

OKLAHOMA WATER NEWS

Bimonthly Newsletter of the Oklahoma Water Resources Board

Soil is a Miracle to a Farmer, But a Menace to Clean Streams

Soil, dirt, earth.

By any name, it is the material that covers the planet. We grow all food in it, build our houses on it and dig minerals from beneath it. Soil is common and precious; lifeless and dynamic; a paradox. A handful scooped from any garden looks quite ordinary, but in fact, it is a miracle-mix of minerals, organic materials, water and air, teeming with life. A mere teaspoon of soil from any region of temperate climate hosts billions of organisms ranging from bacteria and fungi to earthworms, insects and spiders.

Although soil varies from one location to another, it is generally about 45 percent minerals, 25 percent water, 25 percent air and five percent organic material. The particles of minerals—usually silt, clay or sand—which lend texture to soil are constantly weathered and broken from parent material (bedrock, volcanic ash or other geologic material). Water and air fill the pore spaces between the mineral grains and are available for use by plants. Soil's final ingredient, organic matter, is composed of dead plant and animal material and the billions of living organisms that inhabit the soil.

***It requires hundreds
of years to form
an inch of soil***

In the hands of a conservation farmer, soil is a miracle. But borne by wind or water, topsoil can become a damaging nuisance.

Erosion can be dizzyingly accelerated by human activity. In rural areas, accelerated erosion can be seen in bare, plowed fields, overgrazed grassland and tracts cleared by logging. Exposed soils lie vulnerable to the



destructive forces of wind and water.

Erosion by water is a three-stage process. The raindrops break up soil particles, and water flowing over the surface carries the soil downslope. The soil is deposited as the water slows. All things being equal, erosion is greater with large drops than with small ones; with a storm accompanied with wind than a storm in still air; and with a one-inch storm lasting 24 hours than a one-inch storm of one-hour duration.

When rain falls faster than the soil can absorb it, water begins to collect and flow over the surface. When the water picks up particles detached by raindrops, sheet erosion can begin. Soon this surface flow wears paths which become small channels called rills, which can merge with other rills

Continued on page 2

Ken Morris, of the OWRB Engineering Division, inspects a severely eroded gully in Sequoyah County.

Erosion in Oklahoma and other high plains states has been greatly accelerated by man's activities.



Soil, continued from page 1

to form deeper channels or gullies. In a gully, soil is rapidly removed by water gushing over the uphill end, water scouring the gully's bottom and water removing soil material that has slumped from the sidewalls.

In sites of urban and suburban development, vast bulldozed tracts contribute tons of soil and many pollutants to nearby waters. The heavier particles washed into lakes and streams smother fish-spawning beds, choke streams and lakes, clog roadside ditches and culverts, pollute water supplies and impede navigation.

Finer soil particles remain suspended longer and travel farther downstream. Various chemicals—such as fertilizers, pesticides, paints, solvents and other substances—become attached to these fine grains. In today's cities and suburbs, this transfer of soil to lakes and streams can be as great as one inch of soil (135 cubic yards) from each acre each year.

Roofs, roads and parking lots also contribute enormous amounts of sediment to streams. Probably 90 percent of rain falling on these hard surfaces runs off and carries to streams burdens of fine gravel and silt.

Eroded soils and the pollutants transported by them are a major cause of lake pollution. Sediments and attached nutrients may greatly accelerate a lake's natural aging process, decreasing a reservoir's water-holding capacity and spawning algal blooms which lead to oxygen deficiencies. This eutrophication process threatens to destroy many Oklahoma lakes—and the life in them.

In what is now the United States, Native Americans farmed simply, scarcely altering the environment to produce what they needed.

The country's erosion problems began with the colonists. When colonists in the southeast cleared forests to grow cotton, tobacco and other cash crops, yields from the rich soil were high at first, then decreased as the fertility of the soil declined. Yields were lower, and crop failures became more likely until abandonment was the farmer's only option.

Other settlers were moving west, encouraged by the Homestead Act and aided in their agricultural efforts

by the invention of the steel plow, barbed wire and the windmill. The steel plow that broke up the tough, drought-resistant prairie grasses first opened the soils to erosion.

The development of farm tractors in the early 1900s made it possible for a farmer to produce crops on many more acres in much less time, so before 1930, much of the hardy, drought-resistant grasses that had blanketed the plains had been plowed under.

Farmers didn't recognize erosion as a problem until their lands were doomed.

In the place of the native grasses, farmers on the plains planted corn and wheat, which were less drought-resistant and less effective in protecting against erosion. Plains farmers grew the same cash crop year after year until the soil was exhausted of nutrients, then claimed another plot of cheap, plentiful land. Cattlemen and herdsman brought huge herds of cattle and sheep, which overgrazed the grasslands and left in their wake weakened vegetation and bare soil.

The first of several severe droughts burned across the plains in 1931. Droughts were interspersed with dreadful floods. Crops failed as the weakened plants died and hundreds of square miles of bare ground were abandoned to merciless prairie winds

and abrading rainstorms. The fall of 1933 brought the first of many dust storms. Soil was picked up and blown as far east as Washington, D.C., and the coast. Winds lifted from two inches to one foot of topsoil and drove it into dunes over roads, houses, farm equipment and trees. Lighter silt rose in black dust clouds five miles high.

On a single day in 1934 it was estimated that 300 million tons of soil were scoured from the Great Plains.

So devastating was the damage wrought by the Dust Bowl that Congress passed the Conservation District Act in 1937. Today in Oklahoma 89 conservation districts and several state agencies, including the OWRB, encourage the thoughtful management of soil and water resources and the protection of water quality.

Among the many practices to restore the ravaged land was the construction of upstream flood control projects. The first of these, in the watershed of Sandstone Creek in Roger Mills County, was accomplished largely through the efforts of conservationist L. L. "Red" Males, longtime OWRB member. A plaque at the edge of Cheyenne proclaims the Sandstone Creek Project the "First Upstream Flood Control Project in the World." The five-year project, completed in 1953, included 24 upstream flood control structures and extensive land treatment. Males died March 31, 1990.

Innovative Permit Attracts Attention

The OWRB's two-year-old permit for aquaculture is already getting international attention. Phil Moershel, of the Board's Water Quality Division, recently received an inquiry from Tel Aviv, Israel. According to Moershel, the Aquaculture Division of the Ministry of Agriculture is dealing with the familiar problem of properly handling waste from fish ponds and hatcheries.

"Evidently, the Ministry obtained a recent copy of the "Oklahoma Aquaculture Newsletter" which contained an article on the OWRB's wastewater discharge permits for aquaculture. They are starting their own fish farm-

ing operations and wanted guidance on setting criteria for waste discharges," he said.

Moershel, himself a former fish farmer, emphasized that Oklahoma is one of only a handful of states with advanced discharge requirements for aquaculture and therefore receives inquiries about permit requirements.

In the late 1980s, it became apparent that special requirements were needed to regulate discharges from Oklahoma's rapidly growing catfish farming industry. Discharges from fish-raising ponds and hatcheries may contain pollutants which lower water's oxygen-holding capabilities.

The Water Board, which regulates state industrial waste discharges, realized its standard permit would have to be streamlined for the unique aquaculture industry. To develop fair permits, the OWRB's Water Quality Division organized a committee of catfish farmers, state agencies, aquaculture researchers and others who would be affected.

The resulting draft permit, completed in 1989, waives the normal permit application and publication fees and, in many cases, relaxes monitoring requirements. Fish farmers must apply for an authorization from the OWRB to discharge under this general permit. In place of discharge parameters, a variety of best management practices have been implemented which reduce the volume of effluent and better control wastewater releases.

Among these management solutions, Moershel pointed out, was a prohibition against discharges from the bottom 20 percent of a pond—unless suspended organic matter and sediments are removed.

"Board permits ask that initial discharges occur from upper levels and encourage the use of settling basins and, if possible, reuse of wastewater," he added.

Probably the most beneficial of all best management practices included in the permit is land application of waste. "If done properly, land application can be economical, good for crops and remove a significant amount of waste from Oklahoma's wastewater stream."

speakers of national, state and regional importance. The meeting is also sponsored by 28 water-related organizations.

"I am really looking forward to this Water Conference, my first as head of the Water Board," Eaton said.

For more information on the Water Conference, call Mary Whitlow at (405) 231-2523 or Brian Vance at (405) 231-2502.

Governor Creates Sub-Cabinet

Governor David Walters and Secretary of Environment Patty Eaton announced in August the formation of a sub-cabinet to enhance the efficiency of Oklahoma's environmental agencies.

"Currently, there are several state agencies that deal with environmental issues that are assigned to other cabinet areas. Therefore, I have asked the Secretary of Environment to bring together these agencies so their interests and concerns may be discussed in a common forum," Governor Walters said. "Close cooperation will mean better service to the citizens these agencies routinely work for."

According to Eaton, representatives from the State Department of Health, Conservation Commission, Department of Agriculture, Department of Wildlife Conservation, Corporation Commission, Department of Tourism and Recreation and Department of Transportation have been appointed to the sub-cabinet organization.

Unlisted Streams on Agenda

The third public meeting involving the 1991 revision of the Oklahoma Water Quality Standards will be held on September 25 at 1:30 p.m. at the State Department of Wildlife Conservation.

According to Derek Smithee, OWRB standards coordinator, the primary topic of the meeting will be beneficial use designations for unlisted streams in the standards document. The public is invited to attend.

The public meeting is part of the Water Board's ongoing effort to update and refine water quality standards which determine wastewater treatment levels of cities and various state industries.

Texas Mandates Conservation

A water conservation law passed recently by the Texas State Legislature is expected to save 805 million gallons of water a day by the year 2040. The Texas Water Development Board says that the law sets new plumbing standards and prohibits the sale of water-wasting fixtures after January 1.

Water planners say the amount of water that will be saved is enough to fill the Houston Astrodome once every 13 hours. Or they point out that the amount of water conserved will be the equivalent of the combined water demands of Austin, Houston, San Antonio and El Paso.



Water Conference Dec. 18

The Twelfth Annual Governor's Water Conference has been set for December 18 at the Marriott Hotel in Oklahoma City, announces OWRB Executive Director Patty Eaton.

Highlights will include a luncheon address by Governor David L. Walters and presentation of 1991 Oklahoma Water Pioneer awards. The OWRB coordinates the Conference, which has a reputation for featuring

FINANCIAL ASSISTANCE PROGRAM UPDATE			
Approved at August Board Meeting			
Grants		Loans	
Meeker PWA	\$70,000	<i>(4.892%; 28-year maximum term)</i>	
		Davis Municipal Authority	\$450,000
		Garber Municipal Authority	\$175,000
Approved at September Board Meeting			
Grants		Loans	
Muskogee County RWD #12	\$45,000	<i>(5.292%; 28-year maximum term)</i>	
Cherokee County RWD #7	\$23,180	Arapaho PWA ¹	\$ 60,000
Cherokee County RWD #8	\$23,180	Dewey PWA	\$525,000
Eagletown Public Schools	\$20,500	Ponca City Utility Authority	\$750,000
Adair County RWD #5	\$50,000		
Arapaho PWA ¹	\$17,000		
Tulsa County RWD #4	\$100,000		
¹ increase to earlier Board grant/loan			
Totals as of 9/10/91			
	FAP Loans	Grants	SRF Loans
Approved	82	242	2
Amount	\$63,480,000	\$14,923,195	\$25,659,500
Funded	69	213	2
Amount	\$55,775,000	\$12,963,862	\$26,659,500

THE FLOOD CURRENT

SEPTEMBER-OCTOBER 1991

More Counties Participate in NFIP

Prior to 1980, most Oklahoma counties lacked proper authority to enact land use regulations to limit development in floodplains. With passage of the Oklahoma Floodplain Management Act, effective floodplain management became attainable for communities by allowing them to participate in the NFIP. The Act also authorized the OWRB to direct the federal program, established by Con-

ance policy count rose from 11,028 to 11,495 from April 1990 to April 1991, an increase of more than 4.2 percent.

Nationally, the total number of flood insurance policies grew 8.5 percent last year, one of the greatest increases since the NFIP's inception. Washington, D.C., has set the standard in growth, starting 1990 with only 48 policies and ending the year

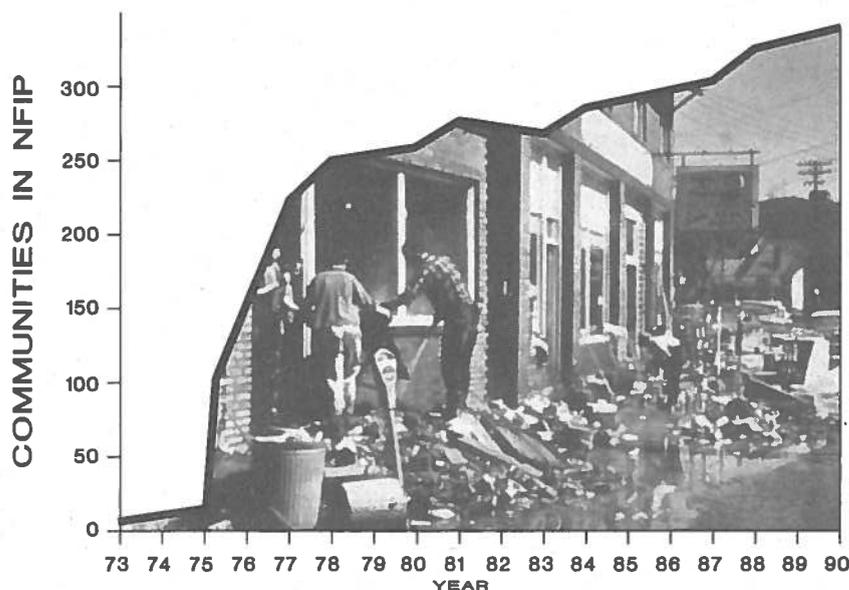
Five Cities Seek Lower Rates

Five Oklahoma communities have applied to take advantage of the Federal Insurance Administration's new Community Rating System which will allow them to lower their flood insurance premium rates by up to 45 percent.

Blackwell, Lawton, Sand Springs, Stillwater and Tulsa all applied for the voluntary program in its first year of operation. If approved, the action will allow them to save local property owners more than \$60,000 next year, and even more in the future. Eligible communities include those which exceed NFIP minimum standards by implementing any or all of 18 specified flood reduction measures, according to Ken Morris, NFIP state representative.

"The CRS not only allows cities and towns to save money, but can significantly reduce flood damages, insurance claims and federal disaster outlays," he said.

Morris added that the deadline for the second round of applications is December 15 and he plans to schedule a mandatory fall workshop to provide assistance to interested communities. To obtain a program manual which explains application procedures, call Morris at (405) 231-2533.



Both large cities and small towns in Oklahoma can profit from growth of the National Flood Insurance Program.

gress in 1968, to provide local governments with a mechanism for implementing floodplain management techniques aimed at reducing or avoiding flood damages.

An increasing number of Oklahoma communities have joined the NFIP since the OWRB initiated the program in 1980. As 1990 came to a close, the program had 342 participants, including more than 30 counties. In addition, the state flood insur-

with 537, an increase of more than 1,000 percent. California and Iowa have experienced increases of more than 30 percent while Florida, Louisiana and Texas continue to lead the country in total flood insurance policies on record.

The NFIP has approximately 18,000 participating communities nationwide with some 2.5 million flood policies for \$202 billion worth of coverage now in effect.

If you're flooded out
you don't have
to be
WIPED OUT.

For information on the
**NATIONAL FLOOD INSURANCE
PROGRAM**
call the OWRB at (405) 231-2531.



The Oklahoma Water News is printed on recycled paper in biodegradable oil-based soybean ink.

Wetlands' Value Often Underestimated

Bogs, marshes, swamps and other wetland areas, though often misunderstood, are extremely valuable to both man and nature. Through history, Americans have drained, filled, channeled and polluted them—destroying more than one-half of the original 200 million acres of wetlands in the lower 48 states.

Only recently has man begun to fully appreciate the ecological importance of wetlands, including their vital use in flood and erosion control. Often called natural sponges, wetlands subdue floodwaters by absorbing runoff during heavy rainfalls and releasing it slowly downstream. Wetlands buffer shorelands against erosion while wetland plants hold soil in place with their roots. The following editorial, portions of which are reprinted here from the Texas Water Commission's Floodplain Management newsletter, accentuates the importance of these natural ecosystems to flood control and the environmental domino effect which may occur upon their destruction.

We drain some pothole wetlands to have more land for agriculture. Later, we discover that the water previously stored in the wetlands is causing flooding problems downstream. As a result, we construct a levee system to confine the damaging floodwaters.

Unfortunately, now the water moves downstream at higher velocities and floods other areas. A dam is built, but the water backed up behind it brings with it silt, reducing the dam's flood control capacity.

The area below the dam is now "safe" from flooding and development soon encroaches, decreasing the area through which floodwaters can safely pass without harming life or property. This scenario is repeated several times as the river flows to the sea.



Carizzo Creek, in Cimarron County, nourishes wetlands in the Oklahoma Panhandle.

In controlling the water through swamps and wetlands, the velocity increases so much that silt is not allowed to settle out and the wetlands are deprived of the nourishing new soil. Subsequently, the depth of water increases in the wetlands and nearby bay shore area. The increased depth "drowns" wetland plants and escalates erosion of the bank and shoreline. Eroded silt is deposited on the bay bottom and submerged beach area. Ship channels and waterways fill with sediment. Jetties are constructed to protect the channels, but littoral drift is disrupted by these structures. Beach erosion accelerates. Dunes and nearby wetlands are destroyed.

By now you should get the picture. Isn't there a better way?

OFMA Holds First Meeting

Western Hills Guest Ranch, near Wagoner, was the site for the First Annual Meeting of the Oklahoma Floodplain Management Association on September 5 and 6.

The opening session of the conference featured discussions of flood warning systems, wetlands, the National Flood Insurance Program's Community Rating System and other topics of interest to federal, state and local floodplain officials.

Also at the meeting, Donetta Blanlot, of the OWRB's McAlester Branch Office, and Greg Scheffe, Woodward Branch manager, were chosen as OFMA regional representatives. Blanlot was also elected secretary for the 1991-92 term.

Dam Safety Officials Meet

The Eighth Annual Conference of the Association of State Dam Safety Officials will be held September 29 to October 2 at the San Diego Princess Resort in San Diego, California.

Conference organizers hope to attract state and federal government officials who work with dams, private sector consultants, contractors, materials suppliers and members of academia. General and special breakout sessions will be conducted by leading experts in areas such as dam rehabilitation, mining, hydrology and hydraulics, public awareness and geotechnical issues. Jan Veltrop, president of the International Committee on Large Dams, will deliver the keynote address. In addition, OWRB Engineer Cecil Bearden is scheduled to present a paper on the late 1986 dam failure at central Oklahoma's Cedar Lake.

For more information on the meeting, call (606) 257-5140.

Flood Insurance Meeting Set

On November 18-21, the National Flood Insurance Program will hold its 1991 Biennial Conference at the Mayflower Hotel in Washington, D.C.

For more information on the Conference or to register, call Charles A. Lindsey at (202) 646-2758.

**STORAGE IN SELECTED OKLAHOMA LAKES & RESERVOIRS
AS OF SEPTEMBER 4, 1991**

PLANNING REGION LAKE/RESERVOIR	CONSERVATION STORAGE (acre-feet)	PRESENT STORAGE (acre-feet)	PERCENT OF STORAGE		PLANNING REGION LAKE/RESERVOIR	CONSERVATION STORAGE (acre-feet)	PRESENT STORAGE (acre-feet)	PERCENT OF STORAGE	
			conservation	flood				conservation	flood
SOUTHEAST					EAST CENTRAL				
Atoka	124,100	103,900	83.7	N/A	Eufaula	2,314,600	2,057,137	88.9	0.0
Broken Bow	918,070	965,406	94.3	0.0	Tenkiller	654,100	621,197	95.0	0.0
Hugo ¹	187,603	180,233	96.1	0.0	Wister ¹	58,601	58,601	100.0	0.1
McGee Creek	113,930	110,778	97.2	0.0	NORTHEAST				
Pine Creek ¹	73,346	73,346	100.0	0.4	Birch	19,200	15,092	78.6	0.0
Sardis	274,330	267,100	97.4	0.0	Copan	43,400	35,786	82.5	0.0
CENTRAL					Eucha	79,600	61,000	76.6	N/A
Arcadia	27,520	27,520	100.0	2.9	Fort Gibson	365,200	349,679	95.8	0.0
Hefner	75,400	69,800	92.6	N/A	Grand	1,672,000	1,517,220	90.7	0.0
Overholser	15,900	15,900	100.0	N/A	Heyburn	7,105	6,074	85.5	0.0
Stanley Draper	100,000	80,990	81.0	N/A	Hudson	200,300	200,300	100.0	0.4
Thunderbird	119,600	113,720	95.1	0.0	Hulah	31,160	24,626	79.0	0.0
SOUTH CENTRAL					Oologah	553,400	500,153	90.4	0.0
Arbuckle	72,400	71,681	99.0	1.3	Skiatook	322,700	294,326	91.2	0.0
Texoma	2,643,300	2,643,300	100.0	0.5	Spavinaw	30,590	30,590	100.0	N/A
Waurika	203,100	203,100	100.0	10.3	NORTH CENTRAL				
SOUTHWEST					Kaw	428,600	408,214	95.2	0.0
Altus	132,830	63,306	47.7	0.0	Keystone	557,600	508,169	91.1	0.0
Ellsworth	72,490	61,535	84.9	N/A	NORTHWEST				
Fort Cobb	80,010	78,681	98.3	0.0	Canton	111,310	66,320	59.6	0.0
Foss ²	256,220	171,091	66.8	0.0	Fort Supply	13,900	12,145	87.4	0.0
Lawtonka	56,574	51,420	90.9	N/A	Great Salt Plains	31,420	31,420	100.0	2.0
Tom Steed	88,970	81,164	91.2	0.0	STATE TOTALS 13,130,479 12,132,020 92.4 0.5				

¹ Seasonal pool operation

² Conservation pool lowered to enhance project operation

N/A—not applicable; no flood storage allocation.

Data courtesy of the U.S. Army Corps of Engineers, Bureau of Reclamation, Oklahoma City Water Resources Department, City of Tulsa Water Superintendent's Office, City of Lawton, Altus Irrigation District, Foss Reservoir Master Conservancy District and Fort Cobb Master Conservancy District.

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