The five types of wetlands most prevalent here are intertidal flats, swamps, fresh marshes, salt marshes and brackish marshes.

The brackish marsh, typified by water of low to moderate salinity, is typically found at the higher elevations of salt marshes, where freshwater runoff dilutes tidal effects.

Sedge, a grasslike plant with solid stems, is the most common plant. Bullrushes, bentgrass and silverweed are also prevalent. Brackish marshes, like most other wetland habitats, provide ecologically rich environments that support a varied community of animals and birds. Included are raccoon, skunk and weasel, marsh hawks, owls, herons and egrets.

is connected to the Cape by a narrow neck of rock and cobble that is visible at low tide. This rock-to-land connection is a classic example of a tombolo.

Continue south on Mattole Road along the beautiful windswept beaches of the Pacific for about six miles. Watch for Steamboat Rock and several hundred-foot-high sand dunes, an uncommon phenomenon to this stretch of coastline. At Domingo Creek, the road turns inland and rises into the hills once again. From the point where Mattole Road leaves the coast, the longest roadless section of the Pacific Coast begins. This isolated stretch of shoreline continues for 40 miles south to Shelter Cove.

The town of Petrolia, the first oil discovery site in California, is located along the Mattole River about 11 miles inland.

Between Cape Mendocino and Punta Gorda, several coastal miles to the south, the coast is dominated by cliffs and flat-topped sea stacks that stand from 10 to 20 feet above sea level. Broad, sandy beaches are also prevalent to this inaccessible coastal region.

In the town of Honeydew, turn left and continue back to Highway 101. After a 14-mile winding drive through the Kings Mountain Range, continue downward out of the mountains and meander through tranquil Humboldt Redwoods State Park. At the south fork of the Eel River, rejoin Highway 101 south. This intersection is located approximately due east from Punta Gorda.

Migrating dune along Mattole Road

Water Cycle
The waters of the earth are continuously cycled through air, land and sea. This life-giving cycle is maintained as a result of the variable patterns of heating and cooling.

Steamboat Rock

Sugar Loaf Rock at tip of Cape Mendocino

The Year of the Coast

In keeping with President Carter's declaration of 1980 as "The Year of the Coast," the U.S. Army Corps of Engineers has joined other public agencies and private organizations in focusing attention on the need to manage, preserve and protect our nation's coastal areas. To assist in this worthwhile objective, the U.S. Army Corps of Engineers will, throughout 1980 and 1981, publish a series of brochures highlighting key natural and manmade features of the California Coast. It is hoped that this series will both inform the public of coastal features and processes and assist in the development of a greater appreciation of the critical need to insure the protection and management of coastal resources.

For additional details on these brochures and other public information and education programs available from the Corps of Engineers, please contact the following Public Affairs Offices:

South Pacific Division
630 Sansome Street
San Francisco, CA 94111
(415) 556-5630

San Francisco District
211 Main Street
San Francisco, CA 94105
(415) 974-0356

Los Angeles District
300 N. Los Angeles Street
Los Angeles, CA 90012
(213) 688-5320

Sacramento District
650 Capitol Mall
Sacramento, CA 95814
(916) 440-2183

California Coastline
Explore Series

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Klamath River

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Klamath River to
Punta Gorda

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Punta Gorda to
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Explore 4
Arena Cove to
Golden Gate

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Sacramento —
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Golden Gate to
Davenport

Explore 8
Davenport to
Cape San Martin

Explore 9
Cape San Martin to
Point Conception

Explore 10
Point Conception to
Point Mugu

Explore 11
Point Mugu to
Point Fermin

Explore 12
Point Fermin to
Newport Beach

Explore 13
Newport Beach to
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