

METEOROLOGY

Drought! Insidious Enemy

Droughts are perhaps some of the least understood and most devastating natural phenomena, against which man has not yet found an effective weapon.

By BARBARA TUFTY

See Front Cover

► A RELENTLESS SILENT ENEMY, drought, advances night and day across fields and highways, suburbs and cities. In past years this thirsty foe resulted in the Midwest's Dust Bowl and this year and probably next it is striking New England, New York and other eastern seaboard states.

Unseen, unheard and unstoppable, the shadowy foe threatens usually moist regions with its devastating weapons of drying streams, depleted rivers and reservoirs, wilting crops, lowering ground water tables and briny water.

Local projects are underway to cut wasteful misuse of precious "sweet" water; interstate conferences are being held to determine legal and engineering distribution from reservoirs and rivers; and science and engineering technologists are mustering their forces to study the nature of this baffling foe and devise weapons to halt, if not prevent, its steady advance.

Unlike hurricanes or tornadoes, which strike with terrifying impact for a few minutes or hours and then move on, droughts are long-lasting drying processes that stealthily and constantly suck moisture from the soil and vegetation of certain areas. Most persons are not even aware of its insidious presence until too late.

Man has conceived many devices to combat some of nature's rampages, but he has yet to forearm himself against drought. Floods can be contained with dams, levees and dikes. Lightning can be funneled harmlessly from buildings with rods and grounding gear. Even the effects of earthquakes can be lessened with specially constructed buildings.

Man Unprepared for Drought

The unpreparedness of man against drought is being underscored this summer as New England and the eastern coast area are moving toward their fifth consecutive year of drought, the longest period yet recorded. Farmers, businessmen and vacationers alike watch with antipathy the fine picnic weather and bright clear sunlight that sheds its glory but no rain over the drying land.

Vegetation is still deceptively green—the trees bear drying but still green leaves, and much of the vegetables and grain and hay crop remain green from the few summer thundershowers that refresh the top soil but do not percolate deep enough to increase the ground water supply. Wells are at the

lowest ebb ever recorded, streams are thin, and reports of lowering ground water sound ominous.

In the towns and cities, dusty cars drive along parched streets lined with scorched grass and brown-leaved trees, over-cooked by heat reflected from asphalt roads and concrete buildings.

Local inhabitants have been requested not to wash their cars, not to water the lawn, not to fill their swimming pools. Notices in papers ask insistently for more restrictions to save the precious fluid squandered so thoughtlessly by million of Americans:

"Take a shower (8-10 gallons) rather than a bath (20-40 gallons)."

"Don't leave the tap water running as you shave, brush teeth or wash dishes."

"Don't empty ashtrays in the toilet, for each flush uses 5-8 gallons."

"Don't let water run to get it cold. Keep a bottle in the refrigerator."

Farther toward the seaboard, people are becoming alarmed for another reason—the taste of the salty sea is creeping into the fresh water supply as the dwindling rivers lose their force in their flow to the sea, and the salty ocean water advances inland at the rate of a mile every two days, making water

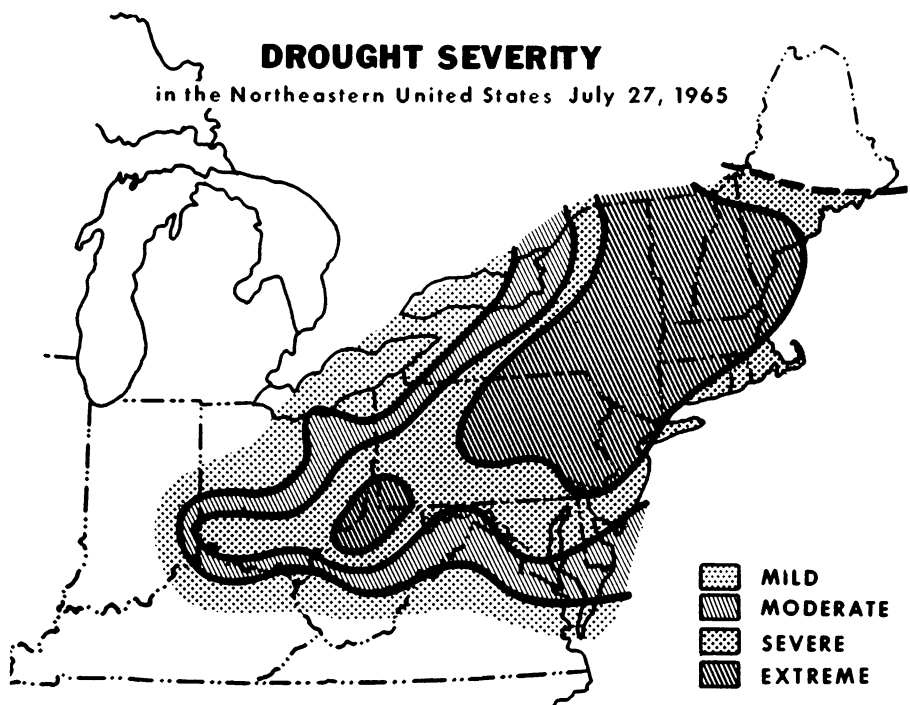
undrinkable and corroding costly industrial equipment.

One thing is sure: the drought in the East as well as in part of the Midwest is forcefully making the American public aware of the urgent need to conserve this vital fluid, without which neither man nor any other living thing can survive. President Johnson has asked for a report on possible Federal Government aid, and Congress has passed a bill to set up a Water Resources Council.

Causes Studied

For centuries, man has undergone droughts in Europe, Asia, China and Africa without really knowing what they were, how they would act or what caused them. In today's scientific world, droughts are still a mystery, and scientists are only starting to study the causes, duration and remedies. In an age of over-expanding population, where society demands more water without taking adequate care to conserve, replace or sufficiently clean it, droughts are becoming increasingly serious.

Just what is a drought? Because it is a composite of so many factors, a drought is hard to define, according to meteorologists, climatologists, hydrologists and geologists. Also it is a relative matter, depending on the economy of the area. What may be considered as a drought in one area is a normal condition in another. Or a weather



Environmental Science Services Administration

DROUGHT AREAS—The map shows the degree to which various areas of the northeastern United States are being hit by the present drought. Reports from the Environmental Science Services Administration indicate that the drought is spreading.

condition of unusually subnormal rainfall in one state is fine for growing crops in another.

Some persons say a drought is a matter of statistical rainfall or days without rain—for instance, when less than 0.10 inches of rain falls in 48 hours, or 30 to 40 days pass without rain, or strong drying winds blow for more than three weeks.

Other persons say a drought "happens" when the vegetation is affected—when corn withers and dries to brown paper, fields stand empty under a hot sun, and livestock become pitifully emaciated and die.

Others are more concerned with the deeper water content of the soil, and define drought by the depleted water supply in streams, reservoirs and wells, and by the sinking level of the all-important ground water table—the topmost edge of the water-saturated soil that lies underground at various depths.

When the ground water table is high, streams are full and the land is green. When the table is low, moisture leaves the rivers and land dry, except where man has been able to set up wells, pumps and costly irrigation systems. The picture on this week's front cover shows the effects of drought on a portion of the Washita River in Oklahoma in 1956. This was the first time in history that this river stopped flowing.

Drought is a prolonged and abnormal moisture deficiency that upsets the existing economy for a specific area, said Wayne C. Palmer, office of climatology of the U.S. Weather Bureau, in a definition that encompasses all these complex conceptions. There is a factor of time involved, Mr. Palmer pointed out, as well as the relative amount of harm to the established economy of a region.

In other words, a true drought occurs when dry weather combines with plants, man and machines to draw more moisture than the land can supply.

During a "dry spell" or "run of fine weather," man can suffer some temporary inconvenience and even mild hardship. But when water becomes unusually and persistently scarce enough to destroy or ruin life or property, the condition is a drought.

Regions Change

Regions may change from wet verdant areas to drying arid lands during a period of decades or centuries—for example, parts of now-dry northern Africa, Australia and Iraq were once fertile. On the other hand, as in the United States, dry areas may become wetter over the course of years.

Early American maps show the plains in the western parts of what is today Nebraska, Kansas and Texas as the "Great American Desert." This may be an erroneous term from subjective reports of European explorers who compared the open plains to their own fertile homelands, today's researchers hasten to point out. Definite statistics are lacking for climate during the early years of America. One of the most disastrous droughts in the records, however, culminated in the tragic Dust Bowl during the 1930 decade.

Dry seasons normally start in the early summer, when plants start to grow and draw lots of water from the soil. Almost

all the rain that falls in the summer is used up by trees, crops and other plants, and very little of it sinks deeper into the soil to replenish the ground water, explained Medford Tomson, hydrologist with the U.S. Geological Survey.

When the growing season ends in late October, the autumn rains penetrate deep into the earth and the water table rises. Melting snows in spring contribute still more water to the soil, ready for spring plants.

But when adequate heavy rains do not fall, the water table drops, and with it drops the water level of lakes, reservoirs, streams, rivers and wells.

Conditions Causing Drought

Many complex conditions cause a drought. High temperatures, strong drying winds and lack of rainfall are some of the most obvious causes.

Rainfall depends on the general circulation of the atmosphere, the interplay between high and low pressure air masses and the way they move over land and ocean.

Generally speaking, the masses of air that surround the earth are heated in the warm equatorial latitudes, rise and move toward the cool poles, and upon loss of heat return to the lower latitudes. The rotation of the earth, the disposition of continents, solar radiation and other factors make this basic atmospheric movement more complex. Rain falls when warm moist air becomes cool or is pushed into upper altitudes by wedges of cold air, and the moisture condenses and drops as rain.

East Coast Drought

The East Coast drought has been blamed partly on the fact that cold air from Canada has not moved south far enough into the U.S. to cause the warm moist air blowing from the Gulf of Mexico to dump its watery load over the eastern part of the continent.

This lack of cold northern air, plus a cold water region in the Atlantic Ocean off the Middle Atlantic States, plus a low atmospheric pressure area in the north Atlantic Ocean—all contribute to the disconcerting fact that moisture-laden air masses moving eastward with the westerly winds are riding past the parched eastern land and dumping their tons of precious water uselessly into the ocean.

Other factors have been blamed for the drought. Man's excessive waste of water, shifting ocean currents, misuse of land and forests, and sunspots that have been at their lowest point in their 11-year cycle may all affect the climate.

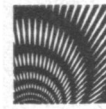
Droughts are not mere chance occurrences. They are part of a definite natural system that can be measured, studied and predicted with increasing precision as scientists in many fields accumulate vast amounts of data on water sources, water movement, soil structure, oceans, atmosphere and sun.

Proper care of land and soil, construction of dams, control of watersheds, and above all a conscientious effort on the part of the American public to conserve the precious resource, water, will eventually reduce the impact of devastating droughts.

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