

# WATER: COLORADO'S SHRINKING COMMODITY

## Demands grow, costs soar and availability dwindles

by eloise ross

"In this country, water is it," explains Dr. J. D. Butler, a full professor of horticulture at Colorado State University (CSU), Ft. Collins. "We talk about water first out here. If you don't have it, you don't have anything. If you don't have the water, you don't do it."

This precious commodity of the semi-arid red stone state has always been a highly volatile and serious issue. Never at a premium in Colorado's history, Dr. Butler says, "In all those movies of the West, you saw men fighting over horses but they were really fighting over water." And the fight continues today.

Colorado's scenic wonder and temperate climate have lured many new people who create a heightening demand upon its water supply. As competition increases for water for food, irrigation, lawns, personal and home uses, new provisions and tactics appear critical.

Currently, almost 42 percent of Denver's municipal and industrial supply enriches the lawns of city residents, according to a 1972 study by Woodward and Dr. Butler says costs for maintaining an 18-hole golf course with water runs between \$30,000 to \$40,000 a year.

The irony is that homeowners who demand lush carpets of lawn are the same people who are creating a water shortage that will make the cost of water prohibitive for turf.

It is not likely that irrigation will change much as a means to replenish agriculture and shrinking turf and croplands except for some grass adaptation but priorities may be necessary for proper use of water.

According to Donald L. Miles, extension irrigation engineer for CSU, agriculture, Colorado's largest industry, has shrunk from a 1970 all time high acreage of 3,380,000 acres to the present 3,100,000 acres. The loss is primarily to subdivision development.

With an increasing flow of new residents, Denver and eastern Colorado are handling greater demands upon water tracts set aside as many as 100 years ago. Denver now imports water from the western slope but has tapped nearly all its available sources. There are no water districts in the state and metering is done in only a few areas.

Individuals and sodfarmers can get water rights, the rights to use one acre flood a year or roughly 327,000 gallons of water. While giving the person the right to use water, water rights don't provide water. That is negotiated through other channels.

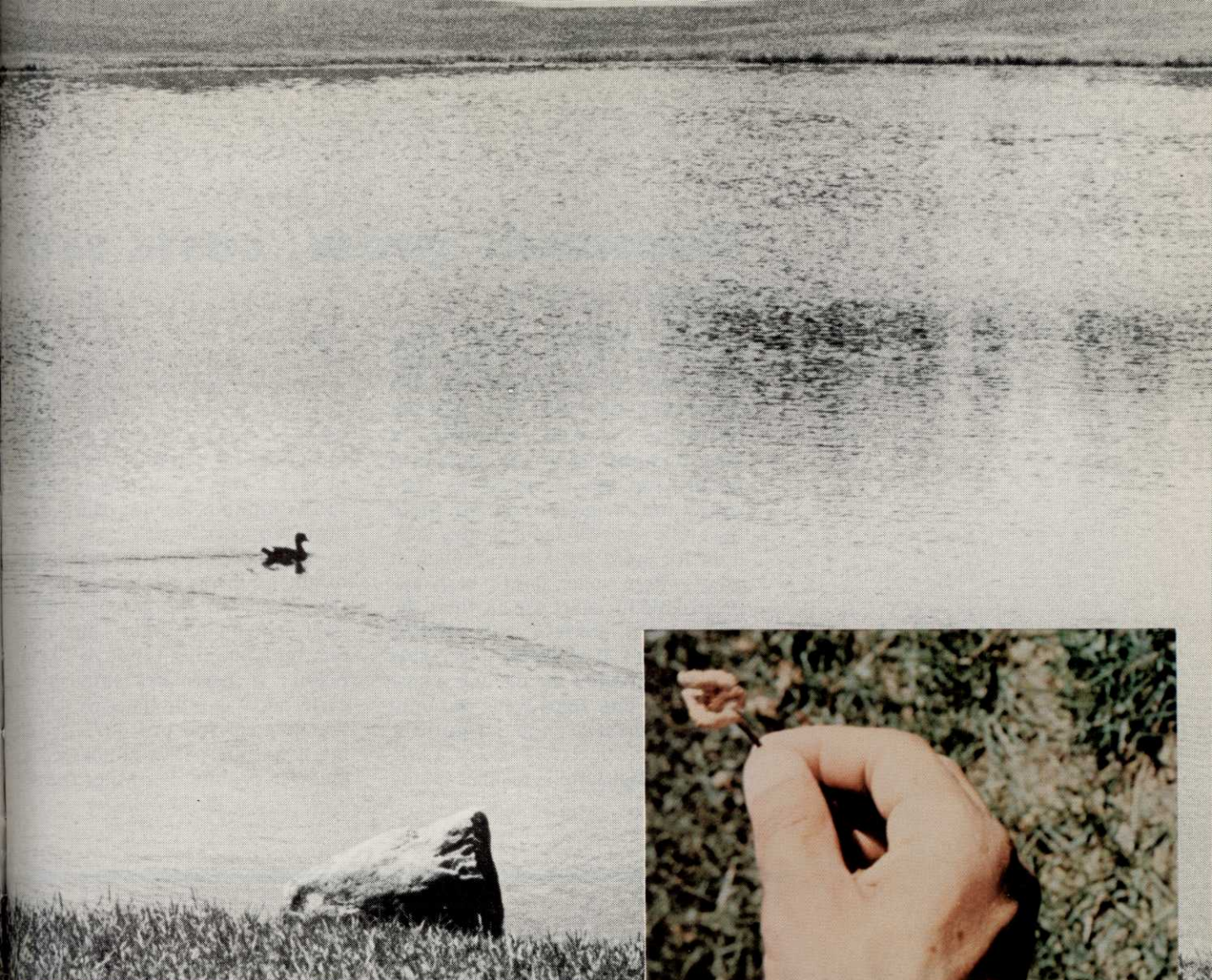
The individual's water right is owned by the city which levies rates as it is charged.

Prices for water rights may vary from \$2500 in Denver, \$600 to \$2500 on the eastern sector to a very low price in the water rich western territory, Miles says. Denver homeowners may pay up to \$10,000 a month for treated water while sodfarmers are charged alike and have a percentage of the cost of water. "It's mostly a matter of who can pay the most," Miles notes. "People pay more to have a little green around them than agriculture thinks it's worth."

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Above—This fairy ring fungus offers a challenge to Colorado turf farmers and developers of drought-resistant grasses. Fungi such as this drain precious water from the turf.

Left—Experimental Kentucky bluegrasses may provide much needed drought-resistant strains.





## **Demands grow, costs soar**

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Some landowners draw water from wells and have faced more restrictions for this practice. In 1965 small domestic wells were granted an exemption from registration if they pumped up to 50 gallons a minute for use in domestic, livestock and irrigation on no more than one acre of land. Today permits for wells are only granted in areas where water hasn't been appropriated for mass use or where the wells don't interfere with existing water rights. It is nearly impossible to get permission for drilling a new well today and some wells can only serve domestic, not irrigation, needs.

Such legislation reaches some

segments of the problem but leaves others uncharted. Miles points to unorthodox housing construction as a major problem. "Many of the areas where subdivisions are placed are going on extremely salty soil," he says. "This as much as anything I see as limiting the use of water for lawn purposes."

Lawn irrigation in such places brightens lawns while burning out the water. "If the grass uses three quarters of the water, the other quarter contains all the salt," he explains. It percolates through the earth and "is four times as salty as that (water) you put on." De-salting is an alternative although costs make it prohibitive, Miles stresses.

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## **Less thirsty grasses hold possible solution**

If and when Colorado sodgrowers line up for tank rationing of water for their crops, turf management studies at Colorado State University (CSU) in Ft. Collins may provide knowledge to ease the situation.

It is hoped these studies will supply grasses that can live with lower quality of water of effluent, run off wells or even brackish colored water.

As part of the PERC (Plant Environmental Research Center) of the Department of Horticulture at CSU, two open plots resembling football fields are the carefully controlled carpet homes of experimental Kentucky bluegrasses. Some 30 varieties grow there in striped patterned sections measuring 10 feet by 10 feet each.

Now in the second year, the turf plots support Adelphi, Nugget, Merion, Code 95, Arboretum, Chem blue, fescues, perennial ryegrasses, Prado, Park and Windsor grasses, among others.

Dr. J. D. Butler, a full professor of horticulture at CSU, is applying both anatomical and physiological research in the Kentucky bluegrass studies and is borrowing his results from his ongoing altitude studies. He also is experimenting with turfgrass from the western slope and plains of Colorado.

Many factors were judged before choosing the grasses to reflect both the soil of the plot areas and Colorado's soil problems. Types of soils and grasses were major points.

In considering these turfgrasses, Dr. Butler stressed that uniform, good soil is difficult to find in Colorado due to disturbances caused by construction and use of low quality land. Colorado soils often differ in water storage and availability. Poorer quality soils often show a very slow rate of infiltration while

The question is whether building should be permitted on such land and if lawn irrigation should be cut back, if not outlawed, there. Colorado's natural salts are only compounded as a problem because of such practices.

As a step in the right direction, subdividing is now illegal on parcels smaller than 32 acres unless water and sewage services are already available from the outside.

Other alternatives are allowing lawn irrigation only on alternate days for houses having even or odd street numbers. Some cities are using re-used agricultural water. There even is a greater likelihood that dual water systems may spring up in

cities with pipes transporting high quality water into the house for tubs, showers, wash basins and the kitchen sink. A second pipe would bring in reclaimed sewage water for flushing toilets, cars and lawn irrigation. The reclaimed water would be biologically pure but would have a rather high concentration of dissolved salts, Miles speculates.

Miles also views more responsible use of landscaping in housing and population limits and distribution in Colorado as a means to better control for using water.

At present, however, re-developing turfgrasses and re-educating the population seem the most workable alternatives. Fancier and more effi-

cient equipment won't help. There are no plans for allocation of water but Dr. Butler believes economics may well dictate higher priorities of water to food production, slurry transportation of coal and practices such as oil shale processing.

The issue of water is very political, though vital. Legislators shy away from it since an appointment to the Executive Committee of the Joint Water Committee is often followed by their ouster by voters in the next election. Since Colorado's legislature provides the governor the option of delegating topics for the even numbered years, it is not likely that the water issue will appear in 1976. Even though, "water is it," perhaps too much it.

turfgrasses having good root systems add to the best rate of water stored in the lower soil levels.

Where drought is critical, the types of grasses are important. Only a few grasses are able to grow where heavy droughts are severe or where it is impractical or impossible to irrigate. But these are often low quality turfgrasses and may not stay drought tolerant without some irrigation beyond average rainfall. A turfgrass' uses may also be limited by the amount of traffic it can endure.

While drier areas prize a grass' ability to remain alive during drought above its ability to stay green into dry periods, less arid regions place more value upon the grass that stays green into dry periods. In studying the grasses, criteria of the grass' tendencies to stay green into drought, and if its foliage desiccates, dies or returns to normal growth with enough rainfall are evaluated.

Colorado does have hearty native turfgrasses such as grama and buffalograss but these are judged

undesirable because they turn brown and don't give good ground cover. The new Kentucky bluegrasses should provide good cover, color and drought resistance.

The CSU bluegrasses were also chosen for their tolerance of eight to 15 inches of rainfall a year (15 inches being a normal year), how well they stayed green in dry times, if they formed a thick turf, and their texture and overall performance, qualities Dr. Butler and his research team of Peter Dernoeden and Mohammed Ali Harivandi have continued into the program.

Research by Dernoeden showed common bluegrasses are the most drought resistant and that these tolerant cultivars grow fairly quickly. Drought tolerance also figured into stomata size and location and the length of bulliform cells.

Other studies Dernoeden conducted note that mowing can affect drought tolerance. Since more water tends to be applied as if in compensation for low mowing, any good features of turfgrasses are can-

celled. Half of the CSU plots at the horticulture center are trimmed to three quarters of an inch while the rest are cut to one and one-half inch.

In handling the project, the researchers also experiment with the thatch and soil fertility. Thatch is important since it may drive water into useless runoff. The new varieties should help prevent this if they have deep roots.

Although Colorado isn't alone in its water problem since Arizona and California also contend with similar situations, the state does have special problems due to its altitude, cooler nights, light intensity, soil salts and high alkaline content. The effects of soil salts and salty water are now being researched by Harivandi at two Denver golf courses in another project which will affect future Colorado turfgrasses.

Although no specific target date is set for the study, when it ends original grasses, not hybrids or mutations will probably go into commercial production. Production is expected by 1981.

# Where have all the flowers gone?

Some flowering plants may be headed for the fate of the passenger pigeon: extinction. The cause, say biologists at Notre Dame, is Man's alteration of his environment.



A recent study by scientists at Notre Dame University suggests that certain flowering plants may become casualties of "progress."

"More and more flowering plants are falling into the categories of threatened and endangered," said Professor Theodore J. Crovello, chairman of Notre Dame's Department of Biology. "Threatened" is a less severe classification than "endangered."

"As Man moves into new areas and alters the environment, by draining areas for farming, for example, flowers decline and disappear. Orchids that grew in Indiana not many years ago are gone."

The conclusion that certain flowers are disappearing is based on a three-year study that used an IBM computer to analyze 35,000 botanical specimens collected in North America over the last 180 years. The specimens were from collections at 75 museums and universities across the country.

"Our study is helping determine the status of certain plants," said Dr. Crovello. "Research, for example, indicates that relatives of the

mustard are disappearing. On the other hand, we might find that a species thought to be extinct or disappearing had been mislabeled in some collections; or hadn't been collected for some years; or exists in only a few collections, but is still thriving in the wild."

The Notre Dame researchers have supplied endangered species information to scientists in Ohio studying plants of the mustard family there. Preliminary research indicates that while some plant species in Ohio are threatened and endangered, others can be removed from the list. Analysis of certain "spring flora" such as various types of spring watercress shows some are disappearing while others are plentiful. Another part of the study, the Flora Indiana Project (FLIP), is focuses on the 2,500 different species of flowers found in Indiana.

The biologists built their files of information by entering names of plants, when and where found, environmental conditions at time of collection, and other information. The IBM System/370 Model 158 produces reports by states and coun-

ties showing numbers of plants gathered by century and decade since 1800.

"As you look back into history, collectors' records become sketchy," said Dr. Crovello. "A botanist might simply have noted 'picked up by the Missouri River' or 'collected in Indiana territory' and just recorded the year. Today, researchers provide more accurate records, sometimes even the street address. Still, we see plants shrinking in geographic distribution over time — the indication of an endangered species.

"This is more than just an aesthetic loss: Man benefits significantly from certain plant species, particularly those that supply important medicines. Yet most plants have not even begun to be analyzed for products useful to people. Who knows what potentially valuable chemicals we are losing with every species that becomes extinct.

"Urbanization and other activities of Man can irrevocably alter the environment, and this forces us to set priorities."





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# Protect irreplaceable trees from lightning destruction

A blinding flash. An ear-piercing crack. Suddenly, one of your most valuable trees is destroyed by lightning — one of the most destructive forces of nature. In its 70-year history, The Davey Tree Expert Company, Kent, Ohio, has seen the results of countless lightning strikes. And, again this year summer electrical storms have taken their toll of hundreds of trees throughout the country.

According to John W. Joy, Davey vice president, "Tree owners can protect their valued trees by turning them into giant lightning rods." The cost of installing lightning protection is only a fraction of what a fine tree may be worth in terms of actual dollars. Remember, a house can be replaced in every detail, but the grand old trees around it . . . never.

Although it is not possible to prevent a tree from being struck by lightning, it is possible to equip a tree so that lightning will be conducted harmlessly into the soil.

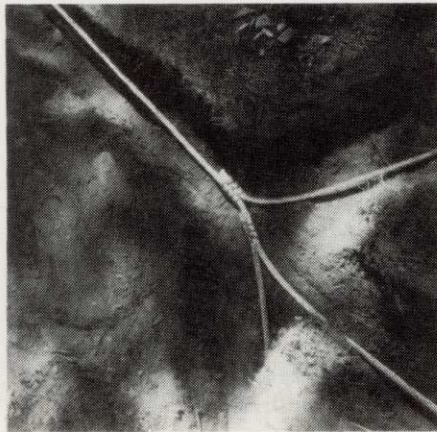
Here is how professionals install a lightning protection system: A copper cable is attached from the highest parts of the tree to the ground, running down the trunk in

as nearly a straight line as possible. Branch conductors also are run from the main limbs in the upper part of the tree and attached to the main trunk connector. (See illustrations.)

Ground cables, buried in narrow trenches, are attached to the main conductor and extend from the base of the tree like the spokes of a wheel. A copper rod, attached to the ground cable, is driven into the ground at the end of each trench. The purpose of the spoke-like ground connection is to pick up or distribute the current beyond and below the roots which are as sensitive to injury as the top of the tree.

Within a clump of trees, terminals should be attached to one or more of the tallest trees in the group. Also, if a tree is close to and taller than your home, permitting the lightning to follow the tree-grounded route might avoid a strike on the house.

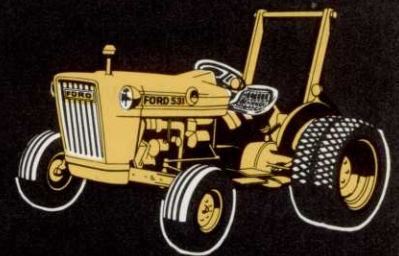
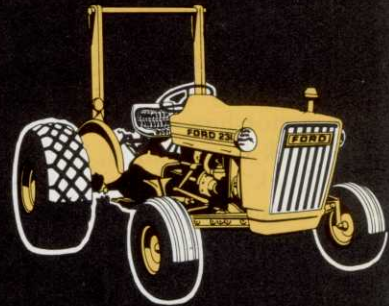
Joy pointed out that trees are constantly growing upward and outward each year and changes occur in their structure, character and physical being. Therefore, lightning protection installations should be checked every four or five years.



For lightning protection a special conductor cable is attached to the highest parts of the tree (left) and runs along major branches down the tree trunk. The ground system (right) consists of an extension of the main trunk cable to a point beyond the main root system and is attached to a rod driven to the required depth.

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## People on the Move

W. H. Bricker, president of **Diamond Shamrock Corporation**, has been elected to succeed C. A. Cash as chief executive officer. Cash will continue as chairman of the board. Bricker will be chief operating officer as well as chief executive. Cash has been with the company since 1935. He has held directorships in the Diamond Shamrock Corporation, American Petroleum Institute, First National Bank of Amarillo, and Texas Mid-Continent Oil and Gas Association. Bricker joined the company in 1969 and has held directorships in the Diamond Shamrock Corporation, Society National Bank of Cleveland, National Agricultural Chemicals Association and the Samuel Moore & Co. He is a member of the John Carroll University Board of Trustees, Greater Cleveland Growth Association, and Musical Arts Association.

Ed Felton has been promoted to Western zone manager for **Charles Machine Works, Inc.**, manufacturer of Ditch Witch construction equipment. He will be responsible for Hawaii, Alaska, 13 Western and Midwestern states and western Canada. Felton has been a district representative in the upper Midwest and on the West Coast.

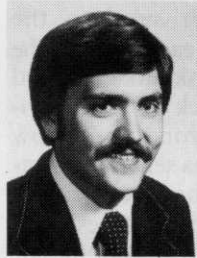
**Ciba-Geigy** announces some new field sales representatives in the Agricultural Division: Jim Fast has a territory covering 18 counties in Missouri, nine counties in Kansas and three in Oklahoma; John Taylor serves 17 counties in northern Mississippi; former administrative secretary Courtenay Benbow Forrester covers 19 counties in North Carolina and four in Virginia; Cheryl Lynn English is responsible for five Illinois counties, and Comfort "Bisi" Komolafe serves 10 counties in western New York.



Felton



Lehman



McKenney



Smith

**ProTurf** has named Doug Smith and Jeff McKenney technical representatives for this Scott's division. Smith has held a similar position in Louisville, Ken., for four years and now takes over the southwestern Ohio territory. McKenney has been an instructor in ProTurf's Professional Turf Institute and now is tech rep in the newly created sales territory encompassing eastern North Carolina.

The **Pennsylvania Turfgrass Council, Inc.** has released its 1976 officers' names: President, Arthur D. Wick; Vice President, C. William Black; Treasurer, David M. Boyd, Jr.; and Executive Director, Fred V. Grau. On the Board of Directors are R. W. Marberger, Jr., Don Pakkala, George J. Morgan, Henry F. Meinert, Jr., Arthur Czarnecki, John M. Bodock, John A. Segui, Bartholomew Cornali, John P. S. O'Connor, Clyde E. Lyons, C. William Black and Arthur D. Wick.

Jim Wickham is the district manager for the Texas and Oklahoma areas of the **Moody Sprinkler Co., Inc.** He has much experience in irrigation and contracting.

Ronald A. Stinson was transferred to Agricultural Sales at **Thompson-Hayward Chemical Company**. He is responsible for agricultural chemicals sales in the Western Oregon territory.

Rowland R. (Dick) Lehman is filling the new position of vice president of marketing at **Wisconsin Marine, Inc.** of Lake Mills, Wis. Addition of Bob-Cat Commercial Mowers and expansion of the Bob-Cat Snow Thrower line prompted creation of the position. Lehman, who has an extensive background in marketing power lawn equipment, is responsible for developing and administering a worldwide market for Bob-Cat outdoor power products.

The **ProTurf Division of O. M. Scott & Sons** has made regional manager changes and formed a new region in the South: Ted Mulcahey is the new Central Regional Manager, serving Ohio, Michigan, West Virginia, Southern Indiana and Northern Kentucky. Mike Kolb is responsible for the newly aligned Southern Region, including Texas, Louisiana, Mississippi, Alabama, Florida and islands in that area. Mid-South Regional Manager Dick Spitler, manages Virginia, North Carolina, South Carolina, Georgia, Arkansas, Tennessee, northern Mississippi and northern Alabama.

Promotions and additions in the **Elanco Products Company**, agricultural marketing division of Eli Lilly and Company, include Becky J. Tilton, E. Sue Hansford and Nicolas R. Herbert, agricultural chemicals sales trainees; David R. Finley and Robert L. Fowler, sales representatives in the Peoria sales district; and a recent addition, Edward J. Sangster, sales representative in Columbia, Missouri.

Milton R. Shapiro was named assistant corporate controller of **Beker Industries Corp.** He is a certified public accountant and has a degree in accounting from Rutgers University.