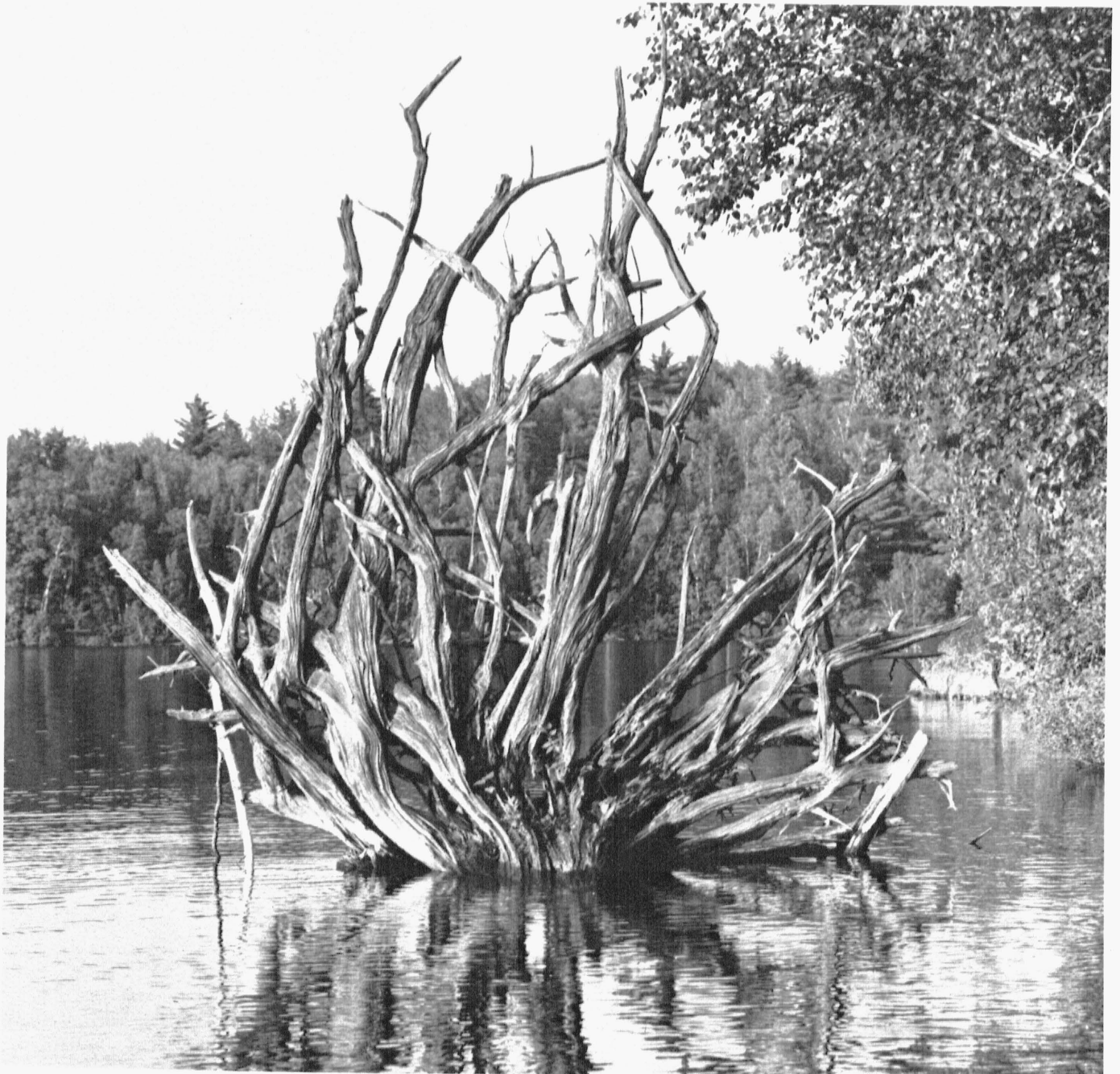


Science for Nature's Sake

College of Agriculture
University of Missouri-Columbia
March 1976 SR188



Missouri Agricultural Experiment Station

This is a report of the Missouri Agricultural Experiment Station emphasizing research that deals with the environment.

Other reports this year are SR186, *Test Tube to Table* and SR187, *To Your Health*.

They are available from:
Publications
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The Missouri Agricultural Experiment Station, headquartered at the University of Missouri-Columbia, combines the best efforts of 250 scientists in 13 departments, 2 schools, 1 division, and 2 colleges working on more than 175 major research projects.

Elmer R. Kiehl
Dean & Director

Richard J. Aldrich
Associate Dean & Director



The forest, left, has been burned every year since 1949. Result: many trees killed or damaged; few small seedlings; water infiltration into soil reduced. Below, lush vegetation is shown in an unburned area. A deep mantle of litter protects soil and aids water penetration.



Forestry, Fisheries, & Wildlife

It doesn't pay to burn a forest. While that statement seems common sense enough, more than a quarter century of research by UMC foresters and the best efforts of the Missouri Department of Conservation and U.S. Forest Service have not convinced everyone.

For more than 100 years, a pall of smoke on the horizon was a common sight in the Ozarks. Until a few years ago many local residents practiced woods burning which they believed to be beneficial and necessary to grow more grass, kill ticks and chiggers, and get rid of brush.

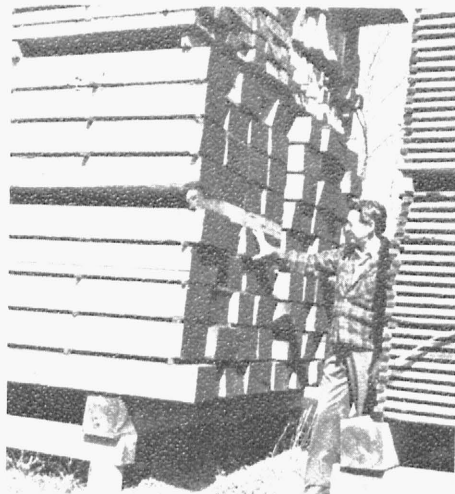
In 1949, in order to determine the effects of fire on hardwood forest vegetation and soils, the UMC School of Forestry undertook a long-term

investigation of burning. Results show burning kills many good trees and generally leaves less desirable species. Fire scars reduce the marketable volume of the trees that remain, and their diameter growth is reduced. Besides, the amount of litter on the surface is less, infiltration of water into the soil is reduced, and erosion is increased.

On the other hand soil nutrients, such as nitrogen, potassium, and calcium, are slightly increased. Also increased is the number of herbaceous species, particularly grasses.

But all in all, say UMC researchers, the detrimental effects of hardwood forest burning far outweigh any beneficial effects●

Timbers and lumber are being air-dried at the University Forest by Ralph Musbach, superintendent. This is just a small part of the 26 million board feet of timber at the University Forest where scientists study everything from tree seedlings to construction uses of wood.



"Largest classroom" is the University Forest a few miles northeast of Poplar Bluff. On this 7,200-acre site, hundreds of forestry students have gained firsthand knowledge of forest ecology and tree management. The teaching, research and demonstration that go on here are aimed at improving Missouri's million acres of timber and nation-leading wood industries.



To Keep Walnut From Getting the Shakes. UMC foresters are looking inside wood to see if they can eliminate some of those defects in walnut gunstocks, flooring, etc. These separations in the wood, called "shakes," are caused by anything in the tree's environment from a logging injury to an overzealous sapsucker.

To discover the cause and cure of walnut shakes, UMC scientists now have their own drying kiln on campus in which over 1,000 potential gunstocks are being monitored. Careful microscopic examinations are made of cells around wood shakes so scientists can learn about abnormalities, their causes, and how they can be prevented ●

All-Wood House Foundations are Cheaper and Superior to Concrete, UMC experts in timber design and structure say.

Wood construction, because of the characteristics of wood itself, has better insulation properties (warmer and drier) than concrete or cement block. All-wood foundation walls are made of 2 x 6's and ½-inch plywood that has been pressure-treated with preservatives to give it an "indefinite" life. Walls are wrapped in polyethylene plastic to keep the basement dry and comfortable. Also, a 6 mil polyethylene barrier is placed between the rocks on the ground and the wood floor. The rocks act as a reservoir for moisture ●

Could Double Fishing Quality. With proper management, fishing quality could at least be doubled for many Missouri waters, according to scientists in the Missouri Cooperative Fishery Research Unit. They have developed a new index for measuring fish quality which includes awarding points for fish that are caught and released and a higher point total for bigger fish than smaller ones.

To sustain fishing quality, the scientists are also testing management techniques that protect high quality fish. For example, one recommendation for improving the quality of bass fishing is to impose a maximum length limit of 12 inches. That permits reasonable removal of any surplus of small, slow growing bass, yet protects the higher quality, larger fish ●



UMC scientists have helped management of fishing areas so there is "optimum yield"—not just in total fish numbers and weight harvested, but community and state revenue, plus personal value to the angler.

A redtail hawk perches on a man-made nest.



Jeff Peters, UMC School of Forestry, Fisheries and Wildlife, is conducting a unique study of bird "imprinting"—a way they learn very early in life. He's teaching birds to imprint on an unnatural (man-made) breeding site so they're better able to survive in a changing environment.



Missouri Leads Effort to Improve Fishing. Missouri leads the nation in strategy to improve fishing quality. UMC scientists have helped manage fishing areas so there is "optimum yield"—not just in total fish numbers and weight harvested, but community and state revenue, plus personal value to the angler.

UMC scientists make these suggestions for better management of ponds and reservoirs for fishing:

- Balance the fish community. (Example: Maintain an adequate bass population to regulate the number and size of bluegills.)
- Carefully manage the fish community. (Example: Introduce gizzard shad and golden shiners along with bluegills to enhance the growth of young largemouth bass in a pond or reservoir.)

- Stock right. (Example: Missouri Parks' large, cold water springs are stocked daily with rainbow trout 10 inches long or longer at a rate of 2.5 fish per angler.)

- Proper and effective regulations. (Example: A 12- to 15-inch minimum length limit for largemouth bass in Missouri was the most effective measure for preventing harvest of bass when new impoundments were first opened to fishing)●

Caring About Birds of Prey. UMC scientists are learning all they can about the mentality of birds of prey, so they can save endangered species. In a project supported by the Cooperative Wildlife Research Unit at UMC, researchers are trying to get hawks and falcons to reproduce in captivity—something some of these birds have never done before. They

also want to build a "new genetic race" of falcons for Missouri to replace the one that has been extinct here since the mid 19th Century.

The birds have to be taught hunting, nesting, and breeding habits under unnatural conditions in hopes of helping them survive and thrive in their changing environment.

Why the concern for endangered species? Scientists believe that there is danger in heading for a simple environment—a more unstable one. The more complex the environment, the less chance one part can get out of control and throw the whole thing out of kilter. Scientists also believe that we have a lot to learn from the behavioral patterns and learning habits of these species, many of which have survived for thousands of years●



Bug's eye view shows Agricultural Research Service entomologist Benjamin Puttler using an aspirator to collect "good" insects—parasites which naturally attack crop pests.

A cabbage looper (top) is attacked by one of its natural enemies, podisus. This predator also attacks the soybean podworm, the green cloverworm, and the soybean looper making it useful to scientists trying to use "natural" means, whenever possible, to manage agricultural pests.



Pest Control

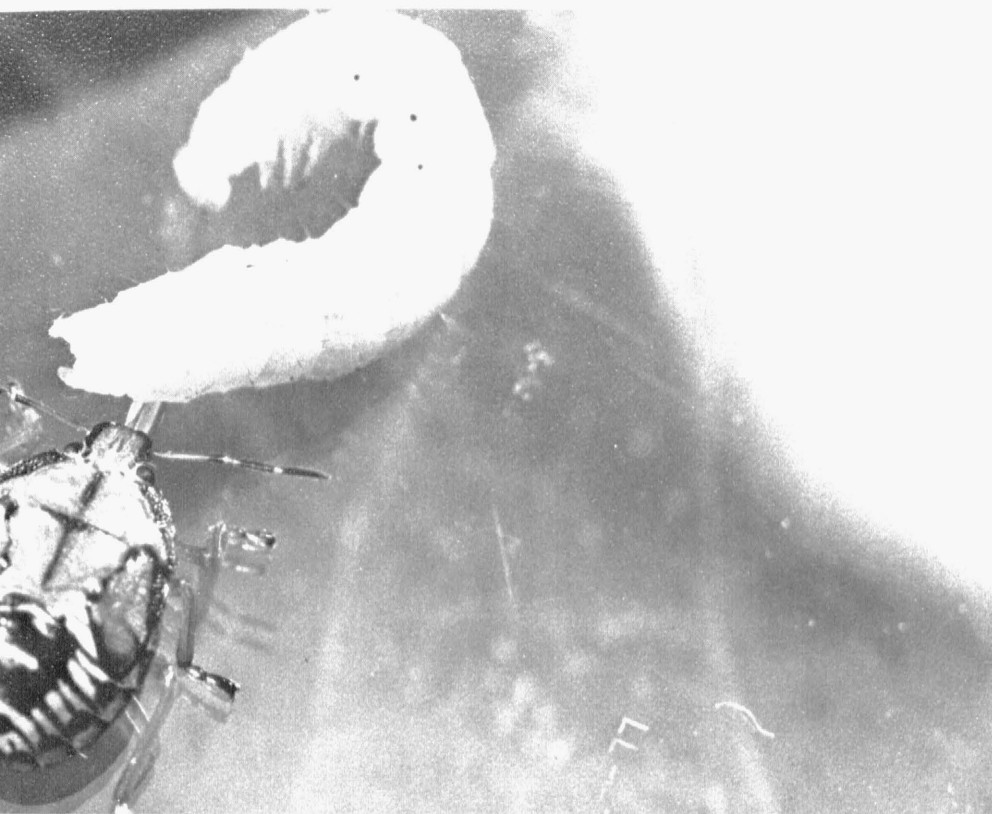
Lead Battle on Soil Pests. UMC scientists have joined those in eight other states and Canada to wage an all-out battle against soil insects that cost farmers and homeowners millions of dollars each year.

The effort is being coordinated by UMC and is being sponsored by the Environmental Protection Agency and Cooperative State Research Service.

Ultimate aim: to manage pests while minimizing damage to the environment●

Let Sleeping Bugs Sleep. A new approach to insect control has been uncovered by a UMC scientist who found that insects hibernate because of a "juvenile hormone" secreted from a gland inside their heads. By controlling that hormone, insects would die or wouldn't be able to reproduce because they would be kept from maturing.

Such hormonal control would be much safer than pesticides. Companies are working on chemical relatives or mimics of the hormone. These would effectively control specific insects without disrupting the environment●



Ambering in walnut meat causes flavor to be bitter or sour. Cause is mineral deficiencies, disease, or moisture—not the walnut husk fly as many had believed.



Forest Insect Control. UMC entomologists have been declaring war on Missouri forest insects. But not all the battles have been clear-cut victories.

On the “good news” side, they did find that *Bacillus thuringiensis* (trade name, Dipel) does a good job of controlling bagworms on Scotch Pine without harming the environment. In fact, large numbers of mourning doves, which stayed right on their nests while an infested area was sprayed, had no ill effects.

On the other side of the coin, UMC entomologists vindicated two insects but still haven’t found the real causes of walnut damage. For example, the walnut husk fly and the walnut husk maggot had been implicated as causing so-called “ambering” in the

nut meats. This discoloration of the skin over the nut meat causes the flavor to be bitter or sour. It had been thought that the flies were laying eggs in the husks, and then the larvae were reducing the husks to slimy mass which was penetrating the shell of the nut and causing the problem. UMC research showed, however, that this was not the case, and that ambering is caused by some other factors such as disease, mineral deficiencies, or moisture.

UMC entomologists also showed that bark beetles (*Monarthrum fasciatum*) are not the vectors that transport the oak wilt disease in oaks. Knowing that, the researchers will continue to look for other insect vectors●

“Natural” Pest Control Helps Protect Environment. It’s called “biocontrol” or “pest management,” and it means combining “natural” controls (like predators and parasites) with a minimum of chemical pesticides to keep pests in check.

Scientists in the Missouri Agricultural Experiment Station, who represent agriculture, forestry and fisheries and wildlife, have been teaming up to thwart agricultural pests with control measures that will not harm the environment●

Written by Joe Marks.

Designed by Ann Carmody and Vicki Russell.

Cover photograph by Paul Szopa.

The University of Missouri-Columbia is an equal employment and educational opportunity institution.

We Care About Missouri's Environment. Missouri has it all—13 million acres of forests; 19,000 miles of streams, 11 major reservoirs and the whopping Lake of the Ozarks with its 1,375-mile shoreline.

Scientists in the Missouri Agricultural Experiment Station work hard to keep the environment intact for plenty of esthetic and economic reasons. We carry out extensive research to improve fishing quality, protect endangered species, manage pests without damaging the environment, improve water quality, and keep forests alive and well.

It's a big job.

Take the forests. They cover almost 30 percent of the state. Annual timber output is 136 million cubic feet worth over \$33 million. Add to that the value by manufacture into wood and paper products, and you have a \$308 million industry that employs 21,000 workers.

Then there's fishing. Missouri has 89,000 square miles of lakes, streams and reservoirs and more than its fair share of anglers. Almost a million fishing licenses are sold annually.

Add to this the nearly 700,000 hunting licenses sold each year, plus those who can hunt or fish on their own property without a license, and you have about

45 percent of our state's population hunting or fishing.

Finally there are the big tourism and recreation industries. Thousands of in-state residents and out-of-state tourists enjoy magnificent fall color drives, float trips of some 2,200 miles on 37 major floating streams and rivers, or just plain communing with nature in their own way.

We think Missouri is a nice place to live. And we're trying our best to keep it this way●