# THE HIGHLANDS VOICE



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## Hearings On SMCRA

Despite holding hearings on a weekday morning in cities far from most affected citizens, hundreds of people turned out to testify at regional hearings on the Office of Surface Mining's (OSM) proposed amendment to the Surface Mining and Reclamation Act (SMCRA) that would allow mining in our parks, wilderness areas, wildlife refuges, historic cultural sites, wild and scenic river corridors, and within the buffer zones around homes, churches, schools, cemeteries, roads, and other public buildings. These areas were provided specific protection when SMCRA was passed in 1977. When staff at Save Our Cumberland Mountains asked for a night meeting, an OSM agency official said it would be "to big a hassle."

In Knoxville, Tennessee, over 300 citizens attended the hearing. Congressman Jim Sasser vowed to fight the proposed amendment "to the end." Melissa Smiddy of Lick Creek, Tennessee, testified that "where I live people depend on springs and wells for water. If there is a strip mine nearby, people will will lose their water. If OSM allows strip mining up to someone's back door . . . the people who own the house wouldn't have a back door or a front door left." Smiddy added, "Its bad when they mine through a cemetery" as she talked about an operator who mined a cemetery near her home. "He dug up the graves, stacked up the caskets, and stripped it. That shouldn't be allowed."

Kentuckians from the coal fields traveled through snow to attend the Lexington hearing. Maynard Tetreault of Perry County described the coal industry at the hearing. "This is not a nice industry," he said. "It's history has been one of land-grubbing, union-busting, shooting at people with machine guns. This rule change is one more blatant grab for land and money." Other commenters expressed concerned about the threat proposed rule could have on 50,000 acres in the Daniel Boone National Forest.

The proposed rule was published in the last days of the Reagan administration and is simply part of the momentum James Watt began to disembowel OSM and SMCRA. In WVHC's comments about the proposed rule, John McFerrin, Chairman of the Mining Committee, wrote: "In West Virginia, such an action would be more than just illegal. It would be a disaster. Much of the coal was severed from the surface estate in the early part of the twentieth century. Since them, owners of the surface have used that surface to build houses, schools, parks, etc. Under proposed Option 1, owners of the coal could mine right up to houses, schools, cemeteries, etc. Allowing that to happen is a long step backward toward the old days when mining companies could trample on people with impunity."

Robert Gentile, OSM director, states that it is the "policy" of the Department of the Interior to not permit mining in the federal areas protected by SMCRA. Instead, according to Gentile, Interior will acquire the coal and prevent mining. Environmentalists contend, however, that the present law has worked, policies can be changed readily, and that Interior has not requested funds to purchase these coal interest in its FY 1990 budget. The cost of acquiring all of the coal interest affected by the proposed rule is over $800 million, according to OSM. There is little, if any, assurance that Congress will pay the cost of buying coal interests. Also, OSM seems to be sidestepping the issue of what will happen to continue the protection that homes, schools, cemeteries, state parks and recreation area, roads, and other public buildings presently have under SMCRA.

The comment period on the proposed rule was extended 45 days until April 24. Over 2,000 comments by individuals, environmental, cultural, and historical organizations have been received by OSM. It is important to apply Congressional pressure on OSM to withdraw the rule, and WVHC members can continue to write their Congressmen about this issue after April 24.

## Geology, Observations, and Floods

**Steven McClelland, Coal Geologist**

*Predicting and preventing floods depends in part on a classic tool of geologists — observation.*

Geology is everywhere under our feet. But in order to see it, we need to keep our eyes open. Because they have years of training in making observations, most geologists are quite familiar with the area in which they work and live, even if they are not actively studying it. When we came to work on the morning of November 4, 1985, the normally placid Cheat River, which flows in front of our Mont Chateau headquarters, was ominously high and fast-moving. This high water was part of one of the worst floods on record in northern West Virginia. As geologists, what observations can we make about this flood and floods in general?

### Why Make Observations?

Geology is a descriptive science. Its core is a mass of observations about the world we live in. Progress in geology has come from using inductive reasoning to sift through this mass of data. It's the same way a detective thinks. Just as a detective cannot find a criminal without clues, the geologist cannot explain the physical world beneath him without observations.

When a geologist makes observations, there is often a use already in mind for the data being gathered. An example is making observations in recent roadcuts through coal-bearing rocks, to help our on-going program to remap the State's coal deposits.

But a geologist frequently sees something noteworthy that does not fit any current need. The observation is still made because the information may be needed in the future, or by someone who does not yet know its significance or cannot visit the site. While the November 4th flood was a disaster, it was also an opportunity for us to directly observe a major flood and study its effects.

Are observations about floods really needed? Isn't there a formula somewhere in which to plug a few numbers and get the answer? Consider what Linsley, Kohler, and Paulhus say in their book, Hydrology for Engineers:

> Adequate basic data are essential to any science, and hydrology is no exception. In fact, the complex features of the natural processes involved in hydrologic phenomena make it difficult to treat many hydrologic processes by rigorous deductive reasoning. One cannot always start with a basic physical law and from this determine the hydrologic result to be expected. Rather, it is necessary to start with a mass of observed facts, analyze these facts, and from this analysis establish the systematic pattern that governs these events. Thus, without adequate historical data for a particular problem area, the hydrologist is in a difficult position.*

The complexity and constant change of a river system and its floods would interest only a few specialists if people's lives were not intimately connected with them. People live, work, and play in, near, and on rivers. Most cities and towns are located on a body of water, often a river. Many rural people live near rivers, and normally it is advantageous; much productive agricultural land is located beside rivers. But when a river floods, people are injured or killed; property is damaged or destroyed; lives and economic patterns are disrupted. This disruption may continue long after the flood, and well outside the river's floodplain. For instance, the November flood sank barges and damaged navigational facilities on the Monongahela River which affected coal mining; the mines were not directly damaged by flooding, but river transportation was interrupted, halting the movement of coal.

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## Gypsy Moth and the AIPM

The Final Environmental Impact Statement (FEIS) for the Appalachian Integrated Pest Management (AIPM) Gypsy Moth Demonstration Project was released in February. The EIS provides guidelines for future site-specific analysis required by the National Environmental Policy Act (NEPA) if control measures are applied to the gypsy moth population within the AIPM project area.

Fourteen alternatives for eradication and control were considered. Six (6) alternatives were studied in detail. The Forest Service's Northeastern Area Director, State and Private Forestry Division, prepared the study. Only one chemical insectcide is being considered for the non-wilderness areas, diflubenzuron, trade name DIMILIN.

The proposal outlines forested suburban/urban area treatment using tactics designed to affect gypsy moth population and biological tactics on the gypsy moth. Gypsy moth specific tactics include disparlure (tape and flakes) release of sterile life stages, mass trapping, release of parasites that only affect gypsy moth, and the application of Gyphek (NPV). Biological tactics

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## Stewardship Week Soil And Water

Renewing the living earth is the theme of the 35th annual Soil and Water Stewardship Week sponsored by the National Association of Conservation Districts (NACD). The dates for the 1989 observance are April 30-May 7. Pamphlet materials and posters emphazing everyone's role in conservation and children's supplements with and without biblical references are available from NACD Service Department, 408 E. Main, P.O. Box 855, League City, Texas 77574-0855.

The observance begins the fifth Sunday after Easter. NACD represents some 3000 local conservation organizations in all states and territories. The first nationwide observance was in 1955.

The origin was in France, 1500 years ago in the city of Vienne. Bad weather, fires and earthquakes had brought crop failures and widespread famine. The bishop called for three days of prayer. As the practice spread it became known as Regation Days and was a formerly adopted annual practice of the Roman Catholic Church in the eighth century.

In this country, a few Southern congregations began observing the fifth Sunday after Easter as Soil and Soul Sunday. In 1946 it became the special initiative with the publisher of Farm and Ranch magazine to formalize the observance. The observance was to focus on "the ethical obligations of all people to serve as responsible stewards of the land."

# Governor Opposes MRS In WV

*Below is a copy of the letter sent to Alex Radin, Chairman of the Monitored Retrievable Storage Review Committee by Governor Caperton, and dated March 20, 1989.*

I understand that the Monitored Retrievable Storage Review Commission has been charged by the Congress with the evaluation of various strategies for the storage and disposal of the Nation's nuclear wastes. I am further advised that the Commission has held numerous public hearings and has solicited public comment for these purposes.

During your review process, some interests have suggested West Virginia as a potential site for such a monitored retrievable storage facility. While the Commission is not authorized to make such siting recommendations, this process has clearly been adopted by some to advocate specific sites, and the suggestion of West Virginia in this regard compels me to respond.

Therefore, please be advised that this administration is philosophically opposed to the siting of a monitored retrievable storage facility at any location within our state. Such a nuclear waste facility is simply incompatible with West Virginia's existing land use patterns, and would seriously impair the efforts of our state to build the tourism industry and further economic development.

Of course, West Virginia will continue to cooperate with our neighboring states through the Southern States Energy Board to properly dispose of our very small quantity of radioactive wastes generated by domestic sources. However, the nature and scope of nuclear waste disposal facilities which the Commission is reviewing obviously transcend our domestic waste disposal requirements.

For these reasons, the State of West Virginia must respectfully oppose the siting of a monitored retrievable storage facility at any location within our state. I request that this correspondence be entered into the record of your hearings in this matter.

Thank you for your consideration and attention to the concerns and position of this administration.


# Device Detects Africanized Bees

Researchers have created a portable device that identifies aggressive Africanized bees by monitoring the sound made by the movement of their wings.

The researchers, at the Oak Ridge National Laboratory in Tennessee, said the device could provide a useful and cost-efficient method of detecting the presence of the disruptive bees in commercial hives.

The portable detector was developed by Howard T. Kerr and Michael E. Buchanan, engineers at Oak Ridge, and Kenneth H. Valentine, a former researcher at the laboratory. Mr. Kerr, an amateur beekeeper whose work on safety controls for nuclear reactors provided the technology for the device, was quick to point out that what he and his colleagues have come up with is simply a new use for an existing technology.

The bees are descendants of bees that escaped after being imported from Africa to Brazil in the 1950s for breeding experiments. They are expected to reach the southern United States in substantial numbers next year.

Mr. Kerr said he and the others began considering some type of noise analysis technique for monitoring the insects after a visiting scientist from Venezuela mentioned that these bees had a noticeably different buzz from bees kept for commercial purposes.

Using acoustic signal processing methods commonly employed to detect malfunctions in nuclear reactors, the team of engineers recorded colonies of Africanized bees in Venezuela and colonies of European honeybees in this country. They discovered that the two strains move their wings at different frequencies, a quality that makes them distinguishable from one another without costly and time-consuming collecting and dissecting procedures.

Mr. Kerr said that the device, which can be worn on a belt and flashes a green light when European bees are near and a red light if Africanized bees are in the vicinity, will be marketed by a private company that he has formed with his co-workers.

**NYT, March 14, 1989**

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# Book Review

**The Ages of Gaia** A Biography of Our Living Earth; Lovelock, James. A volume of **The Commonwealth Fund Book Program** under the editorship of Lewis Thomas, M.D. W. W. Norton & Company; 237 pages; $16.95.

If you are looking for answers this book is not for you. If you are interested in the unconventional, James Lovelock presents several coherent arguments that expand his unique view of life systems. The journey from ashes to star dust is a way strewn with all the powers of technology.

Precise observations about technological solutions in the context of the corporate economy of the world preclude intrepreting the Gaia thesis as the ultimate rationalization for man's frenetic analysis and packaging of life. A convincing rebuttal to criticisms who dismiss the hypothesis as just another teleological argument is met with frank denial by the author. In fact, one gets the feeling that Lovelock will deny any attempts to present Gaia in formulated terms.

Describing Gaia in her own terms is the mission, and no less, that Lovelock determines for this summation of Gaia theory. Short of creating his own language, a new science, the science of Gaia — geophysiology— is named.

Lovelock, an independent scientist, wrote the book from his office, a converted water mill, in Cornwall, England. The history of the theory is presented in the informative and deliberate prose that characterizes the entire book.

*"In this century it is the tales of astronauts and the harvest of space exploration that has moved the locked plates of our minds. It should not therefore be necessary to explain why there is a chapter about Mars in a book on Gaia, but I will remind you that the Gaia hypothesis was a serendipitous discovery, arising directly from the invention of a method of planetary life detection intended for use on Mars . . ."*

The additional confessions of the author expand the hypothesis. As a contemporary practitioner of planetary medicine, no exact duties, goals, or other conventional measures of human activity capture the scope or responsibilities of planetary practitioners. The author gives precedents from a traditional time-line of human history by citing the accidental fortutious happenings that resulted in a pivotal discovery or intellectual breakthrough.

The concluding chapter offers the reader a paradigm for the Gaia hypothesis in terms of Lovelock's own life. Undoubtedly bursting with his own peculiar position within Gaia the tangible examples are presented to be inappropriate for extrapolation to any other's life. The strongest argument that can be presented by the author he feels to be not answers to the "whys" presented by modern sciences; but, an exploration of the dogma that provides context for contempory sciences.

Convinced that a message describing Gaia is present from Gaia herself if the "decoder" is prepared to work through errors that have inevitably become a part of the language. Just as the the initiator of a whispered message recognizes only one or two phrases from the original thought finally enunciated by the last person to receive the message.

*"Not only has Gaia stayed alive from the beginning; she has also provided a noise-free channel of chemical messages about those ancient times . . . There is every reason to believe that we share with the first ancient bacteria a common chemistry, and that the natural restrictions on the existence of those ancient bacteria tells us what the environment of the early Earth was like . . . life acts as a repeater . . ."*

Other sources from astrophysics and geology are presented. Insights are deepened by schematics suggesting alternative ways to augument the Gaia hypothesis.

# Forest Biology Research And The 21st Century

*Stanley L. Krugman, staff director, and Stephen E. McDonald, research forester, Timber Management Research Staff, Forest Service*

The modern forest manager must be increasingly sensitive to society's changing view of the forest resource. As lands that were forest are devoted to other uses such as agriculture or roads, the forest land base grows smaller. Yet the outlook is not bleak. Much of our forested land is producing at only 30 percent of its capability. So even in the face of declining forest acreage, there is plenty of room for improvement in the use of the land now growing trees. New forest products, such as flakeboard, use trees or parts of them once thought of as waste. Possibly just as important, research is providing new tools that will increase the efficiency of forest management.

New management direction from an enlightened, concerned populace, new uses for forest products, and new management in the United States.

### Selective Tree Breeding

For about 60 years scientists have been studying the genetic makeup of forest trees in the hope of learning how to breed them for faster growth, improved wood quality, improved species adaptability, and greater resistance to disease. Several breakthroughs have already occurred. In southern pines being grown for pulpwood, our scientists have charted growth rates 40 percent above normal in genetically improved stock. Pine strains with natural resistance to several native diseases, including fusiform rust, also have been located. But timber management is still hindered by both insect and disease pests and by the poor adaptation of forest trees to a particular growing site.

Now that genetics research has identified "super" trees in several commercially important species, breeding programs will enable the production of seed from these trees in quantity. Eventually all reforestation will be done with genetically superior stock. Growth gains of 60 to 70 percent should be possible, the forest of the 21st century will have increased resistance to pests.

### The New Biotechnology

Trees are so big and take such a long time to reach reproductive maturity that improving their genetic makeup through conventional methods is time-consuming and expensive. Recent advances in genetic engineering — called the new biotechnology — will help short circuit the long breeding cycle of trees. Instead of relying on natural selection to improve the gene pool over centuries, they can isolate the genes that control desirable features in a superior tree and transfer that genetically coded material to ordinary trees.

One method for transferring desirable characteristics uses "Ti" plasmids from the soilborne bacterium Agrobacterium tumefaciens. The "Ti" plasmid is a natural carrier that routinely inserts new genetic material into plant cells and normally induces tumors in such plants. Through the new biotechnology, however, scientists can now insert useful genes into the "Ti" plasmid and have the plasmid transfer them into a forest tree. There is good evidence that herbicide tolerance can be incorporated into forest trees directly by using genetic engineering techniques such as the "Ti" plasmids. If our research is successful, trees will grow that can survive exposure to the herbicides used to control competing vegetation.

In the last few years, "osmoprotectant" genes have been identified and isolated in cells of bacteria. These osmoprotectant genes allow certain organisms to cope effectively with drought and cold stress. In the future, it will be feasible to transfer osmoprotectant genes into forest trees, making it possible to extend the commercial range of certain species into areas too dry or cold for them now.

Genetic engineering will help boost growth rates in pines and firs by tricking them into fixing their nitrogen requirements out of thin air! Some tree species can fix atmospheric nitrogen naturally, but this is not a characteristic of conifers. If scientists find a way to pass this capability to pines and firs from species that already possess the trait, they will be making an improvement on nature that would greatly reduce the cost of fertilization and forest management in general.

Soon it will be possible to identify the gene or genes responsible for resistance to certain forest tree diseases. Once identified, such genes can be isolated, reproduced, and transferred into nonresistant forest trees. The resulting decrease in the number of trees now lost to forest pathogens (disease-causing agents) will go a long way toward improving that 30 percent production capability of our forested land.

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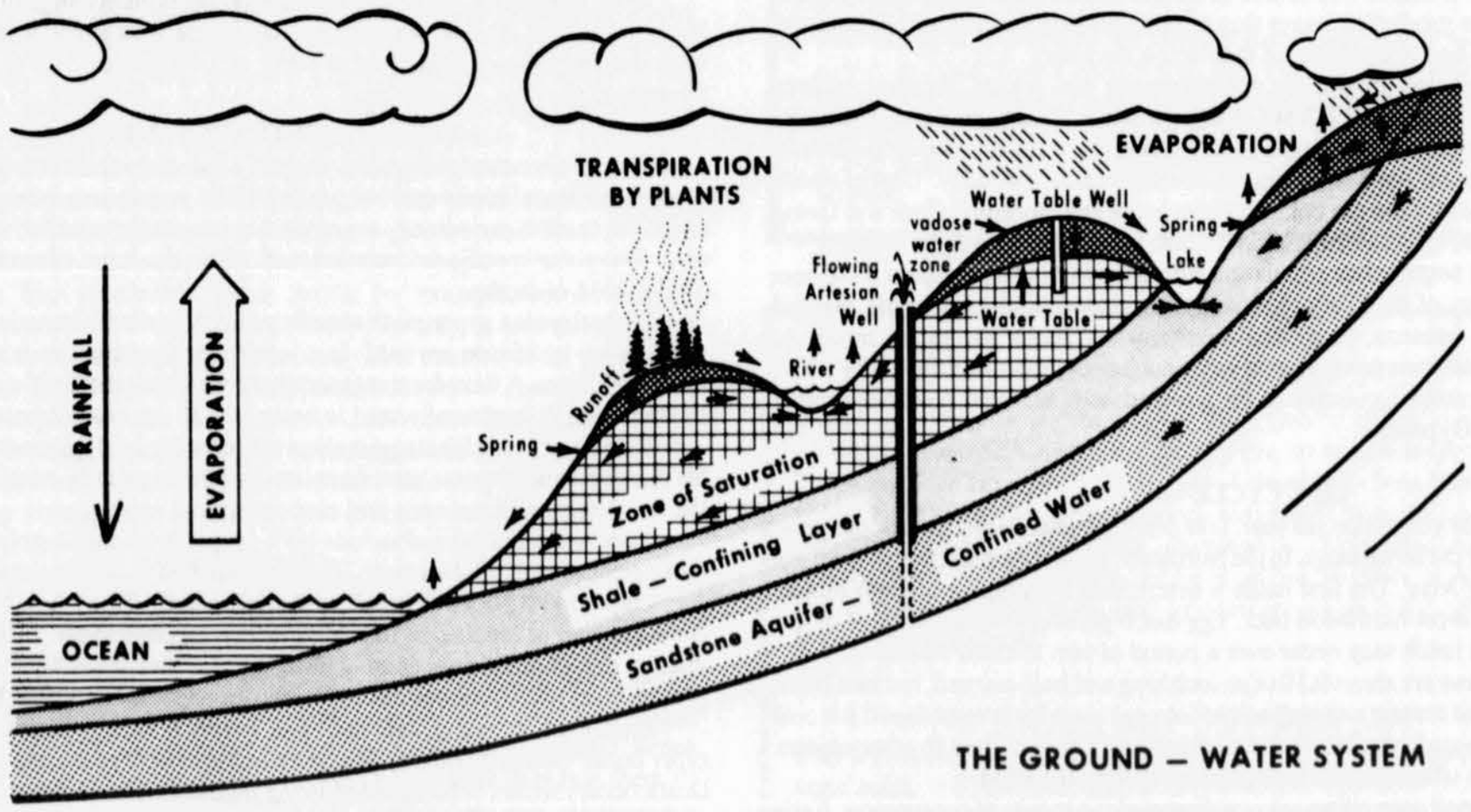



FIGURE 1.— The hydrologic cycle illustrates how water occurs in nature. Water within the zone of saturation is ground water—the source of water for wells and springs.

# Gypsy Moth and the AIPM

(continued from page 1)

include the use of Bt, release of parasites and predators, and the chemical insecticide diflubenzuron.

In general, the fifteen (15) wilderness areas within the project area will not be treated. A buffer zone of adjacent land will ensure protection of the wilderness. Specific conditions are required before wilderness would be treated: gypsy moth will have an adverse effect on an endangered plant or animal species; a potential exists, based on gypsy moth populations, that significant defoliation and tree mortality is eminent; or, a unique or rare ecosystem is affected by the moth, e.g. a trout stream. those miles of wilderness boundary adjacent to private land will receive extra monitoring to ensure infestation does not spread to private lands.

At least 50% of the project area contain gypsy moth population which have the potential for increasing to defoliating levels within 3-5 years. Covering approximately 12.8 million acres in 18 Virginian counties and 20 West Virginia counties, the AIPM project is funded by the federal government and free to private landowners who wish to participate. (See Voice November 1988)

The projects main objectives include: slow the spread and reduce adverse effects of gypsy moth within the project area; develop and evaluate (integrated pest management IPM) methods of control; develop and evaluate intervention tactics for managing isolated populations of the gypsy moth; assess the feasibility of a coordinated county, state, and federal gypsy moth program over a large geographical area.

## BIOLOGY

Introduced by colonists in the 1860's to develop the silkworm industry, the gypsy moth (lymantria dispar L.) has defoliated forest and ornamental trees on over 93,000 square miles. The first outbreak occurred in 1889 about 20 years following introduction. Spreading slowly from the Boston, Massachusetts area north to all of New England, portions of southern Quebec, south to Delaware and Maryland, west through New York, Pennsylvania, northern Virginia and northeastern West Virginia. An isolated area in central Michigan is infested. Interstate movements have resulted in isolated infestations in Arkansas, California, North Carolina, Oregon and Washington.

The preferred host of the gypsy moth is oak. Over 500 species of trees, shrubs, and vines are food for the larvae. Second to oak are apple, basswook, gray and river birch, sweetgum, hawthorne, aspen, beech, and willow. Less desired but still attacked are black birch, yellow birch, paper birch, cherry, cottonwood, elm, sassafras, spruce and pine. Older gypsy moth larvae feed on the foliage of several species that younger larvae normally avoid, particularly hemlock, pine and spruce. The gypsy moth avoids ash, balsam fir, butternut, black walnut, catalpa, red cedar, flowering dogwood, American holly, locust, sycamore, yellow poplar, and shrubs such as native laurel, rhododendron and arborvitae. During outbreaks, however, gypsy moths will feed on almost **all** vegetation.

Outbreaks are defined as cyclic in that populations periodically build to epidemic levels and then collapse. The four phases or modes as given by USDA researchers: (1) Innocuous mode: Gypsy moth populations are stable as low levels. Predation by small mammals, birds, and arthropods, as well as insect parasitism, appears to play a major role in maintaining stable populations. (2) Release phase: The exact causes which permit stable gypsy moth populations to begin building are not clearly understood. It is thought that populations build first in localized areas, having secure resting or hiding locations to escape enemies, adequate food and favorable climatic conditions before populations spread to adjacent areas. Favorable weather conditions, such as a mild winter followed by a warm dry spring and summer, increase larval survival and population expansion. (3) Outbreak mode: Gypsy moth populations build to high levels, and the larvae cause moderate to heavy defoliation of susceptible hosts over wide areas. Mortality caused by birds, mammals, arthropods, and parasites continue, but their impacts are minor. Toward the end of the outbreak, the gypsy moth virius (NPV) may begin to build in the population. (4) Decline phase: Gypsy moth populations begin to collapse as a result of over population, characterized by gypsy moth virius, reduced production of offspring, and starvation. Parasites and predators apparently play a minor role in the decline of populations.

Feeding activity of light larvae populations causes little noticeable defoliation in a forested community or hardwood stand. In comparison, defoliation by moderate populations is often evident in the upper crown portions of the tree or at the outer edges of the crown. Most defoliated trees will refoliate producing leaves that are smaller than normal and light green. Many hardwoods that have had two seasons of defoliation may die.

Factors triggering population growth are not completely understood. Weather patterns may greatly influence the RELEASE PHASE. Winter weather conditions characterized by constant snow cover for egg masses followed by a dry spring favor the survival of the larvae. Extremely low temperatures on uncovered egg masses may cause mortality. Unseasonably warm days in winter followed by intense cold may also cause egg mortality. Cool wet spring weather that delays bud break and leaf expansion on host trees causes larvae mortality.

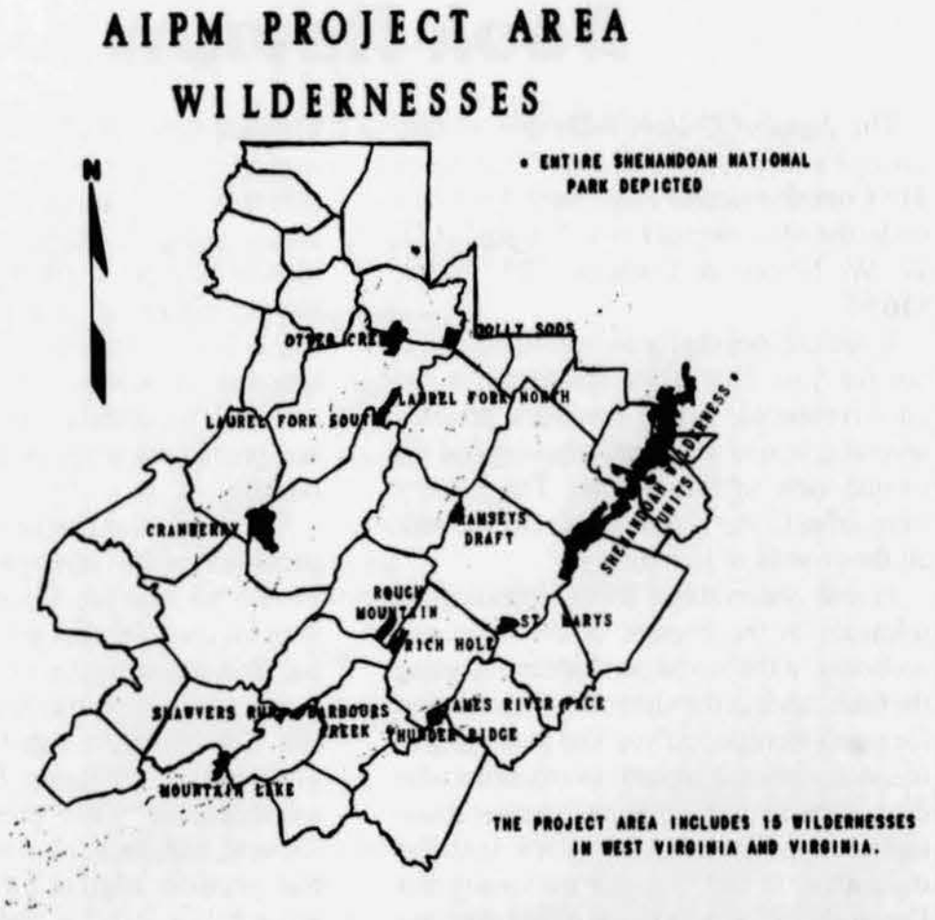
Parasites and predators help control population within the early phases. About 38 species of bugs feed on various stages of the gypsy moth and 15 species of forest mammals. Natural diseases caused by viruses, bacteria, fungi and microsporidia attack the gypsy moth. At outbreak levels the most significant natural agent is the nucleopolyhedrosis virus (NPV). The build up of this virus may initiate a collapse of the population. It has been developed into a biological insectcide, called Gypchek.

## LIFE CYCLE

Gypsy moth produce one generation per year. Like other tree-defoliating insects, the gypsy moth does its damage during the larval stage. In the Northeast, larvae begin to emerge from egg masses in late April or early May. The first hatch is determined by temperature and usually coincides with budbreak of most hardwood trees. Egg hatch generally occurs in three to five days, but in some situations hatch may occur over a period of two to three weeks.

The newly hatched larvae are about 0.10 of an inch long and buff-colored, but turn black within a few hours. The larvae remain on or adjacent to the egg mass for several days if it is cold or raining. When conditions are favorable the larvae climb to the tops of trees or other objects. They suspend themselves on silken threads and are dispersed by the wind.

The distance that the small caterpillars may be dispersed is a source of controversy. Early researchers were convinced that long-range dispersal was common. However, Mason and Mcmanus (1981), concluded that, in non-mountainous terrain, 99% of the larvae would be




diposited within about 0.6 of a mile from the source. In mountainous areas, where turbulence and updrafts are more pronounced, an atmospheric dispersion model predicted that most larvae would land within two miles downwind. Extensive aerial sampling of larvae over heavily infested ridges in Pennsylvania suggests that about 3% may have the opportunity to travel as far as 12 miles in one episode.

This method of spread, which may last for two weeks, is the primary method by which the insect infests new areas. The movement of campers and outdoor furniture from infested areas to uninfested areas, in the U.S. and Canada, is often responsible for introduction of the insect into new areas. Larvae may go through several dispersions before landing on a suitable host where they begin to feed.

As they feed, the larvae pass through several stages (instars), shedding their skin as they grow. Male larvae usually pass through five stages, and females through six. Depending on the temperature and available food, each stage lasts about 4-10 days.

Characteristic markings are developed by the fourth stage — five pairs of blue spots followed by six pairs of brick-red spots running down the larvae backs. Behavior varies with population density. At low to medium levels, larvae rest during the day under bark flaps or crevices, in cavities or broken limbs. If suitable sites are not on the tree they descend to the ground and rest under logs, rocks or other objects. When populations are high, the larvae remain on the foliage and feed day and night.

Most larvae complete their development by early July and undergo pupation in protected sites on trees or other objects. The brown colored pupae are immobile and defenseless for about two weeks. The dark brown male gypsy moths emerge before the females, are strong flyers and are most active during the daylight hours. The heavy bodied females are nearly white and cannot fly. They crawl to sites suitable for egg laying.

The females release a strong sex attractant to attract male moths to their site for mating. After mating, the females deposit their eggs in well-defined tan or buff-colored masses that may contain from a few hundred to nearly a thousand eggs. Soon after mating, the females die, but males survive for a few weeks. In about six weeks, the embroys develop into larvae that remain in the egg during winter the hatch and following spring. The size of the egg mass in a given area provides information on the health of the population.

Small egg masses, about the size of a dime indicate that the population in the area is stressed and is on the decline. Such decline may be the result of lack of food, poor-quality food or the build up of nucleopolyhedrosis virus (NPV). Large egg masses, about the size of a quarter, indicate a building population.

Upon landing on suitable foliage, the larvae begin feeding. First instar larvae chew small holes in the leaf. Second and third instar larvae feed at the leaf margins and rest beneath branches and twigs. Larvae feed at night and descent the tree to rest in protected locations throughout the day.

## INTERVENTION

Choice of control tactics will depend upon the population density and life stage of the gypsy moth. Population monitoring in the AIPM project area is based upon a gridwork of moth traps. The catch is periodically counted and evaluated to establish the growth potential for that area. Using site specific information will allow the most effective application of tactics or combination of tactics.

Disparlure is a gypsy moth specific tactic. A synthetic formula of the female sex attractant pheromone, two forms are used. In a tape form, the attractant is slowly released from a strip attached to trees. A flake form is generally applied from the air. No other organisms are affected by disparlure. It is generally used in areas of 1-10 egg masses per acre.

Release of sterile life stages is also a tactic for the 1-10 egg mass per acre level. A third tactic for this population level is mass trapping. Resembling a milk cartoon, male moths are lured by the sex attractant pheromone and captured before mating.

Insecticides considered include NPV (gypsy moth nucleopolyhedrosis virus), Bt (bacillus thuringiensis) and diflubenzuron. These are applied to hatched caterpillars as foliage expands.

Gypsy moth NPV, Gypchek, was registered by the EPA in 1978. A protein particle, the chemical must be ingested by the larvae in first of second instar. After ingestion, the virus attacks internal organs and tissues causing disintegration and death. Referred to as "wilt" disease, the process takes ten to fourteen days. It is used for populations greater than 250 egg masss per acre.

Bt is used in many varieties. The Berliner, variety Kurstaki, strain NRD-12 is for gypsy moth. Generally used in first or second instar only for areas with 250 egg mass per acre. Death occurs within 7-10 days following ingestion. The protein, toxic to many Lepidoptera, dissolves the gut causing the insect to stop feeding. Infection then spreads to other body parts.

The fatal to the gypsy moth, diflubenzuron, also has the most potential for effecting the

(continued on page 6)

# Endangered Species Need More Help

The 15-year-old Endangered Species Act requires the Interior Department's Fish and Wildlife Service (FWS) and the Commerce Department's National Marine Fisheries Service (NMFS) to develop and implement specific plans to aid all U.S. species listed as "endangered" (facing imminent extinction) or "threatened" (likely to become endangered soon). However, two new reports indicate that federal programs aimed at recovering these species — returning them to a non-threatened status — fall far short of what the law mandates.

According to a report issued Jan. 18 by the General Accounting Office (GAO), while it's not possible to save all species threatened with extinction, "biologists we interviewed suggested that recovery is possible for nearly 70 percent of the listed domestic species" — if appropriate recovery plans are enacted. However, as of May 1988, no recovery plans had been developed for 113 U.S. species —26 percent of those listed at that time. Moreover, GAO found, even for the 271 species having recovery plans, completion of recovery activities — such as creating a captive breeding program, monitoring wild populations or buying critical habitat — averaged 6.5 years.

Although FWS has jurisdiction over 96.3 percent of the listed species, GAO found NMFS has the poorer track record. NMFS had no recovery plans for 61 percent of its listed species, compared with 40 percent of species covered by FWS. Moreover, NMFS has taken far longer to begin developing those plans — average of 13.8 years, compared with 2.8 at FWS.

Officials of both agencies told GAO tight budgets were the primary reason they had not completed recovery programs for listed U.S. species. And a December analysis of FWS programs by the National Fish and Wildlife Foundation — an independent organization set up by Congress in 1984 —agrees that "the endangered species program is seriously underfunded and understaffed given the scope of its legally mandated duties." But one major reason for that, the foundation charges, is FWS' failure to let Congress — which sets its budget — know exactly how many species need "emergency" help.

And there are many. Roughly 4,600 species have been proposed for listing. FWS estimates about 1,000 of these will warrant immediate listing — and therefore protection. But under its current budget, FWS can list only about 60 species a year, the foundation notes, suggesting that even the most endangered may await federal protection for a least 16 years.

Funding doesn't explain the whole problem, however. When time and money are short, both agencies must adopt a triage approach for crisis management, GAO says. NMFS has no such system for identifying which species would benefit from the quickest attention or most money, although one is under development. While FWS does have such a system, GAO found the agency generally ignored most species highest on the priority list, concentrating instead on those with high "public appeal" or facing imminent recovery.

For example, in 1986 FWS directed 25 percent of all recovery funds not congressionally earmarked for specific species to just four animals — the American peregrine falcon, southern sea otter, gray wolf and Aleutian Canada goose. None of these is listed as endangered, GAO notes, or is even highly threatened throughout most of its range.

GAO recommends that in addition to making better use of a triage system for aiding listed species and periodically assessing whether species-recovery plans need changing, each agency should develop computerized files on the status of listed species. "[C]entralized information on the status of all listed domestic species would be beneficial," agrees Commerce Under Secretary William Evans, who says NMFS will consider developing such a file. FWS is now field-testing its own system to track a species' status.

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# Forest Biology Research And The 21st Century

(continued from page 3)

### Understanding Tree Physiology

Advances in the science of tree stress physiology are changing our understanding of how trees resist cold, drought, and disease and insect attack. Such knowledge helps us understand not only how plants function but also why certain plants grow where they do and why they respond to different environments as they do. That information, in turn, helps in the selection and development of trees that are resistant to drought, cold, insects, and diseases.

Stress physiology is related to the broader field of ecophysiology of trees — the study of the interactive relationship between trees and their environment. In other words, ecophysiologists try to determine how the environment influences the placement, nature, and function of the plants in it. Forest scientists are only beginning to understand thses complex relationships and how they alter them when they manipulate forest stands, for example, by thinning or fertilization. The operating procedure in the past has been primarily to change the forest environment through vegetation manipulation and then observe the reaction of the vegetation.

Ecophysiology examines the direct effects of the manipulation — changes in water relations, energy balances, temperature, air movement — and relates these factors to the reaction of the vegetation. Through ecophysiology, forest managers can expect to accurately predict how plant life will react to treatments on specific sites. Knowing those reactions in advance will help in choosing management alternatives that precisely match objectives.

### New Research Trend

Forest biology research is advancing rapidly along several fronts in the late 20th century. However, the trend is definitely away from research that concentrates on specific treatments at a specific site with extrapolation of results to the whole area, type, or habitat.

Instead, modern measurement, analysis, and the use of computer modeling are enabling forest biologists to measure basic physical factors that control or prompt changes in the forest. Then changes in these factors can be directly related to forest development. Better understanding of these physical forces in the environment and how to manipulate them to change the response of plants will take us to a level of forest management sophistication not even contemplated just a decade ago.

From — 1986 Yearbook of Agriculture.

# WV Conservation Organizations' Outings And Other Nature-Related Activities

| | |
|---|---|
| April 6, 7, 11, 12 | "Birding for Beginners," Mgtn - MAS |
| April 8 | Folk Medicine and Herbal Remedies, 1-4 pm, Mgtn BRAD |
| April 12 | Joint Meeting MAS and WVSC in Mgtn. |
| April 15 | Lesage WV (wildflowers) Field Trip HTSAS |
| April 15-16 | WVHC Spring Review, Blackwater Falls State Park |
| April 22 | Lake Vesuvius OH Field Trip HTSAS |
| April 23 | Identifying Wildbirds of Spring, 7-9 am, Mgtn BRAD |
| April 27 | "Birds of the Tri-State (for beginners), Huntington HTSAS |
| Late April | Medicinal Herbs Hike (T Saxe, 292-0605), Mgtn. MAS |
| April 28-30 | BBC Old Hemlock Weekend at Terra Alta |
| April 29 | Neighborhood bird walks HTSAS |
| April 29 | Exploring the Unusual Courtship of Woodcock and Snipe & Stalking Wild Turkey with a Camera in Canaan Valley BRAD |
| May 6 | Super Saturday w/ Otter Ck, Blen'hst Is. & New River Hikes TNC |
| May 6 | Local Shops and Scenic Spots, 1-4 pm, Mgtn BRAD |
| May 6 | BBC/HTSAS Century Count Day |
| May 7 | Hike and Exploration of Early Iron History, Mgtn BRAD |
| May 7 | Spring Migration & Wildflowers in Pa (S. Stebbins, 599-7015) MAS |
| May 11-14 | Wildflower Pilgrimage at Blackwater Falls State Park |
| May 13 | Kanawha State Forest Field Trip HTSAS |
| May 14 | Botanizing Hike Down the Cheat Canyon, 1-4, Mgtn BRAD |
| May 17 | Annual Banquet & "Winging It With Audubon," Mgtn. MAS |
| May 20 | Seining for Minnows in a Clear Mountain Stream, 1-4 pm BRAD |
| May 25 | Covered Dish and Members Slide Show, 6:30, Huntington HTSAS |
| May 26-29 | Blackwater Falls Field Trip (M Griffith, 522-4674) HTSAS |
| May 27-30 | Oglebay Birding Week-end, Terra Alta |
| May 30-June 4 | BBC Sortie in E. Panhandle |
| June 2, 3, 4 | WV Wildlife Week-end, Blackwater Falls State Park 800-CALL-WVA |
| June 3 | TNC fun Bird-a-Thon in E. Panhandle, So. WV and Wood Co. |
| June 4 | Learning Bird Songs (Swallow Falls), 8-12 am, Mgtn BRAD |
| June 8-17 | BBC Foray at Camp Pioneer near Beverly |
| June 10-11 | Oglebay Annual Herb Week-end |
| June 11 | Cranesville Swamp Ecology Tour, 12-4, Preston Co. BRAD |
| June 18 | Where Do They Mine All That Coal? 1-4 pm, Mgtn BRAD |
| July 8 | Stalking the Cheat Mountain Salamander, 9-5 Dolly Sods BRAD |
| July 15 | TNC Fern Hike, Mgtn. |
| July 16 | Wild Mushroom Hunting and Nature Exploration, Mgtn. BRAD |
| July 20-23 | BBC Terra Alta Week-end |
| July 29-30 | Week-end Tour of WV's Unique Natural Areas BRAD |

**Key and Contact** (if none given above):
BBC — Brooks Bird Club, Helen Conrad, Wheeling, 547-1053
BRAD — Back Roads Adventures, Mgtn, 296-0565. Reservations needed.
HTSAS — Huntington Tri-State Audubon Society, Tom Igou, 429-5409
MAS — Mountaineer Audubon Society, Mgtn, Sally Stebbins, 599-7015
Oglebay-Brooks Nature Center, Oglebay Park, Wheeling, WV 26003
TNC — The Nature Conservancy (WV Chapter), Emily Grafton, 292-0229
WVHC — The WV Highlands Conservancy, C. Rank, 924-5802
WVSC — The WV Sierra Club, Greg Good, 296-6850

This calendar is prepared for outdoor-lovers and conservation-minded folks as a service of Back Roads Adventures, Inc. For the entire year's listing to assist with planning to spend time enjoying and learning about the WV outdoors, send $3 and a stamped, self-addressed envelope to BRAD, Rt. 5, Box 228A, Morgantown, WV 26505. Additions to the calendar are welcome. They may be submitted to the same address.

### *A Hand-Mirror*

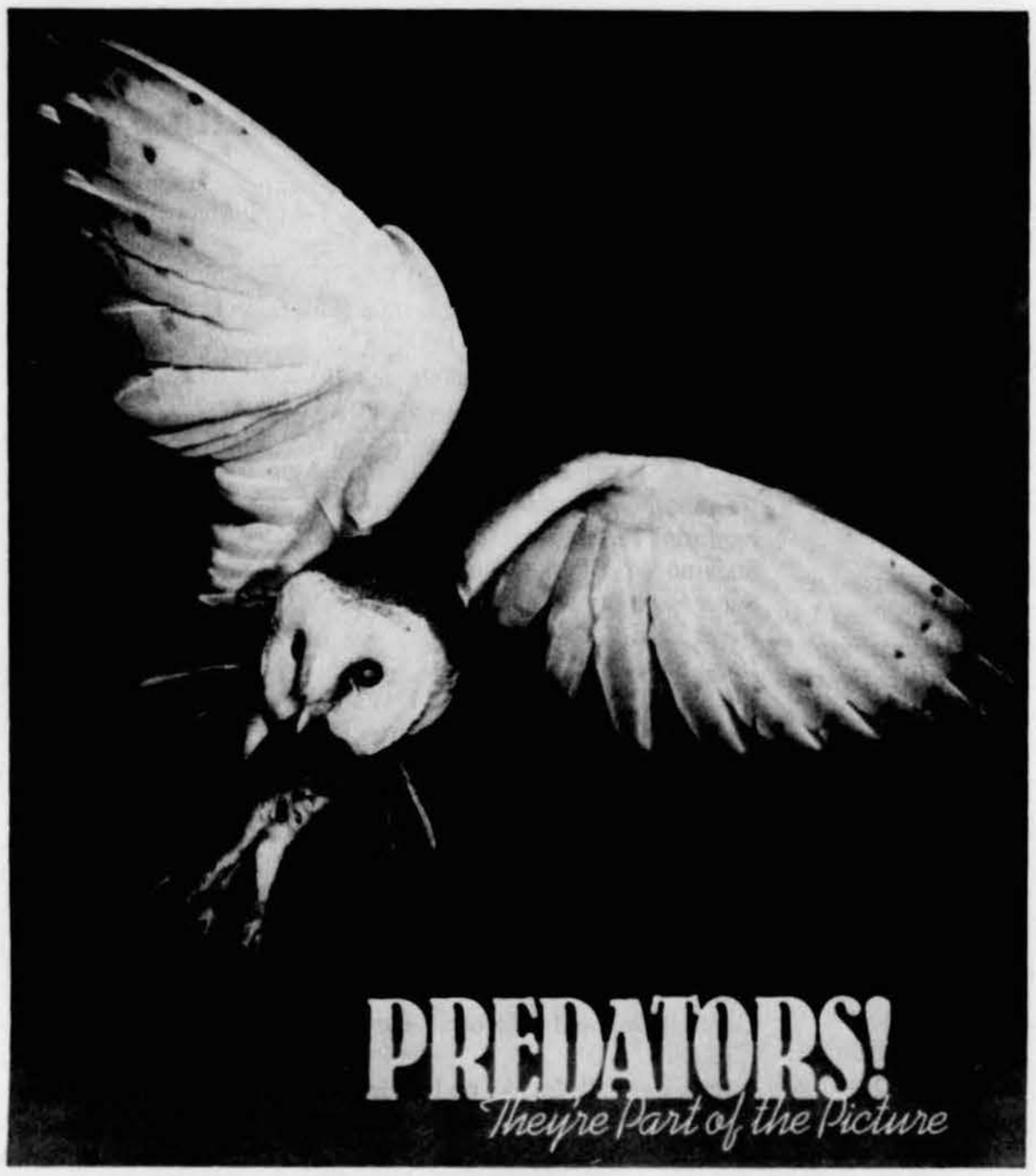
*Hold it up sternly — see this it sends back, (who it it? is it you?) Outside fair costume, within ashes and filth, no more a flashing eye, no more a sonorous voice or springy step, now some slave's eye, voice, hands, step, A drunkard's breath, unwholesome eater's face, venerealee's flesh, lungs rotting away piecemeal, stomach sour and cankerous, joints rheumatic, bowels clogged with abomination, blood circulating dark and poisonous streams, words babble, hearing and touch callous, no brain, no heart left, no magnetism of sex; such from one look in this looking-glass ere you go hence, such a result so soon —and from such a beginning!*

*Walt Whitman*

### *Perfections*

*Only themselves understand themselves and the like of themselves, as souls only understand souls.*

*Walt Whitman*




## Gypsy Moth and the AIPM (continued from page 4)

environment. Sold and manufactured under the trade name Dimilin, it is a benzoylphenylurea based chemical insectcide. It is fatal at any stage but generally applied in the first to third instar. When ingested by larvae, it caused rupture during the molt.

The half-life of diflubenzuron is shown by laboratory experiments to be 3-7 days in soil and 1-2 days in water. In water with a pH less than 4.0, persistence and accumulation is observed. Field tests give a half life of 1-4 days in soil and less than 24 hours in water. Diflubenzuron may remain on leaf surfaces for up to 60 days following an application.

The classical biological control of importing and establishing predators and augementation of natural predators may also be considered. In general, most established arthropod predators and parasites move with gypsy moth populations and are only effective at low population levels. Known predators include cotesia melanoscelus, phobocampe disparis, coencyrtus kuvanae, anastatus japonicus, blepharipa pratensis, parasetigena silvestris and AIPM project cooperating agencies. A FEIS report entitled "Gypsy Moth Suppression and Eradications Projects" was a major source of information for the eradictation techniques studied by AIPM.

# Predators: Important 'Rivets' In Our Ecosystem

**by Jay D. Hair, President**
**National Wildlife Federation**

Somehow this majestic country of ours one day became too small for the settlers that came from other lands and some of the animals that had thrived here for centuries. Predators, such as wolves and bears, were so dreaded during the frontier settlement that various human activities nearly wiped them out.

Fortunately, through the efforts of modern wildlife management and laws, such as the federal Endangered Species Act, animals that are threatened or in danger of becoming extinct are protected. Under the law, the wolf and grizzly are now recovering from nearly decimated population levels.

Still, because their habitat has been encroached by human development, ensuring that they survive remains a struggle. Recall how the 1988 reauthorization of the Endangered Species Act was held up for several years in the U.S. Senate, due in part to political pressure to allow the killing of wolves in some ranching states.

Many predators historically have been the brunt of people's misconceptions — maligned as evil, cunning stalkers of innocent lambs or other helpless prey. Then, as our society became more educated and urbanized, the popular perception of animals such as wolves and grizzlies hinged more upon their romanticized reputations from fabled Indian lore or western raconteurs' tales.

Recent public opinion surveys reveal support, even in western states, for reintroduction of wolves and grizzlies.

Support to stop direct attempts to eliminate an animal that has gained charisma in the public eye certainly has an important place in preserving certain species. The next question, however, is whether the same public realizes the need to protect less-glamorous predators. Examples are animals we all know and take for granted, such as song birds and pond frogs that usher in our spring. Direct as well as indirect actions by humans can have a tremendous impact on these species.

To help the public better understand predators, the National Wildlife Federation chose the theme "Predators: They're Part of the Picture" for National Wildlife Week, March 19-25.

One of the Federation's messages year round is that habitat destruction and pollution are certain to lead to species loss. Predators on the brink of extinction should be reminders to us of our own vulnerability. After all, man is considered the ultimate predator.

That vulnerability lies in the fact that in our complex ecosystem, delicate balances must be maintained. The unnatural loss of any species, predators included, leads to a disruption that could have grave consequences.

One conservationist uses an analogy to get the point across. "Rivet taker" is the label he applies to those who rationalize that it will make no difference to wipe out a few species, or fill in a few wetlands. He then notes how when one or two rivets are removed from the support structure of an airplane, it could still manage to fly. But when the wrong rivet, or one too many is removed, a crash is certain.

Predators, just as any other species in the global biological structure, help keep our ecosystem from crashing. While the early settlers can be excused for not realizing that, today we must ensure that all wildlife, including predators, remain part of the picture.

# *Taming Our Fear Of Predators*

Ever since the Massachusetts Bay Colony began paying a bounty on wolves in 1630, we've poisoned predators, shot them, and trapped them at every opportunity. In the 1930s, wolves and cougars were being shot and poisoned throughout our national parks. Between 1917 and 1952, Alaska paid bounties on 128,273 bald eagles.

In the past two decades, however, something has happened, according to **National Wildlife** magazine. As a nation, we have generally gone from persecuting predators to encouraging their survival, from loathing them to, in many cases, loving them. Conservationists can only cheer this long-overdue change in public perception and policy.

To biologists, a predator is an animal that kills and eats other animals. That defination encompasses an enormous number of species, including most birds, frogs, and even sponges. Cotton rats, which prey on quail eggs, are predators. So are people, although most of us ordinarily leave the killing to others.

To many nonscientists, however, predation implies tooth and claw, blood and terror. Predators are the creatures from our nightmares that can terrorize people, menace children, and devour livestock. Instead of songbirds we think of the large carnivores — wolves, mountain lions, grizzly bears, and eagles. Not so long ago these creatures were considered harmful, if not downright evil.

By the sixteenth century, any flesh-eating creature that competed with European fishermen, falconers, or gamekeepers had a price on its head. In England, bounties were placed on crows, hawks, cormorants, mergansers, kingfishers, weasels, wildcats, and other "ravening birds and vermin." Over time in western culture, predators acquired, through folk tales and fables, a reputation for greed, cunning, and viciousness.

Europeans brought this heritage to the New World, and the attitude stuck. By the mid-twentieth century, bounties and poisons had exacted a heavy toll on some species. Timber wolves disappeared from all states except Alaska and Minnesota. The red wolf was gone from the Southeast, and the Mexican wolf no longer roamed the southwestern states. Grizzlies, once widely distributed, were confined to parts of Montana, Wyoming, and Idaho. Where poison baits were left, chiefly in the West, ferrets, martens, fishers and badgers faded from the landscape.

Only in the 1930s did scientists begin to look closely at predators. Eventually, many authorities concluded that not only did predators have a legitimate place in nature — they were an essential part of it.

A dramatic example of what happens when predators are eliminated from the environment occurred with the deer population of Arizona's Kaibob Plateau, which was set aside as a game preserve in 1906. Government authorities killed mountain lions, wolves, coyotes, and eagles in a misguided effort to protect the deer. Instead, the deer population exploded then crashed as the animals exhausted their food supply and starved. Conservation pioneer Aldo Leopold concluded that the loss of predators had allowed the deer herd to grow beyond its ecological limits.

On the strength of biological studies, game managers' attitudes toward predators gradually changed. In the 1930s, the National Park Service — which in the preceding decade had assiduously shot and poisoned wolves in Yellowstone — adopted a new policy to protect predators. In 1940, the killing of bald eagles was outlawed nationwide; golden eagles were added to the protected list in 1962. Poison baits, once commonly used by the federal government to kill predators, were banned in 1972. And although some local communities still pay bounties on predators, all states have stopped.

Perhaps the ultimate indication of change came in the mid-1980s when two pairs of captive-reared red wolves were released in North Carolina's Alligator River National Wildlife Refuge. The event marked the first time that a predator extinct in the wild was restored to the wild.

Despite these strides, a battle still rages over the emotional issue of predator control. While the overall perception of killer species has improved, predators continue to feed on livestock, particularly in the West. The problem is especially notable in Nevada, where predators, chiefly coyotes, cost ranchers the equivalent of half the total value of their sheep and lamb flocks each year. Although Western sheepherders continue to hunt, trap, and, on their own land, poison coyotes, the public tends now to disapprove.

Likewise, efforts to reintroduce animals where they have been eliminated often encounter great resistance. After a 50-year absence, wolves recently reappeared on the west side of Montana's Glacier National Park. State officials, however, now fear that there is insufficient game to support both wolves and sportsmen in the area. The officials also oppose a plan by the National Park Service to reintroduce wolves into Yellowstone National Park, in part because neighboring ranchers oppose it.

If eventually we can resolve these issues and come to terms with predators, it may well be evidence of rare human wisdom. For as Purdue University biologist Durward Allen suggests, "Curious impartial sympartial sympathy toward all creatures, regardless of their diet, is an attitude of the cultivated mind."

From **National Wildlife** magazine.

# Geology, Observations, and Floods (continued from page 1)

### River Systems

Rivers have been studied from numerous points of view. Sedimentologists have looked at the sediments rivers carry (especially when they flood) and eventually deposit somewhere. Fluvial geomorphologists study the shapes of rivers and their influence on the shape of the land, through erosion and deposition. Hydrologists are interested in the behavior of the water itself. Engineers are interested in using, taming, damming, bridging, or some other practical control of the river, usually working through experience and mathematical modeling.

What picture emerges from these studies? Rivers are dynamic systems, everchanging in form. They change in response to both internal and external forces, and are so individual that knowledge gained about one river usually cannot be generalized and applied to another. Because rivers are most usefully viewed as systems, real understanding involves understanding the headwaters, the channel, the floodplain, and the mouth, rather than just one of these parts in isolation.

When rain falls, the water that does not evaporate or percolate into the soil is tugged downslope by gravity into creeks. Creeks are the river's headwaters; the source of a river. Single creeks are eventually joined by others to form one larger river channel. During low-water flow, the channel will not be filled and the banks on either side may be visible. It is when the channel is brimming with water from bank to bank, that a fluvial geomorphologist considers the river to be starting to flood. On the average this bankful flow can be expected every year or two.[1]

On either side of the channel in most river systems is the floodplain. It is the relatively flat part of the valley floor next to the river. It is this area, composed of sediments deposited by the river, which is covered by water during a large flood. The floodplain is the part of the system that is attractive for building and agriculture. But it is also the part which changes rapidly and is hazardous.

The downstream end of a river is its mouth. If the river's mouth opens into a relatively quiet body of water, such as a bay or lake, it may form a delta when the sediments "drop out" or can no longer be suspended and carried by the now slow-moving water. Or the river may flow into another river; its "end" is more of a name change than a physical change.

### Studying the Effects of Flooding

Geologists look at several key pieces of data when studying a river's behavior during flood: crest, flow, capacity, competence, erosion, and deposition.

One of the most useful tools in studying flooding is the hydrograph of a flood. This is a graph showing the amount of water flowing past a point each day. A river which has sharp, sudden floods is said to be "flashy".

Not all river flooding is so flashy. Flooding of large streams in the upper midwestern United States associated with the melting of the snow in the spring exhibits a gradual rise in river level. Downstream towns are usually warned when the river will crest and at what stage (height). There is often time to build sandbag dikes to protect lowlying areas.

Based on our observations of the Cheat River on the morning of November 4, 1985, is it a flashy river? Between 9 and 10 a.m. the water rose and covered the access road to our offices at Mont Chateau. By about 4 p.m. the water subsided, and the next morning the Cheat River remained swollen, but was no longer a raging torrent. These observations show the Cheat to be, as in 1936, a "flashy" river.

How high did the water get? Standing at the low point on the road, the water level came to a person's mid-thigh, or near the tops of the road's guard rails. This basic observation is useful if someone needed to know the elevation of the crest at that point along the Cheat River. Another method of fixing the elevation of the crest is to record the height to which debris came on the banks. Such observations must be made soon after the flood or they are lost.

### Competence and Capacity

With an increased water velocity, a flooding river has a much greater ability to move objects. A small increase in water velocity greatly increases the size of objects a stream can carry. This ability to carry objects is a stream's competence.

Another measure is the stream's capacity, the total load that the stream can carry. Capacity depends on both the velocity and volume of the stream. The stretch of Cheat River flowing past Mont Chateau is usually slow-moving, since it is near the point where the river widens out into Cheat Lake. During the flood, however, the greater velocity and volume were obvious. The increased capacity could be seen in the muddiness of the water and the large amount of debris being carried, such as trees, oil drums, and propane tanks.

### Flow

The flow of water in a river is not simple. It is turbulent — full of swirls and eddies. In a backwater, the water, as the term implies, may actually be flowing backwards. Velocity is usually greatest over the deepest part of the channel, and on the outside of bends. The water nearest the bank may barely be moving. During flooding, in fact, the high water may back up tributaries and temporarily drown their mouths. This water is "slack", flowing slowly if at all.

With little velocity, the stream's competence is low, and material in suspension settles out. As the flow waters recede, these fine-grained sediments are left behind, forming a valuable record of how high the flood waters reached. But these sediments may be washed away by the next rain, so they should be recorded immediately after the flood. Quarry Run enters the Cheat River just upstream from Mont Chateau. The little cove at the mouth of Quarry Run was flooded on November 4, and when the waters receded, an inch or two of these slackwater deposits were found.

### Deposition and Erosion

Another type of deposit the Cheat River left behind is within the lake itself. Cheat Lake was formed in 1926 after the Lake Lynn Dam was constructed on the river near the Pennsylvania/West Virginia line. The backed-up water and decreased velocity of the current changed the area behind the dam; where sediment was being carried through, deposition now took place.

Erosion of banks by flooding is also of interest. Eroding banks may imperil structures near streams and rivers, while deposition can prevent access to the water or could make the body of water useless for some activities.

### Using the Observations

What can be done with these types of observations? From observations come conclusions, a conceptual model of a river basin, and scientific understanding. Such models and understanding lead to technological progress in minimizing flood damage. This includes buildings strong enough to resist the power of the flood waters, avoiding flood-prone areas, and building flood-control dams. Many specialists are involved in such an effort. Weathermen predict, observe, and record precipitation. Hydrologists (such as officials of the United States Geological Survey) record and interpret river stages and flow. Civil engineers use the data supplied by these specialists for designing structures in and near rivers. With such a diversity of people involved in studying rivers, progress is slow but fruitful. Scientific observations are the first step in understanding, and hopefully being able to do something about flooding.

### The 100-Year Flood

Many people have the impression that a 100-year flood can only happen once in a century. In fact, there is one chance in four that 100-year floods will be less than 29 years apart, and one chance in four that they will be more than 139 years apart. The 100-year flood is really a flow of water which has a probability of 1% of being equalled or exceeded in any year.

Even so, this probability must be viewed with caution. One hundred-year floods are derived by using sophisticated statistical methods on streamflow records. This yields statistical probability, not an absolate prediction. Furthermore, good flow records for periods as long as 100 years exist for few streams, so trends must be extrapolated. Predicting the 25-year flood is much more accurate; predicting the 500-year flood is guesswork. Not only is 500 years longer than nearly any existing records of streamflow, but we know from historical records that there are significant climate changes in that length of time, and these change precipitation patterns, and hence stream flows.

### Predicting and Preventing

Can floods be predicted? Yes, in two ways. One way is general: a given piece of ground can be evaluated for the possibility of flooding. By comparing the elevation of the ground to the elevation of recorded flood crests (as seen on river stage records), one can see if the ground has ever been flooded, and how severely. By knowing the probability of a flood of a given size, the probability that the ground will be flooded can be determined.

The other way of predicting a flood is specific, that is, giving warning of an impending event. This requires a flood warning system. The four components of such a system are: collecting data (precipitation and river stage), transmitting data, forecasting the flood, and spreading the warning. By knowing the amount of precipitation and river stages (levels) upstream, by knowing the amount of moisture in the soil (to get an idea of how much of the rain will run off), and by knowing the hydrologic behavior of the particular river basin being studied, a flood prediction can be made. The system can be manual or automatic, or a combination. Manual systems are simple and inexpensive, but human vigilance is necessary. While automated systems do not suffer from boredom, equipment must be maintained, and is expensive to buy. The type of system installed will depend on the needs and resources of the community.

So, floods can be predicted. Can floods be prevented? Yes, but . . . As long as an area receives precipitation, and flooding is a natural process, floods cannot be completely prevented. One method of prevention is building dams, which prevent floods in certain areas at the cost of permanently flooding other areas (or having them reserved for flooding in case of emergency). Thus, flooding can be prevented in a valued area.

Another way around flooding is to avoid building in flood-prone areas. By not building in the area covered by, say, the 100-year flood, the probability of damage by high water becomes small. There is still flooding in the sense of high water, of course, but not flooding in the sense of damaging high water.

A third alternative is to build flood-resistant structures. By knowing the amount and velocity of water in a river's flood, a flood-resistant building could be built. So, although floods cannot be absolutely prevented, things can be done in such a way as to minimize the damaging effects of flooding.

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***R. K. Linsley, Jr., M. A. Kohler, and J. L. H. Paulhus, Hydrology for Engineers: 1975, McGraw-Hill Book Company, New York, p. 5. Reproduced with permission.**

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**[1]Obviously, a flood doesn't occur everytime it rains. Among the important factors determining whether a flood occurs or not are the capacity of soil to hold water and the amount of water in that soil as a sponge. Water dropping on a dry sponge will soak in; water dropping on a wet sponge will run off.**

**The amount of water present in soil is dependent on several things including how much rain has recently fallen, and how much of the water that has infiltrated (soaked in) has evaporated in the meantime. Related to this evaporation is how much water has been taken up by plants.**

**The rate at which water moves through soil is also important. For example, water moves quickly through sands and gravels, but slowly through clays.**

**Surface topography also plays a role. Depressions, ranging from puddles to small pools or lakes, catch runoff and can delay its flow to stream and river systems.**

**When runoff does reach streams, timing becomes critical to the occurance of a flood. Enough water must run off into streams at the same time so that high waters on headwater creeks combine to produce a flood when they flow together into a river.**

**In effect, a flood is created when rain falls at the same time over much of an already saturated river basin. This produces large amounts of runoff, all channeled at about the same time into the river channel.**

# NEWS BRIEFS

## Clues To Allergy Emerge From New Cell Studies

Buoyed by a rush of research findings about the development of allergic reactions at the molecular level, scientists are now attempting to devise new ways to block allergies before they can even begin.

Scientists have recently identified the complete structures of important call receptors and gained new insights into the chemistry of the immune reactions involved in the allergic response.

The new knowledge is allowing scientists to explore treatments that may block allergic processes at early stages instead of simply coping piece-meal with the debilitating symptoms they cause.

Researchers are already testing drugs intended to halt or modify the allergic process early in its development.

Their goal is to devise better treatments and prevention of symptoms for the millions of Americans afflicted with allergies. Among them are hay fever, many cases of asthma, particularly in children, reactions to certain drugs or foods as well as illnesses that seem much like the common cold.

"We are beginning to understand the biology and regulation of the cells that cause the clinical problem," said Dr. K. Frank Austen of Harvard Medical School, an authority on allergic diseases.

Scientists believe allergy is fundamentally a harmful mobilization of body processes that evolved to attack and destroy parasites. The main cells involved in the mobilization are mast cells and eosinophils. They originate in the bone marrow, migrate to tissues like the mucous membranes of the air passages from nose to lungs as well as the digestive and reproductive tracts. They contain granules filled with substances that can have powerful destructive effects when released abnormally in the body's allergic response.

"In my judgment there is a rensaissance in allergy," said Dr. Gerald J. Gleich, of the Mayo Medical School, Mayo Clinic and Foundation in Rochester, Minn., who has contributed much to the understanding of the functions of eosinophils.

Just why the defensive process goes astray is not known, but an early stage begins when certain antibodies, called immunoglobulin E, or IgE, that are anchored to mast cells, come in contact with a substance — the allergen — that provokes the allergic reaction. The mast cells may attract eosinophils and both may release the destructive substances from their granules. The process can cause airways to constrict and blood vessels to dilate and become leaky and can prompt the production of mucus.

Until now, therapy has been limited to countering these effects. For example, anthistamines counter histamine, one of the destructive substances. But advances in molecular and cell biology have given scientists powerful new tools.

Dr. Gleich has analyzed the contents of eosinophil granules in great detail.

In one set of experiments described last year in Hospital Practice magazine, Dr. Gleich and his colleagues tested the effects of major basic protein (MBP), which constitutes most of the protein in eosinophil granules. The scientists exposed tissues of animal airways to the protein and found changes much like those seen in asthma patients. Interior surface cells of the bronchial passages were destroyed and the airways became hyper-reactive to outside stimuli.

### Multiple Effects In The Body

Dr. Gleich said the results suggested that intact bronchial passages produce a substance that tends to make the airways relax, keeping them open when other influences would make them contract. His studies suggest that MBP released by improperly activated eosinophil cells may rob the airways of this defense, setting the stage for asthma.

In recent years scientists have discovered many substances, called lymphokines, that are produced by white blood cells and have multiple, only partially understood, effects in the human body. Some of these substances may also come into use against allergy. Antibodies designed to block one such substance, interleukin-5, have been shown to interfere with eosinophils' destructive effects against parasites, suggesting that such substances might be developed into anti-allergy drugs. Much the same is true of another lymphokine, interleukin 4. Antibodies that block its action appear to shut off the production of the allergy-related IgE antibodies.

Recently, scientists at the National Institute of Arthritis and Musculoskeletal and Skin Diseases reported in the journal Nature the that they had successfully cloned an important cell surface receptor in rodents for IgE. Part of the comparble human receptor has also been cloned and the rest is expected within weeks, the scientists say.

### New Class Of Drugs

"The discovery of the receptor structure allows us to search for a new class of anti-allergy drugs, said Dr. Jean-Pierre Kinet, one of the leaders of the research team. His co-authors were Drs. Ulrich Blank, Chisei Ra, Laurence Miller, Kenneth White and Henry Metzger, the institute's scientific director.

New treatment strategies that scientists are thinking about today include interfering with IgE antibodies in various ways or even arming the antibodies with toxins and using them as biological guided missiles to inactivate mast cells.

Attempts are already being made to use as drugs, substances designed to inactivate some of the products of eosinophils or mast cells, like the substances called leukotrienes. Another strategy being explored is to inactivate a substance that itself activates a substance that itself activates platelets, the particles that contribute to blood clotting. The platelet activating factor is capable of producing some of the effects of allergy.

Dr. Michael A. Kaliner, of the National Institute of Allergy and Infectious Diseases, said at least a half dozen clinical trials are under way on different experimental drugs to achieve these effects. Other trials are exploring the value of the anti-cancer drug methotrexate as an anti-allergy medicine because it acts against immune defense cells and the inflammatory process that contributes to the effects of allergy. Methotrexate was recently approved by the Food and Drug Administration for use against the inflammatory effects of rheumatoid arthritis.

Dr. Austen said he hopes that the future will also show ways of attacking an even earlier and more fundamental stage of the allergic process by reducing the numbers of mast cells or eosinophils or manipulating their ability to function.

Success in these efforts might substantially reduce reliance on antihistamines, steroid drugs and "desensitizing" regimens in which skin tests identify the particular substance to which a patient is allergic and the patient is given repeated injections of it.

Today, scientists understand allergy much better than ever before, said Dr. Kaliner, an expert on asthma and other allergic diseases at the National Institute of Allergy and Infectious Diseases. The institute is a major unit of the N.I.H. His current research is on the biology of the mucous membranes that line air passages from nose to lungs, seeking to understand the details of how those membranes act in asthma, hay fever and the common cold.

"I've been in this field for almost 20 years and the difference is like night and day," said Dr. Kaliner.

Dr. Austen, chairman of the department of rheumatology and immunology of Brigham and Women's Hospital in Boston, said most of the current experimental drug strategies represent only intermediate steps against allergy. The future, he believes, will see strategies, yet to be developed, that will allow doctors to use drugs to regulate the numbers and activities of the mast cells and eosinophils themselves.

Dr. Austen thinks the future of allergy research and treatment is particularly bright, because the new tools of molecular and cell biology give scientists powerful new ways of studying the allergic process.

"I'm very optimistic about where we are," Dr. Austen said, "because with molecular biology we can now answer in a year, questions that used to take a decade."

**New York Times, Tuesday, 1/31/89**

## Permit To Increase Discharge Into River Draws Opposition

Island Creek Coal Co.'s application to increase the legal limit of manganese that can be released into a tributary of the Buckhannon River was outlined by a company official and opposed by a group of fishermen, environmentalists and Buckhannon area residents during a hearing Wednesday before the state Water Resources Board.

The controversy involves a mining operation along a fork of Tenmile Creek in Upshur County, and dates back five years.

In 1984, when the mine was operated by Enoxy Energy, caustic soda from an acid treatment pond spilled into Tenmile Creek, making its water 10,000 times more alkaline than normal. All aquatic life, including a resident population of brook trout, was killed, according to DNR reports following the incident.

Subsequent DNR fish surveys have shown the stream to be "infertile," while an undisturbed fork of Tenmile Creek continues to support a trout population.

Stephen Keen, Island Creek's environmental affairs officer, said he does not dispute that trout once lived in the stream and that mining practices at least contributed to their demise.

"But it's our understanding that the stream never did fit the state's definition of a trout stream," Keen said, in explaining why his company referred to Tenmile as a "small, non-fishable stream" when applying for the discharge variance. Even though DNR surveys confirmed the presence of trout prior to the 1984 spill, the stream was not included on the state agency's official listing of high-quality, trout-supporting streams, he said. Keen added that Island Creek does not seek a lower stream quality designation for Tenmile Creek from the DNR.

Keen said the stream's continued degradation problems stem from other sources, including the presence of mine acid seeps, which the company is working to correct.

Cindy Rank, president of the Highlands Conservancy, said the Buckhannon River's degradation as a drinking water source was the main reason she opposed granting the variance. Buckhannon's city water system, she said, already has to buy special chemicals just to treat for excessive manganese content.

Granting a variance to Island Creek, she said, "would set a precedent for other creeks that are impacted by permitted or unpermitted mines — they could pass on treatment costs to downstream users."

"A reward given for killing a trout stream is ludicrous," said Lou Schmidt of the Mountaineer Chapter of Trout Unlimited, who added that Island Creek "has a history of pollution violations," and called on the Water Resources Board to "restore (Tenmile Creek) to its designated use as a sport fishery."

**The Gazette, 2-16-89**