

Marine rescue plan

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Scientists hope an artificial reef proposed near the San Onofre power plant will restore once-thriving kelp forests

By Angela Lau
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The thinning kelp beds damaged by the San Onofre Nuclear Generating Station may flourish again when one of the country's biggest artificial kelp reefs is completed off the San Clemente coast near the power plant.

The 150-acre reef will be about one-half mile off San Clemente Beach, bounded by San Clemente Pier to the north and San Mateo Point to the south.

Marine biologists hope the \$20 million man-made reef will spawn dense kelp forests, like those that once thrived near the power plant and were home to an abundance of sea life.

If it receives approval from the California Coastal Commission, the power plant's majority owner, Southern California Edison, could begin construction of the artificial reefs as early as next summer, said David Kay, the utility's environmental project manager.

“In Southern California, kelp forests are not all that abundant,” said Steve Schroeter, a University of California Santa Barbara marine biologist. “But they are valuable habitats, extremely diverse habitats. They have a high density of plants, algae, fish and invertebrates.”

The artificial kelp reef is part of a compensation package that Southern California Edison agreed to after a 1989 Coastal Commission report concluded that the power plant's operations degraded the ocean because they killed fish and thinned the kelp beds, which provide shelter for marine life.

The utility company always has disputed the findings but agreed to corrective measures.

“We maintain the impact was insignificant,” Kay said. “In 1990, the power plant set operating records, but the kelp forest was as large as had been recorded since the 1960s.”



Courtesy of Southern California Edison
A kelp canopy was included in a test reef built by Southern California Edison to determine how to create an artificial kelp reef.

Southern California Edison agreed to:

- Build a 150-acre artificial kelp reef near the power plant. The project began with an experimental reef in 1999 and will finish with the proposed main reef. The total cost of the project is estimated at \$22 million.

- Restore wetlands, which are fish nurseries, at the San Dieguito Lagoon at a cost of \$86 million. The lagoon is 33 miles south of the power plant. Work began in September.

- Build a white sea bass hatchery adjacent to the Encina Power Plant in Carlsbad with a goal of producing 300,000 fish to release into the ocean. White bass is popular among commercial and recreational anglers. The \$5 million hatchery was built seven years ago.



Courtesy of Southern California Edison
Biologists found that pisasters flourished at the test reef, as did crabs, starfish, tunicate, surf perch, blacksmith, kelp bass, sand bass, lobsters and sheephead.

San Onofre opened its first reactor in 1968, a second one in 1983 and a third in 1984. The first reactor was retired in 1992 and is being dismantled. The second and third reactors are in use.

The reactors cool down by sucking in ocean water. They then return it to the ocean in a continuous cycle.

The Coastal Commission report, using data collected between 1975 and 1988, found that the water that is sucked in is laced with fish, larvae and eggs, some of which are killed.

When discharged, the water rushes out in huge volumes. When all three reactors were operating, that volume measured one square mile by 14 feet deep each day, the report said.

The discharge stirs up sand from the ocean floor, creating a cloudy plume that drifts southward to the San Onofre kelp reef. The plume, which is thick and wide enough to be seen on satellite images, blocks sunlight vital to kelp growth.

As a result, the kelp beds outside of San Onofre were reduced by about 180 acres, or 60 percent, the Coastal Commission study said.

“Part of the San Onofre kelp bed is bald,” said Schroeter, one of three UC Santa Barbara marine biologists tapped by the Coastal Commission to study the effectiveness of the experimental kelp reef.

“Kelp doesn't live to be that old. If there is no (production of young kelp) for three to six years, there will be nothing there,” Schroeter said.

The power plant also sucked in 45 tons of fish each year, killing at least 21 tons while releasing the rest, the study said.



Courtesy of Southern California Edison
Blacksmiths made themselves at home at the \$2 million, 22.4-acre experimental reef where the main reef would be built. In 1999, Southern California Edison built the test reef, which was studied from 2000 to 2004.

Consequently, the population of fish and invertebrates that depend on kelp was significantly reduced. For instance, sheephead, barred sand bass and black surf perch were reduced by 200,000, or 70 percent.

Invertebrates such as snails and sea urchins were reduced 30 percent to 90 percent.

In 1991, the Coastal Commission required Southern California Edison to rectify the damage. The next eight years or so were filled with disputes over the extent of damage, proposals of remedies and environmental reviews.

In 1999, Southern California Edison built a \$2 million, 22.4-acre experimental reef where the main reef would be built. The test reef, made of 56 blocks of concrete or quarry placed apart, will count toward the 150 acres.

The experimental reef was studied from 2000 to 2004 by Schroeter and two other UC Santa Barbara marine biologists, who were under contract with the Coastal Commission but whose work was funded by Southern California Edison.

The biologists found that kelp flourished there, as did crabs, starfish, tunicate, surf perch, blacksmith, kelp bass, sand bass, lobsters, pisasters and sheephead.

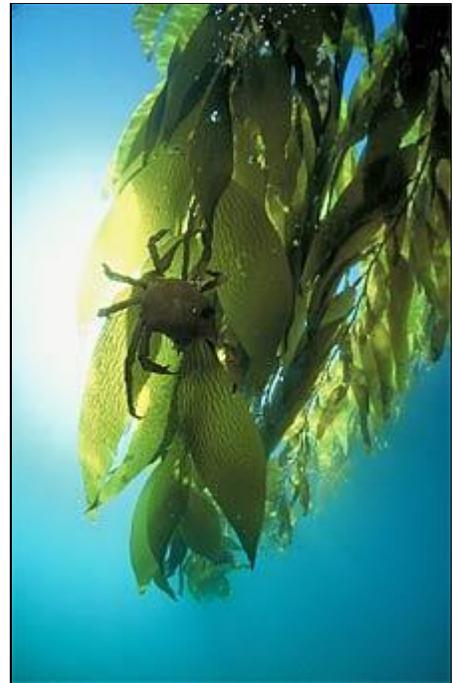
In 2005, Southern California Edison proposed the last phase of the artificial reef.

It would be made of blocks of quarry rock from nearby Santa Catalina Island and would vary in shape and size. The rocks would be inserted into the gaps between the test reefs to form a massive reef.

Unlike the test reefs, which grew from spores that naturally drifted over from other kelp beds and from young lab-grown plants, the main reef will only use drifters because researchers found that they grew better, Kay said.

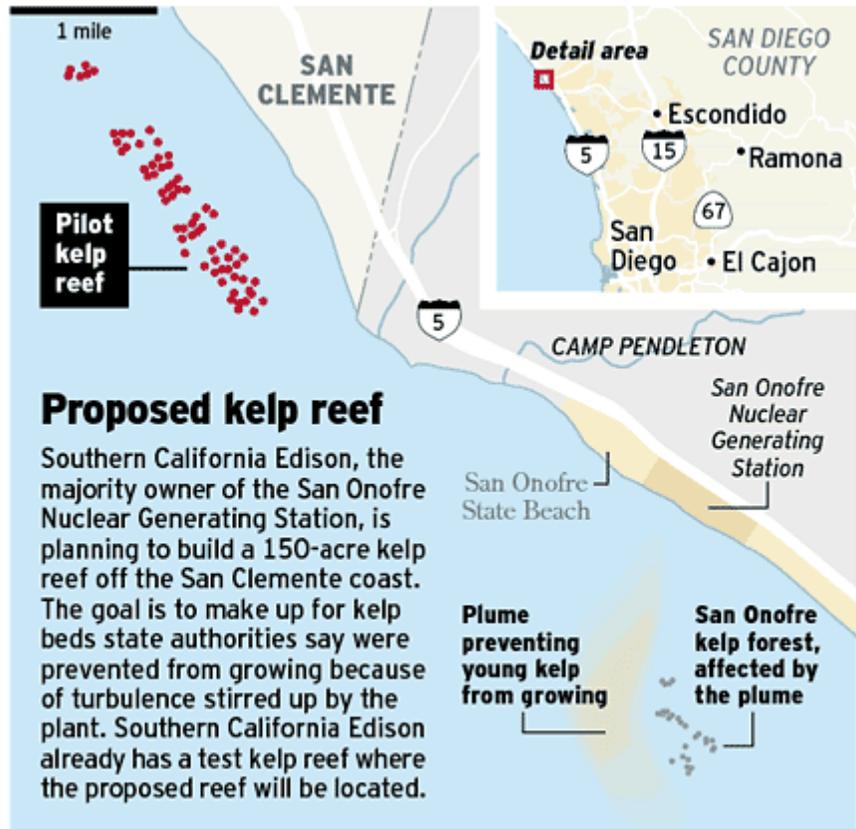
He expects a kelp canopy to appear in about two years and marine life to begin migrating from the surrounding test reefs within a year after that.

To compensate for the additional 30 acres of kelp beds damaged by the power plant and for the fish killed, Southern California Edison began restoring San Dieguito Lagoon in September and hopes to complete the work in three years. The \$86 million project includes keeping the lagoon's inlet open, building earthen berms to control flooding along the San Dieguito River, constructing five nesting sites for the endangered California least tern and the Western snowy plover, and planting new salt marsh.



Courtesy of Southern California Edison
A kelp crab rested on fronds at the test reef, which was made of 56 blocks of concrete or quarry. The test reef will count toward the 150 acres.

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SOURCES: Google Earth; USGS

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