CONSERVATION

Making Water Plentiful

Water can be conserved by cutting down waste, using present supplies more efficiently, and finding new sources of supply.

By EDWARD HEDRICK

➤ WHILE THE NATION'S water supplies appear to be getting scarcer each year, ideas for saving what we now have and what we can expect in the future are becoming more plentiful. They range from mixing giant reservoir cocktails of cetyl alcohol and water to melting down icebergs.

Actually, water as such is not scarce on a national basis, but rather, water is not where we would like it in the quantities we would like it. It is true that certain areas, like the Southwest, suffer periodic and prolonged droughts, but others areas of the nation have floods and, in some cases, water waste is a bigger problem than water shortage.

The problem, experts agree, is not one of trying to fabricate water or create a synthetic substitute in the laboratory, but to conserve and better utilize the water we have and the rainfall we get.

To this end, scientists both here and abroad are currently working on several promising answers.

Chemical Lock for Water

Perhaps the most promising is the use of a chemical called cetyl alcohol which locks in water in reservoirs to save it from loss by evaporation. Although only limited experiments with the chemical are undergoing tests in this country, several large-scale and successful experiments have been tried by the Australians.

Preliminary results using cetyl alcohol, also called hexadecanol, show that it might be the quickest and cheapest way for scientists to save millions upon millions of gallons of water annually.

The chemical consists of chunks of a wax-like substance that can be spread on lakes and reservoirs. The long, chain-like molecules of the alcohol tend to detach from the chunks and spread out similar to an oil film over the surface of the water. The molecules then "link arms" and when a water molecule is escaping from the water surface, the chain of alcohol molecules absorbs its blow and keeps it locked in.

Unlike most other alcohols, cetyl alcohol does not affect the water's taste.

This particular method is used to cut down loss of water supplies from evaporation. It is estimated that more than 70% of the water that falls on the United States each year is lost through evaporation. It returns to the atmosphere from irrigation ditches, trees, grass, useless water-plants that suck up water, and shallow water surfaces, as well as from open bodies of water, such as lakes, ponds, reservoirs and pools.

In addition to using chemicals to lock in water, several scientists have experimented with roofs and floating covers. This idea has been turned around for the farmer's fight against water loss. Plastic floors are currently being tested as watertight liners for the bottoms of irrigation and stock watering ponds.

In the fight to save water, other weapons are being tested to turn the tides of the battle, such as making reservoirs deeper to make them more efficient water storage areas; concentrating many scattered water supplies into one big reservoir, thus cutting down water evaporation by cutting down water surface area; storing or "recharging" water in natural underground reservoirs, the "water table" itself; setting up windbreaks around lakes and reservoirs to cut down evaporation by the wind, and eliminating water-hungry plants that suck up water and return it to the atmosphere.

Water Consumption Grows

Why is water so scarce in certain areas?

The reason is that today men have become "water gluttons," using as much as one gallon of water out of every six or seven available, or 200,000,000,000 gallons daily from an average daily supply of 1,300,000,000,000 gallons. All this daily supply of water is only the 30% of the 5,000,000,000 acre-feet of annual rainfall escaping evaporation into the clouds.

In 1975, the U. S. is expected to be consuming an estimated 400,000,000,000 gallons of water daily, double its present use.

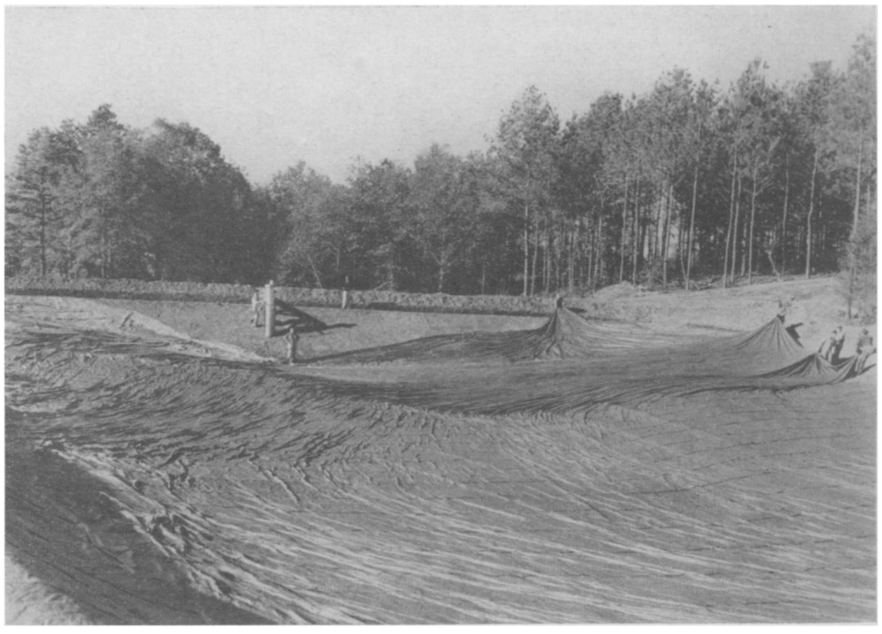
Scientists, in addition to trying to save water by conservation measures, are also seeking ways to make fresh water outright, by chemical or distillation methods.

The chief way of doing this has been to utilize the vast water supplies in the salty oceans. Experiments in saline water conversion, turning salt water into fresh, have brought to light four feasible processes: ion exchange, distillation, electrochemical processes, and freezing salt water to separate fresh water ice.

Salt water can be turned into fresh water directly. When water containing dissolved salts is passed through certain kinds of chemicals called "ion exchange resins," electrically charged parts of the salts, called ions, tend to replace other ions in the resins. These "other ions" combine to make fresh water.

The heat from the sun is being used to make fresh water evaporate from salt water, leaving bitter brine. The process is carried out in greenhouse-like structures, where heat energy from the sun is trapped in glass-enclosed troughs containing salty water. Fresh water is collected as droplets on the slanted glass panels, leaving brine to flow away as waste. Using high efficiency stills, regular fuels are also in use to distill fresh water from salty sea water.

Electric currents can actually take mineral



WATER-SAVING FLOOR—A pond gets a plastic floor. The Bakelite film, like that used for shower curtains and wading pools, is designed to cut down water seepage. Before it received its water-saving flooring, the water level in this pond fell approximately three inches a day due to seepage.

salts out of salt water, thus making it fresh.

A container of the mineral-saturated water is separated into compartments by films or walls of a substance through which water can pass fairly easily, but which ions have difficulty squeezing through. An electric current is then set up between two electrodes at each end of the container to attract the charged mineral ions. The ions head toward the electrodes, leaving fresh water free to be drawn off.

Present estimates indicate that salt water can be turned into fresh water for about 50 cents to $1.00 per 1,000 gallons, it is reported by the U. S. Department of the Interior, under which most of the saline water conversion projects in the U. S. are being carried out through contracts.

Iceberg Storehouses

To find new sources of fresh water, one scientist, J. D. Isaacs of Scripps Institution of Oceanography, La Jolla, Calif., has suggested using icebergs as floating water storehouses. The icebergs would be floated into a container in a harbor and melted. The lighter fresh water from the iceberg would float on top of the heavier sea water, transforming the system into a "floating reservoir.'

Even the clouds are under scrutiny as possible sources of water. Scientists have found that, in some cases, "seeding" clouds with silver iodide crystals or dry ice dropped from aircraft provide nuclei around which tiny water droplets in the clouds, cooled far below their normal freezing points, can condense and freeze, fall into warmer air and become rain. Workers in Australia have reported that clouds "can be artificially stimulated to produce rain," and predicted that their methods would be "most promising."

A statistical evaluation in certain U. S. experiments showed a significant increase in precipitation in mountainous Pacific Coast areas from cloud-seeding.

A very direct way to get the moisture out of clouds is literally squeezing them. S. Twomey of the Commonwealth Scientific and Industrial Research Organization of Australia does this by setting up large screens on mountainsides. Mists or clouds passing through these screens must squeeze through their tiny meshes, leaving some of their moisture behind, which is then collected in buckets.

Finally, those interested in trying to conserve water supplies suggest replacing the ground water that has been mined or drawn from the porous water-bearing underground rock strata that support the water "table." In certain areas we have "over drawn" these underground supplies, depleting the water they contained, by sinking too many wells. These often drew as much as 40 times the water replenished by annual natural rainfall seepage.

Experiments near El Paso and Amarillo, Texas, carried out by the U.S. Geological Survey, show that diverting water from other sources and storing it underground is entirely practical.

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MEDICINE

Arthritis Drug Available

➤ A NEW ANTI-ARTHRITIC drug claimed to produce excellent results in 71% of cases has been released to the medical profession.

Chemically known as chloroquine and trade-named Aralen, the drug has been under trial since 1951 and appears to attack the disease itself rather than just its symptoms, the Winthrop Laboratories, New York, producers of the drug, have reported.

Chloroquine was first synthesized in 1944 as an anti-malaria drug that proved to be more effective than the drug Atabrine, widely used by the military during World War II. It was later noticed in trials of the drug on prison volunteers that those who had arthritis were getting relief.

Since then clinical studies on its anti-arthritic properties have been made by 14 research investigators. The outstanding results were recently announced to the Ninth International Congress on Rheumatic Diseases that met in Toronto in June.

The drug seems to be able to reverse the disease rather than just relieve the symptoms as cortisone or ACTH do.

Aralen does not produce early and dramatic results, however, and a patient is unaware for some weeks that the drug is having any effect on his illness.

"In the light of present experience, a trial of less than three months is probably inadequate——and even if some favorable result is evident at the end of two or three months, maximal benefit is not to be expected for six to 18 months," Dr. Arthur W. Bagnall, professor of medicine, University of British Columbia, reported.

After taking chloroquine, patients first simply feel better and look better, sometimes within the first few weeks. Then they go on to show their condition has improved by measurable lessening of the swelling, tenderness and protective muscle spasm, he added.

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GEOPHYSICS

IGY Data Centers

➤ THE RUSSIAN data centers for the International Geophysical Year, or IGY, are being set up in two cities, Moscow and Novosibirsk, the U. S. National Committee for the IGY has reported.

The sub-center at Moscow will house all information gathered during the 18-month IGY in the fields of aurora and airglow, ionospheric physics, solar activity and cosmic rays.

The sub-center at Novosibirsk will handle the fields of meteorology, geomagnetism, longitude and latitude, glaciology, oceanography, seismology and gravity.

All information at any center will be exchanged with the other two centers. The third world center is operated by several nations in Western Europe and the Pacific. It consists of the following sub-centers: geomagnetism, Denmark and Japan; aurora, Sweden and Great Britain; airglow, France and Japan; ionosphere, Great Britain and Japan; solar activity, Switzerland, Italy, Great Britain, France, German Federal Republic and Australia; cosmic rays, Sweden and Japan; glaciology, Great Britain; meteorology, World Meteorological Organization, and seismology, International Central Seismological Bureau, Strasburg.

With 70 nations participating in the IGY, with thousands of scientists and observers taking measurements and observations at more than 2,000 stations distributed around the earth and from pole to pole, mountains of raw data will be collected.

A first step in the utilization of the results of IGY is the orderly compilation of these data, their safe and proper storage in accessible centers and their indexing.

The world centers resulted from two years of international deliberations concerning the problem, it is reported in the *IGY Bulletin* (Aug.), a new publication of the National Academy of Sciences.

In the United States the sub-centers are: visual aurora, Cornell University; instrumental aurora, University of Alaska; airglow and ionospheric physics, National Bureau or Standards; cosmic rays, University of Minnesota; geomagnetism, gravity and seismology, U. S. Coast and Geodetic Survey; glaciology, American Geographical Society; latitude and longitude, U. S. Naval Observatory; meteorology, National Weather Records Center; oceanography, Texas A. & M. College; solar activity, University of Colorado, and earth satellites and rocketry, National Academy of Sciences.

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AERODYNAMICS

Ejection Seat for Pilot Flies Like a Skyrocket

See Front Cover

➤ POISED on its launching platform on top of a supersonic rocket sled at the Air Research and Development Command's SMART track at Hurricane Mesa, Utah, the "B" ejection seat, or aerial bobsled, is positioned. A "dummy" is in the seat.

Twin booms that can be seen in the photograph on the cover of this week's SCIENCE NEWS LETTER extend almost five feet behind the seat back to stabilize its flight, ending in a safe landing.

These booms are an application of the ancient Chinese skyrocket design in which a stick was attached to a skyrocket to make it fly an even course.

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