VIEWER'S GUIDE

HIGH STAKES AT THE SALTON SEA

A Public Television Program

With Host
Val Kilmer

High Stakes at the Salton Sea

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Program Highlights

Host Val Kilmer

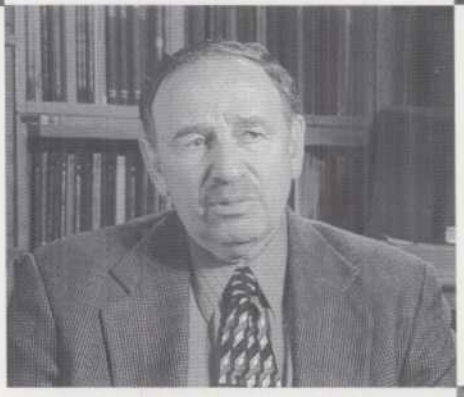
The issues surrounding the Salton Sea confront and confound us.

How can we have a healthy fishery and support a large population of migratory birds with a body of water that becomes saltier each year from agricultural runoff and natural evaporation. Without that salt-heavy agricultural drainage water the Sea would not exist. Now southern California water agencies see a chance to reduce reliance on the over-allocated Colorado River system by transferring water from desert irrigators. But if farmers conserve water to free up supplies for growing cities then the Salton Sea would begin to shrink with ecological disaster not far behind.

Should the Sea be saved or allowed to die and at what cost, not just in terms of dollars but in terms of consequences for habitat and for people. There is one thing that is certain about the Salton Sea – there are no easy solutions and the clock is ticking towards irrevocable damage if no action is taken.

"The positive and the negative are in precarious balance at the Salton Sea and without intervention will topple like a stack of dominos. And it isn't just the Sea we stand to lose – it's fish, birds, farm production, an opportunity to transfer water to growing cities and a foundation of economic stability for the entire state."

– Val Kilmer, host.



"The Salton Sea has . . . more birds in terms of species than has been documented anywhere . . . with the exception of the Gulf Coast of Texas, which is a major wintering migration pattern. So, from my perspective, the Salton Sea is . . . the crown jewel of avian biodiversity of anywhere in the world."

– Milton Friend, Salton Sea Science Committee

"I don't see us changing the climate here any time soon. But if we change the inflow and reduce it by 100,000 acre-feet or 200,000 acre-feet or, as our friends in San Diego and Los Angeles perhaps would like, many hundreds of thousands of acre feet to provide drinking water eventually to the homes in Orange and Los Angeles and San Diego counties, that changes the equation."

– Tom Kirk, Salton Sea Authority.

"There's too much salt and the Salton Sea is continuing to get saltier. The time will come when the fish are no longer able to survive, so the birds that feed off the fish will no longer be able to survive. And the Pacific Flyway may be damaged."

– Steve Horvitz, California State Department of Parks & Recreation.

Background The Salton Sea

Once California's largest fresh water lake, the 375-square mile Salton Sea is 25 percent saltier than the Pacific Ocean. Without a natural outlet, water trapped more than 200 feet below sea level continually evaporates, increasing the salt content in the remaining waters an estimated 1 percent per year.

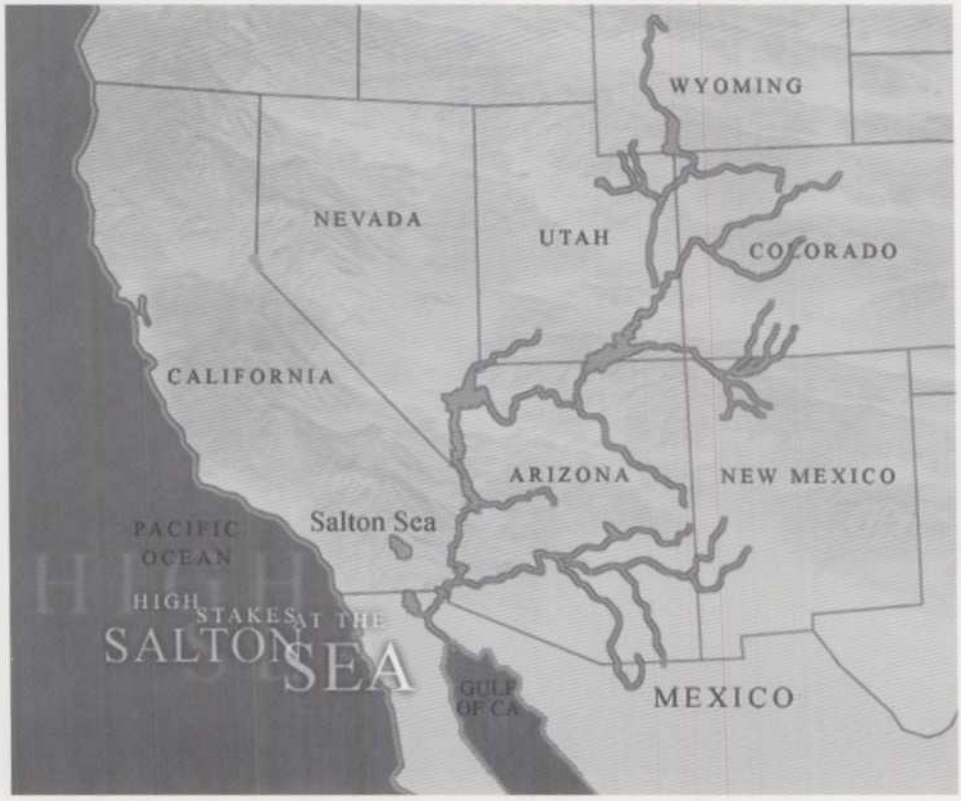
During the Gold Rush of 1849, historians estimate that 70,000 prospectors traveled through the California desert on their way to the gold fields. These early travelers recognized the possibility of irrigating the desert region with by diverting part of the Colorado River, a vision that came to fruition in 1901 when water began flowing to the newly christened Imperial Valley via the Alamo River. The advent of irrigation set off a land boom and within less than a year 2,000 settlers arrived to farm 100,000 acres. But silt carried by the river blocked the intake of the Imperial Valley Canal during 1903-1904. Bypasses were cut but they silted up, too. An intake was cut four miles below the California-Mexico border. Disaster struck when high river flows caused the Colorado to jump its banks, flow down the Alamo River and inundate the Imperial Valley.

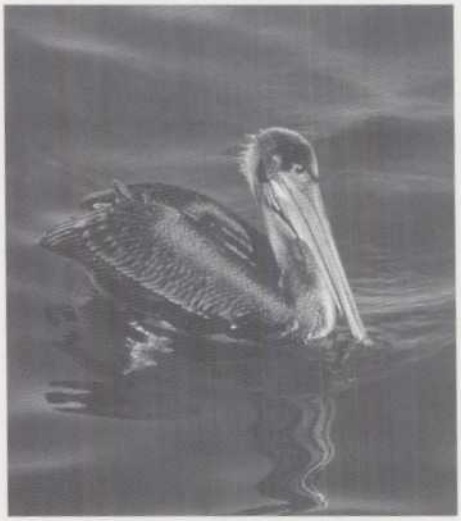
Despite the attempts to fill the breach, the river poured into the Salton Sink for 16 months. In 1907 the Southern Pacific Railroad, a major landowner in the region, finally closed the breach after a 52-day, non-stop effort during which 6,000 carloads of rock and gravel were dumped from a railroad trestle. The flood left behind a vast body of water in the Salton Sink, about twice the size of today's sea.

The flood did not eradicate the dream of an agricultural empire in the inland desert. The Imperial Irrigation District was formed in 1911 and by 1916 had acquired the rights to the irrigation system. By 1918, 360,000 acres of land were in production. By 1928, more than 424,000 acres were being farmed. Drain water from these fields flowed to the Salton Sea, which was declared a depository for agricultural drainage. Today, the Salton Sea produces immense revenue from agriculture. Cattle are the most valuable commodity, followed by alfalfa and vegetables.

The artificial inflow of farm drainage helped sustain the Sea, although the rising salinity eventually killed off species of freshwater fish. Introduced species of saltwater fish, such as orangemouth, sargo and Gulf croaker thrived at the Sea. By the 1960s, the area was one of the most productive fishing spots in the state. By the late 1970s, one of the most frequently caught fish was a freshwater species of tilapia native to Africa.

As the Sea attracted crowds for boating, swimming and fishing, a number of resorts sprang up, as did plans for housing subdivisions. For a time in its history, the Salton Sea looked like it might become a booming recreational Mecca with fabulous





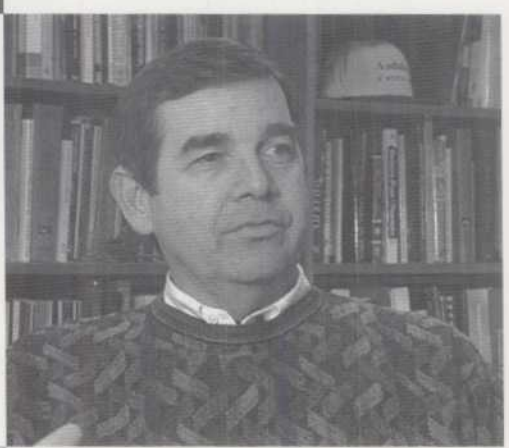
The Salton Sea is the only North American inland breeding site for brown pelicans.

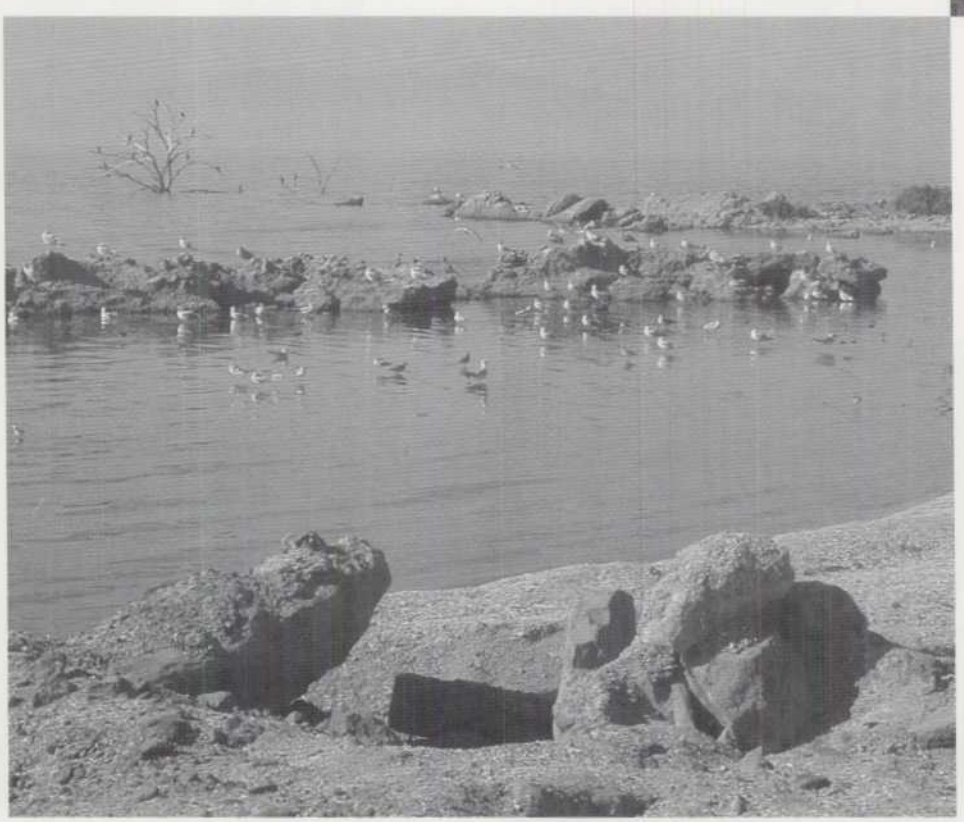
fishing, lush golf courses and waterfront living. In 1958, a developer named Penn Phillips bought some 10,000 acres on the west shore of the Sea. He had an ambitious vision for the Salton Sea as a kind of recreational haven for those of modest means. A marina and golf course were built. Headlines touted the Salton "Riviera" as a prime investment and buyers flocked in.

More than 20,000 people bought land but only a fraction ever built homes. As quickly as it took off, the Salton Sea boom plummeted. Rising waters wiped out shoreline development while reports emerged of increasing salinity and pollution. The plan for a seaside development disappeared, marked only by the remnants of forgotten infrastructure that still dot the landscape. The area is far from deserted, however, and those who remained revel in the Salton Sea as a kind of paradise – a sanctuary of peace and beauty.

"I think people want to see the Salton Sea saved. It is just finding the perfect answer. And I believe people are hopeful that we can find both the scientific answer and the political answer for the sea."

– Mary Bono, Congresswoman, R-Palm Springs





"The Salton Sea is providing enormous value for wildlife because it is a wetland of International importance. We've lost most of our wetlands in California."

– Dan Taylor, Audubon Society

Timeline Major Events

700 Lake Cahuilla forms in the Salton Sink when the Colorado River flows north through two bypass channels. Lake fills up and dries four times during wet and dry climatic cycles.

1500 A large inflow from the Gulf of California fills the lake to a size 26 times larger than the present Salton Sea.

1700-1750 Last large infill of the lake.

1774 Don Juan Bautista de Anza leads first large European expedition through modern Imperial Valley. Salton Sink is dry.

1849 Prospectors cross Imperial Valley on their way to gold fields.

1852 River flood to Salton Sink recorded. Three more such floods recorded during next 40 years.

Despite numerous efforts to fill the breach, the Colorado River poured into the Salton Sink from 1905-1907.

1853 Farming potential of Imperial Valley recognized if properly irrigated.

1876 Torres Martinez Desert Cahuilla Indian reservation established.

1901 Imperial Canal delivers Colorado River water to Imperial Valley.

1904-05 Silt blocks canal. Temporary diversion of river is breached by flood. River changes course and flows into Salton Sink.

1906 Floodwater fill Salton Sea, washing out settlement and threatening agriculture.

1907 River breach closed by Southern Pacific Railroad. Sport fishing first promoted.

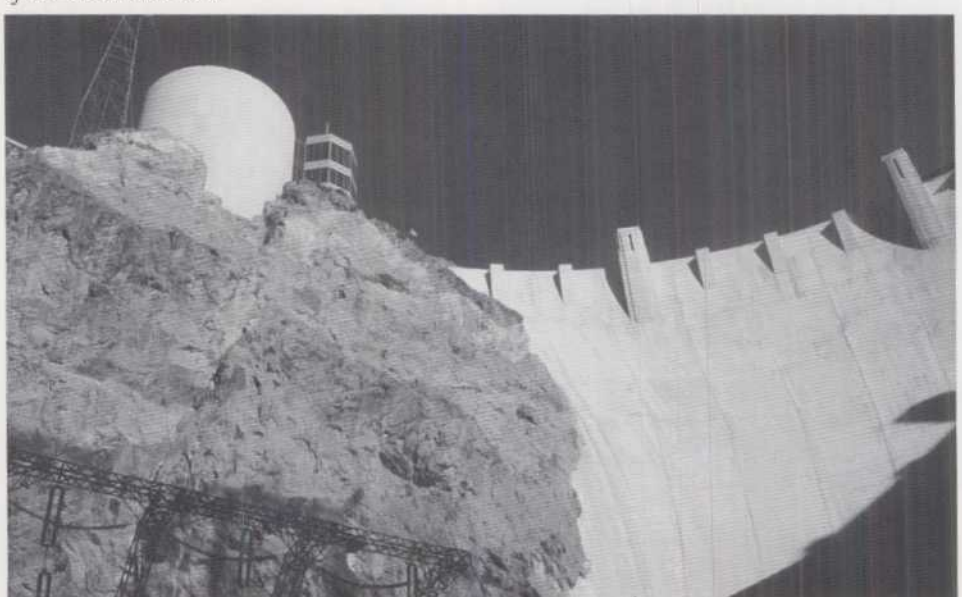
1908 Breeding colonies of cormorants, white pelicans and other birds discovered.

1924 Salton Sea set aside as permanent drainage reservoir.

1930 Salton Sea Wildlife Refuge established.

1950 First saltwater fish species introduced.

The completion of Hoover Dam in the 1920s tamed the once-wild and unpredictable flows of the Colorado River.



1955 Salton Sea State Park dedicated. It is the second largest park at the time.

1958 Salton City subdivision mapped out.

1961 California Department of Fish and Game says the Salton Sea will die by 1980-1990 because of excessive salinity.

1979 Salton Sea elevation measured at 228 feet below sea level.

1988 Local agencies form Salton Sea Task Force.

1992 150,000 eared grebes die, focusing national media attention. Congress authorizes $10 million research project to reduce and control salinity, provide endangered species habitat and protect recreational facilities.

1993 Riverside and Imperial counties, the state of California, the Imperial Irrigation District and Coachella Valley Water District form the Salton Sea Authority under joint powers agreement.

1995 Salinity of Salton Sea nears 45,000 parts per trillion.

1996 Large-scale die-off of white and brown pelicans due to avian botulism. An estimated 15 to 20 percent of the western population of white pelicans and more than 1,000 brown pelicans perish.

Salt is not a significant factor in the fish kills occurring at the sea today.

Originally inhabited by fresh water fish from the Colorado River, salt water fish were intentionally planted in the Salton Sea in the 1930s and 1940s.

Flooding again became a problem at the Salton Sea in the 1970s.

1997 Rep. Sonny Bono forms Congressional Salton Sea Task Force.

1998 Salton Sea Restoration Act orders Bureau of Reclamation to prepare a feasibility study on Salton Sea restoration.

1999 More than 7 million tilapia and croakers die from oxygen depletion due to algae blooms.

2000 Salton Sea Authority and the Bureau of Reclamation release plans for Salton Sea restoration. Testing begins on enhanced evaporation and solar ponds to reduce salinity.

2001 Legislation authored by Rep. Mary Bono provides $4.5 million for ongoing restoration.

2002 Bureau and Salton Sea Authority discuss fallowing farmland to reduce costs of stabilizing salinity in the Sea.

2002 California required to meet conservation guidelines as part of plan to eventually reduce Colorado River water use to 4.4 million acre-feet.

The Issues

Through the Salton Sea Restoration Project, agencies are exploring ways to stabilize the Sea's salinity. In 2000, a draft environmental review identified a handful of potential options, such as diking off portions of the Sea and allowing those areas to grow saltier and accelerating the natural evaporation/salt concentration process by pumping water and spraying it in the air. Not all of the stakeholders agree that resources should be directed to restore the Sea; some say that easier and less expensive restoration opportunities exist on other portions of the Colorado River.

But the people who place a high value on saving the Salton Sea disagree with those who argue it's an unworthy, unnatural system. In November 2001, President Bush signed into law a measure by Rep. Mary Bono, R-Palm Springs, which appropriates $4.5 million for ongoing restoration efforts. Even if nothing is done to offset the Sea's increasing salinity, scientists estimate the 50,000-ppm to 60,000-ppm threshold will be reached in 12 to 20 years. The Sea receives about 1.3 million acre-feet of inflow. Farm drainage provides most of the water, about 1 million acre-feet. If proposed water transfers reallocate deliveries from farms to urban needs, the inflow to the Sea could drop to 700,000 acre-feet. Because the Sea's evaporation rate is now equal to its present inflow, the reduction would accelerate the Sea's rising salinity. With the transfers, scientists believe the 50,000-ppm to 60,000-ppm level would be reached much sooner. The Sea would also shrink, leaving many lakefront homes several hundred yards from shore.

Officials are studying various ways to offset the effects of the proposed water transfer on the Sea, including the fallowing of farmland. The transfer will most likely go through in one shape or another because it is an integral part of California's plan to reduce its use of the Colorado River to 4.4 million acre-feet annually. Advocates for the Salton Sea say the pressure to conclude the deal by the end of 2002 means the adverse impacts on the ecosystem will be overlooked.

Fallowing farmland, which is not universally supported, would reduce the costs of stabilizing salinity levels in the Salton Sea. From a cost perspective, fallowing is an attractive option for Sea restoration; given the estimated $1.6 billion it would cost to preserve the environment without fallowing. With fallowing, the cost estimate drops to an "affordable" $250 million.

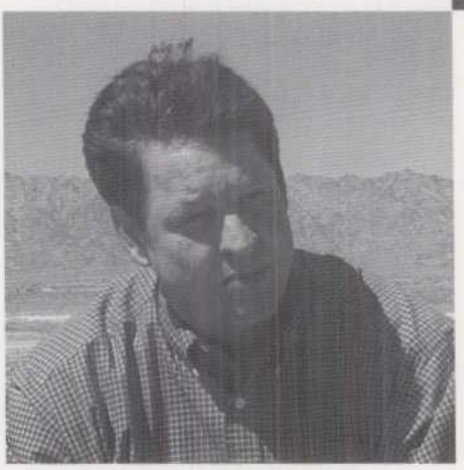
Every solution, every action or inaction has a consequence, not just for the Salton Sea but for the people who depend on the Colorado River, for Americans who enjoy a diverse and abundant food supply and for fish and birds who can't speak for themselves. The Salton Sea is like a test that is too important to fail but too difficult to pass. Can a healthy ecosystem co-exist with a thriving farm economy and the demand for water by growing cities in Southern California?

There are no easy solutions but there is one thing everyone agrees on: The stakes are high at the Salton Sea and time is running out.

"There's speculation that something's going to happen, that Sonny Bono started something and they're going to see it through. We've never known anybody to take on the sea to this degree, to repair it and start a salt-removing project."

– Norm Niver, resident

An estimated 15 to 20 percent of the western population of white pelicans and more than 1,000 brown pelicans perished in 1996.

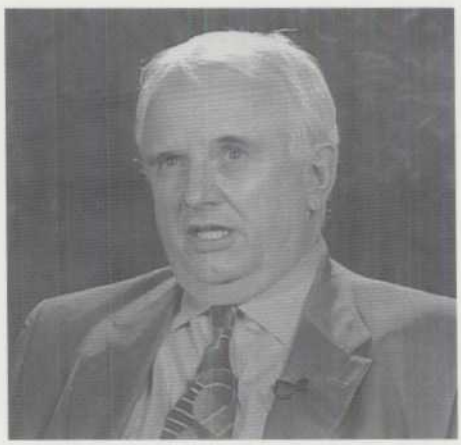


"We have a tremendous amount of water. We divert and use over 3 million acre-feet of water, which is a lot of water. Imperial Irrigation District is the largest user of water on the Colorado River, more than any other state."

– Andy Horne, Imperial Irrigation District Board of Directors.

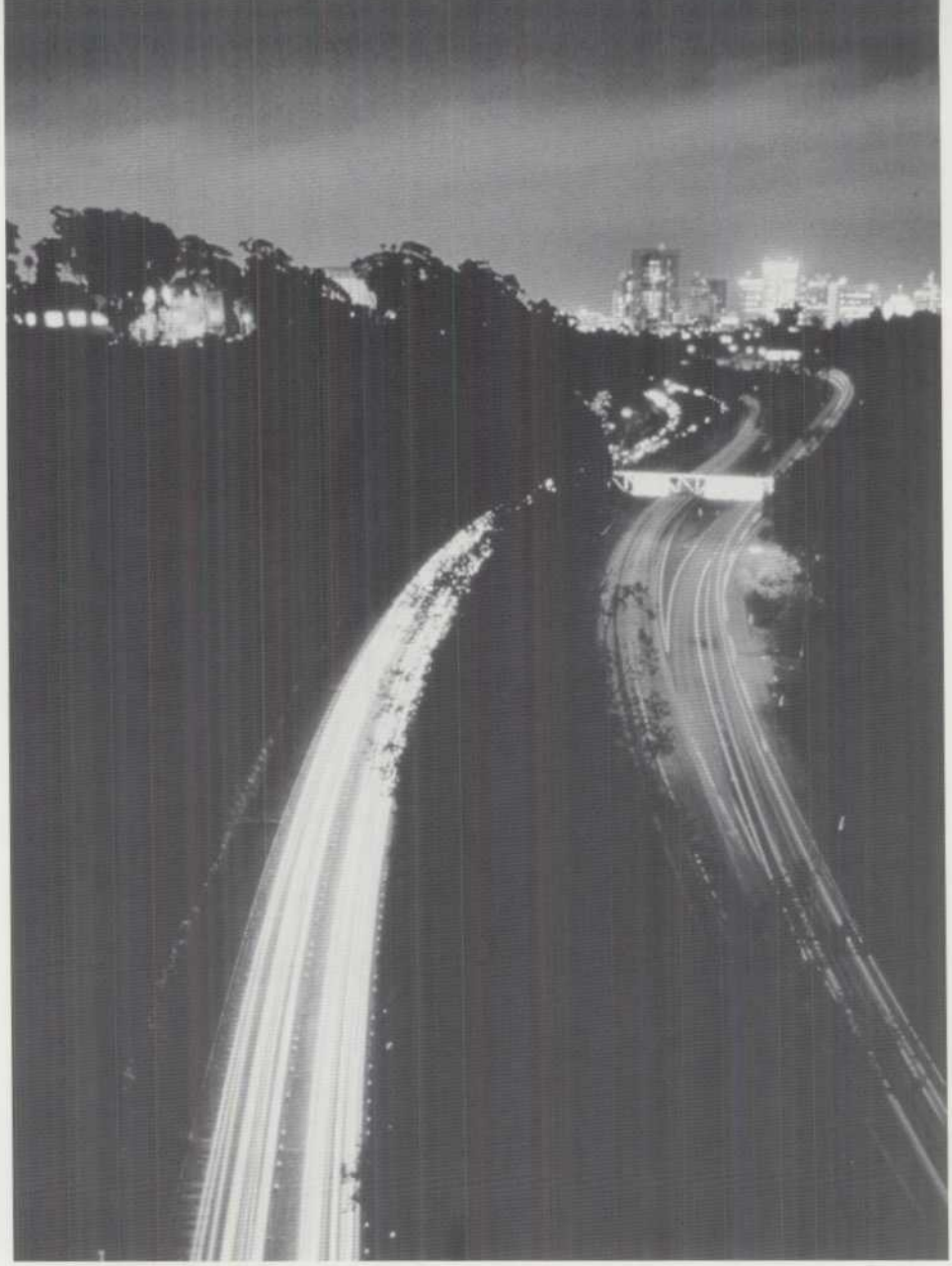
"San Diego and Imperial Irrigation District have come to terms on a historic water transfer. It is the largest and longest voluntary transfer between an agricultural community and the urban community. And it's for up to 200,000 acre-feet of water for up to 75 years."

– Maureen Stapleton, San Diego County Water Authority.



"If the transfers don't go forward, it has a statewide impact, because it then means that we have to acquire water from other places. And that can translate back to the Bay-Delta area."

– Dennis Underwood, Metropolitan Water District of Southern California



The historic farm water conservation-water transfer agreement between Imperial Irrigation District and San Diego is a linchpin of California's plan to reduce its draw on the Colorado River.

In The Classroom

The Hydrologic Cycle and Desalination

Grade Level: 5-8

Objectives:

Students will be able to:

1. List the three states of matter of water.
2. Define condensation and evaporation.
3. Indicate with arrows the flow of water molecules in the hydrologic cycle.
4. Make a prediction about water evaporation and condensation for the experiment.
5. Explain the process of desalination.

Procedure:

Teacher places a small ice cube in a dish in a sunny location or under a lamp.

Ask: What do you think will happen to the ice cube? (students will most likely predict that the ice cube will melt, and may need prompting as to what will happen after that. The water in the dish will eventually evaporate).

Explain: Water can exist in three forms: solid, an ice cube; liquid, water; and gas, water vapor. Water is made of molecules which contain two hydrogen atoms and one oxygen atom. Molecules are in constant motion. If water molecules are heated up, they move faster and move farther apart from one another. Think about that information when we perform an experiment.

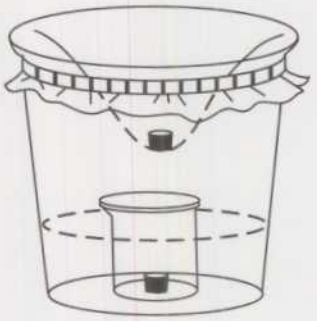
The objectives of this experiment are:

1. To demonstrate that water will evaporate and then condense on another surface.
2. To show that salt water can be purified and the salt removed by evaporating and then condensing the water.

Materials needed for each group:

bucket or coffee can, jar or beaker, plastic "Saran"-type wrap, salty water, weight, tape.

Set up the solar water purifier as shown in the illustration. Place the beaker or jar in the bucket. Add the salty water to the bucket, taking care not to get any in the beaker. The water level should be at least an inch below the top of the beaker. You may have to weigh down the jar. Completely cover the top of the bucket with the plastic wrap, allowing it to sag enough so that when the weight is placed on it, a cone shape is formed which points down to the open beaker or jar. Make sure that the plastic does not touch the mouth of the beaker or jar. Tape the plastic firmly to the bucket and place the weight in the center. Place your apparatus in the heat of the sun or a strong lamp and leave it there for a day.



Ask: What do you think will happen here? Write down your prediction, or guess, about what you think will happen.

Collect the students' predictions. Categorize them to read to the class later (e.g., 12 of you thought the water would disappear, 7 of you thought water would be in the beaker, etc.). Either later in the day, or the next day, show the water in the beaker to the students.

Ask: How many of you think the water is salty? Not salty?

Have a student taste the water by dipping a finger into the beaker. Ask students what they think happened.

If students are having a hard time with the concept of condensation, bring in a pan of hot, steaming water and hold a cold glass or spoon above it. Allow students to examine the glass or spoon as the water condenses. Ask where the water came from.

Possible discussion:

When rain falls, what happens to the water? (It soaks or percolates into the ground, runs along the ground, collects in streams which join to become rivers, and eventually runs into the ocean.)

If rainwater sits in a puddle in the street, what will eventually happen to it? (It will evaporate, or disappear.)

Where does it go? (Into the sky, or the air.)

Water also evaporates from streams, rivers, lakes and the ocean. What gives the molecules the energy to move up into the sky? (Heat from the sun.)

If the water is evaporating from the ocean, will the salt evaporate also? (No)

What happens when the air has as much water as it can hold? (It rains.)

Explain: The amount of water that can be held as vapor in the air depends on the amount of energy or heat. When the temperature is reduced, the water molecules move closer together, forming droplets around tiny particles of dust in the air. This process is called condensation. These droplets fall to the earth as precipitation, or rain and snow. So the cycle begins all over again. There is the same amount of water in the world as there has always been. The water you drank this morning might have been the same water a dinosaur drank millions of years ago. It just keeps moving around and around in a cycle. This is called the hydrologic cycle. "Hydro" means water.

Assessment: Have students think about their experiment and then write a paragraph or make a drawing to explain how salty water might be purified, or desalinated, for drinking water or water that could be used on crops. Ask them to identify the energy source for the desalination.

Extension: Germinate bean seeds in paper cups filled with soil. Water some of the seeds with salty water, some with fresh water and some with a mixture of fresh and salty water. Discuss the results. Repeat the experiment with different kinds of seeds. Are some plants more tolerant of salt than others?

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The Foundation is governed by a 25-member board of directors representing a broad cross section of the state's water, education, environmental and public interest communities.

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