

The Jewels of 101

OREGON'S COASTAL BRIDGES

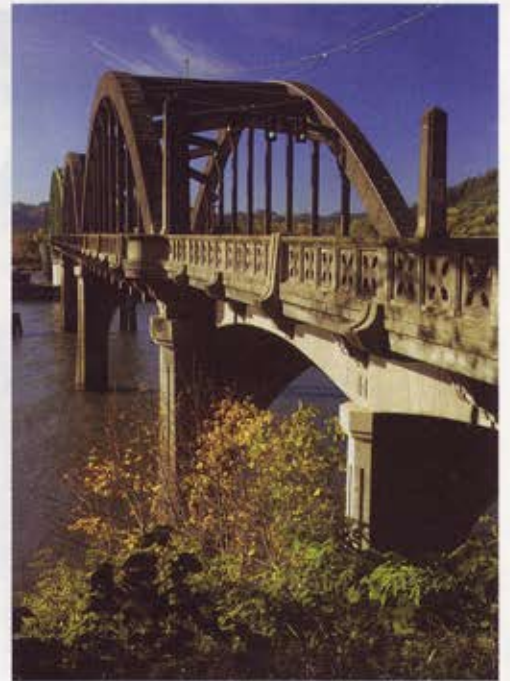
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In brilliant sunshine or mysterious fog, the coast's magnificent spans add elegance and artistry to the Oregon Coast Highway.

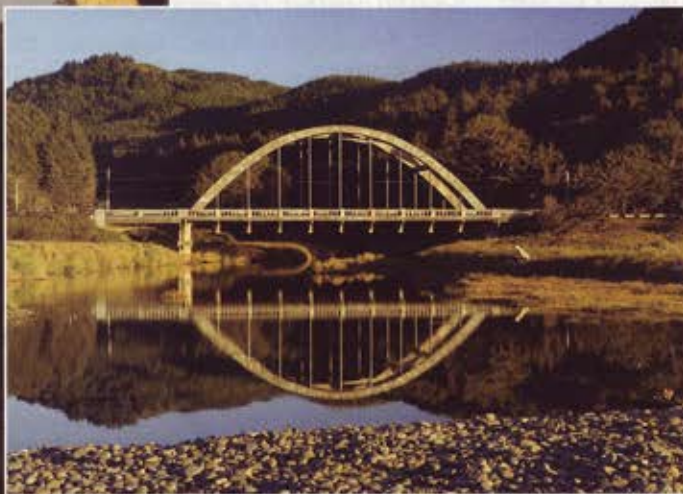
THERE ARE MANY ways to mark travel along the Oregon Coast: seaside communities, beaches, beacons, bowls of clam chowder. But one of the most beautiful is the countdown of Oregon's coastal bridges. Picturesque concrete and steel bridges are a state hallmark, and they stretch from the Astoria-Megler Bridge over the Columbia River to the California border. Tucked in between are the state's crown jewels, the soaring and repeating arch bridges built in the 1920s and '30s by master bridge builder Conde B. McCullough.

The Iowa State-educated McCullough was hired in 1919 to head the Oregon Department of Transportation's newly formed bridge division. McCullough brought to this job a pioneering spirit and a vision that married romance to engineering. The result? Oregon's stunning bridge lineup. McCullough's chosen direction for bridge design can be traced to a telling criticism he made about the field of engineering: "From the dawn of civilization up to the present, engineers have been



busily engaged in ruining this fair earth and taking all the romance out of it."

His buck with tradition can be witnessed up and down the Oregon Coast. McCullough's spans grace Oregon's coastal grandeur like tasteful jewelry. His bridges exceed function, becoming passages through art. McCullough successfully combined Romanesque arches, Egyptian obelisks, gothic piers, and Art Deco designs with the state-of-the-art and cutting-edge technologies of the day.



Yaquina Bay Bridge in Newport (left), Tenmile Creek Bridge at Stonefield Beach State Park (above), and Umpqua River Bridge in Reedsport (top right).



In 2005, 11 of McCullough's coastal bridges were listed on the National Register of Historic Places. In 1999, *Engineering News-Record* named McCullough one of the top bridge engineers of the century.

McCullough led the bridge division at an interesting time in Oregon's development, 1919 to 1935. World War I had just ended and the state was embarking on an ambitious road-building task, the

Roosevelt Military Highway, which would become Highway 101. This project required many major bridges in a short period of time and posed problems that required McCullough's innovative thinking and allowed his vision to burgeon. The bridge projects also brought Depression-era jobs to Oregon and, upon completion, swelled tourism to record levels.

The bridge construction is a marvel, when you think back to the day's tools,

machinery, and absence of safety measures. Construction was a feat of derring-do for the workmen. "I imagine them climbing around on timber falsework 150 feet or more in the air, hand-placing rebar and forms and overseeing the pouring of cement, as they erect a tiered-arch-supported roadway 600 feet across open space," said James B. Norman, ODOT project photographer for the National Historic Landmark and Historic Places nominations, about workers on the Cape Creek Bridge.

The bridges are postcard images, ready for a sunset. Storm, fog, and sunbeam only magnify the enchantment. But severe coastal weather and the resulting salt-induced corrosion of the rebar inside them has presented ODOT engineers with unique preservation challenges for restoration and maintenance. The deterioration and ultimate demise of the original Alsea Bay Bridge, built by McCullough in 1936, was a wake-up call. Currently, several bridges have been repaired and the rebar is now protected from corrosion with a process called cathodic protection, which involves spraying the bridge with a zinc coating, applying low-voltage current, and thereby

Here is a north-to-south countdown of the McCullough 11:

1 Wilson River Bridge—1931

At Tillamook, travelers pass through this reinforced concrete bowstring (tied arch) bridge, the nation's first. It has the look of a magnificent stringed instrument.

2 Depoe Bay Bridge—1927 and 1940

This Depoe Bay centerpiece spans the world's smallest bay. A stairway passes beneath the bridge, allowing passersby to appreciate the top-to-bottom attention to detail. The original bridge was constructed in 1927, and in 1940 an identical bridge was built alongside to accommodate increased traffic.

3 Rocky Creek Bridge—1927

Dwarfed by its landscape, this bridge, also known as the Ben Jones Bridge, straddles a small gorge at Otter Crest in Lincoln County. Located on Otter Crest Loop, the bridge is 1/10 mile from the north junction with Highway 101. It has recently been treated with zinc cathodic protection.

4 Yaquina Bay Bridge—1936

Newport's classic bridge stretches 3223 feet long, with a soaring steel through-arch, flanked by two steel deck arches and a jewelry chain of five concrete deck arches stretching south. Grand stairways lead to bridge observation areas.

5 Tenmile Creek Bridge—1931

South of Yachats, this tied arch bridge spans picturesque Tenmile Creek as it empties to the sea.

6 Big Creek Bridge—1931

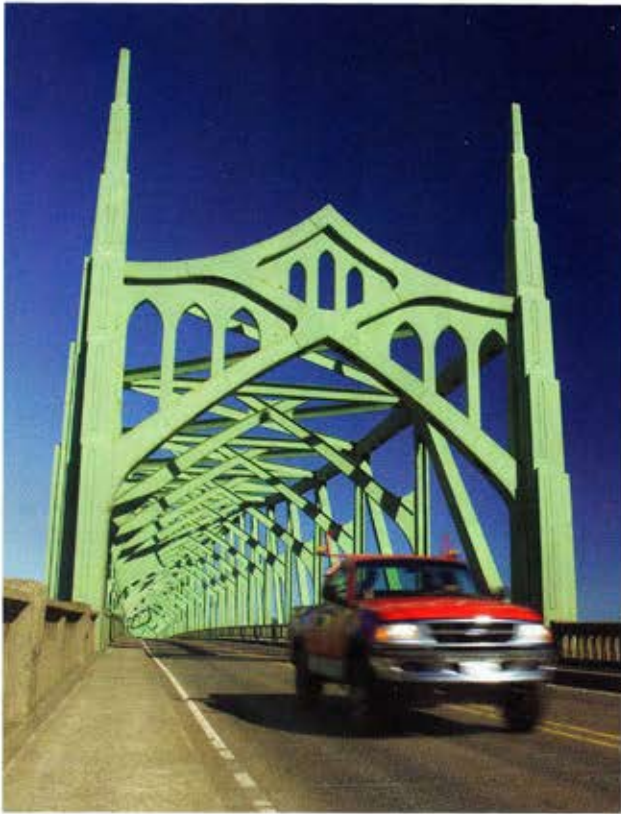
A kissing cousin to the Tenmile Creek Bridge, this Lane County bridge has a lovely precast concrete railing.

7 Cape Creek Bridge—1932

At Heceta Head Lighthouse State Scenic Viewpoint, the double-tiered viaduct of this 619-foot structure echoes back to the Roman aqueducts with its repeating arches and columns. It is best appreciated from creek level.

electrochemically regenerating an alkaline environment around the rebar.

Travelers can appreciate windshield views of the bridges on approach and while traversing the deck. Pedestrian stairways and sidewalks, bayfront viewing, and journeys down to the beach add perspective. "Wandering beneath such



colossal structures as the Coos Bay or Yaquina Bay Bridges is an exercise in mental awe," says Norman. Fluted columns and spires, detailed railings and brackets, and hammered inset panels all show McCullough's eye for the aesthetic.

McCullough built nearly 600 spans in Oregon. Other coastal examples are the

Old Youngs Bay and Lewis and Clark River Bridges (Astoria) and Cummins Creek Bridge (at Neptune Scenic Viewpoint). For more information, visit the Historic Alsea Bay Bridge Interpretive Center in Waldport or read *Elegant Arches, Soaring Spans* by Robert W. Hadlow. □

Coos Bay Bridge, North Bend (left), and Rocky Creek Bridge in Lincoln County (facing page).

8 Siuslaw River Bridge—1936

In Florence, twin concrete bowstring arch spans flank this double-leaf bascule drawspan. The four bridge operator houses are in the Art Deco style.

9 Umpqua River Bridge—1936

In Reedsport, this steel through-truss bridge is the only Oregon state highway swing span still in operation, and it is the largest swing span in Oregon.

10 McCullough Memorial Bridge (Coos Bay)—1936

When built, this mile-long span was the longest bridge in the Oregon highway system. It consists of a high rise

cantilever construction with curved upper and lower chords and a ballet of 13 arches leaping across the water.

11 Isaac Lee Patterson Bridge (Rogue River)—1932

At Gold Beach, travelers ride a rolling wave of seven open-spandrel concrete deck arches over the Rogue River. Governor Patterson promoted the bridge's construction. This was the first structure in the United States to use the Freyssinet method of arch ring decentering, and it is a National Historic Civil Engineering Landmark.



BRIDGE-SPEAK

Deck is the bridge surface on which traffic passes.

An **arch bridge** is one where the arch transfers the pressure load from the deck to the abutments. These arches can be either above or below deck. For a **deck arch bridge**, the deck sits above the arch. On a **through-arch** or **tied arch bridge**, the deck is hung below the arch. In a deck arch bridge, the space between the bottom of the arch and the deck can be solid (a **closed spandrel deck arch**) or open with supporting vertical ribs (an **open spandrel deck arch**).

A **cantilever bridge** has projecting beams that meet at the middle and are supported by **piers** (heavy columns). Counterbalanced beams act as anchors.

A **bascule bridge** is a drawbridge with a counterweight that continuously balances the span or leaf through the entire upward movement. In a double-leaf span, the two spans meet and open at the middle, allowing boat traffic to pass.

Truss bridges use a series of triangles in the structure to transfer the weight load from the deck to the piers. In a **through-truss bridge**, the deck is located under the skeletal truss structure. In an **under-truss** or **deck-truss bridge**, the deck sits above the skeletal truss structure.

A **pylon** is one of a pair of towers at a gateway. ■