



# THE HIGHLANDS VOICE

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## President Appointed Deputy Director

West Virginia Governor Gaston Caperton has appointed Charleston attorney Larry W. George as Deputy Director of the State Department of Natural Resources. George, 34, will be responsible for policy development and state and federal legislation in environmental and resource conservation programs. He took office with the Caperton Administration on January 16, 1989.

George served as President of the West Virginia Highlands Conservancy from 1983 to 1986. On a pro bono basis, George represented the Conservancy in the U.S. Congress on surface mining, river conservation and public lands legislation from 1976 until 1987. His Congressional work included the 1982 legislation designating West Virginia's 35,500 acre Cranberry Wilderness Area and the West Virginia National Interest Rivers Act of 1988 (H.R. 900).

John Purbaugh, Past President of WVHC, succeeded George as President. He was happy to comment on George's new position: "Larry's background as both engineer and lawyer serve as good preparation for his new job. Too often, agency administrators are fluent in either the science or the law and politics of the field, but are unable to combine the two into coherent policy, as Larry can. While President of the Conservancy, Larry began our current emphasis on river corridor protection, and before that, lead our successful effort for Congressional designation of the Cranberry Wilderness area."

George has been engaged in the private practice of law since 1982. While in private practice, he also served as staff counsel for the West Virginia House of Delegates (1988 regular session) and as Majority Counsel of the West Virginia Senate (1984-85 regular sessions).

Prior to his legal career, George was a civil engineer trainee with the Huntington District, U.S. Army Corps of Engineers from 1976 to 1979. He was also an environmental policy specialist with the U.S. Office of Surface Mining in Denver, Colorado during 1981.

In 1978, Governor John D. Rockefeller appointed George to a four year term on the State Water Resources Board. Since 1985, George has served on the U.S. National Coal Council which advises the U.S. Secretary of Energy in coal and energy policy.

George received a B.S. in Civil Engineering from Virginia Polytechnic Institute & State University in 1979 and received his law degree from West Virginia University in 1982.

## Military Overflights Pose Major Threat, Say Parks

Low-flying military aircraft have become a leading threat to the sanctity of our national parks, according to a recent National Park Service survey. Managers consistently ranked "military overflights" an immediate threat.

Around the country, park visitors and wildlife increasingly are being disturbed and frightened by the deafening roar that accompanies F-4 Phantom jets, A-6 Starfighters, F-14 Tomcats, and other military aircraft on low-flying training exercises.

Pilots of the aircraft often swoop over parks at an altitude of several hundred feet or less at hundreds of miles per hour. Though pilots may simply be ignorant of park boundaries, critics charge many overflights result from sightseeing diversions or displays of aerial bravado.

While the problem is not new, its increase in frequency is the result of changes in military strategy over recent years. These changes emphasize the use of low-flying, high-speed jets that avoid radar detection.

## The Greenbottom Society Formally Organized

*We have the right to resist and we have the obligation; not to defend that which we love would be dishonorable!*

—Edward Abbey, *Eco-defense*

The Greenbottom Society, organized to preserve and promote the archaeological, ecological, and historical aspects of Greenbottom (Glenwood Bend Mitigation Area), has been formed. The plight of Greenbottom, with its wetlands habitats, General Albert G. Jenkins historical home, and Clover site, was highlighted in the January issue of the *Voice*. The Greenbottom Society is comprised of conservationists, historical preservationists, archaeologists, civil war re-enactors, Marshall University representatives, and wide variety of other civic and environmental groups. Janet Fletcher has been named acting chairperson for the Society.

The Society has proposed the establishment of the Greenbottom Natural History Preserve, which would restore the General Jenkins home as a living museum for pre-civil war history and develop the 838-acre plantation as West Virginia's first non-game wildlife refuge. The Army Corps of Engineers owns the land and plans call for the WV-DNR to lease and develop the land as a public hunting and fishing area.

Anyone interested in the current controversy over Greenbottom or finding out more about The Greenbottom Society and its efforts should contact the Society, c/o The Huntington Museum of Art, Park Hills, Huntington, WV, 25701. We welcome all input.



Larry W. George appointed Deputy Director of DNR.

Although the Federal Aviation Administration recommends that pilots not fly below 2,000 feet in national parks, the agency is powerless to enforce its advisory. The military itself has a policy barring flights of 3,000 feet or less, and yet NPS files are rife with reports of jets flying low over parks.

Military officials claim disciplinary action has been taken against some errant pilots. Park rangers, however, characterize the military as indifferent, arrogant, and irresponsible to requests to end the flights.

Officers claim there is nothing they can do unless park managers cite the identifying number from the offending plane's tail section — usually an impossible feat. Military officials have even, on occasion, denied flights below 3,000 feet ever occur over parks, despite evidence to the contrary.

In the meantime, the *Sacramento Bee* conducted an in-depth, nationwide investigation into the matter, and published the results in a special report. According to the report, noise from jets has cracked the eggs of endangered birds in the Everglades and dislodged bricks from 142-year-old Fort Jefferson National Monument, a nearby island just off the coast of Florida.

The same article detailed a near mid-air collision over Sequoia National Park this summer between a helicopter carrying park supplies and an F-4 Phantom jet. Reports abound — from North Carolina's Cape Lookout to the desert parks of California — of visitors terrified by the sudden roar of military jets.

Russ Butcher, NPCA's California/Southwest regional representative, called the current situation at Grand Canyon a disaster waiting to happen. Low-flying military aircraft frequently barrel through the canyon in excess of 500 mph, cutting through the same airspace occupied by commercial air tours.

NPCA has long urged the FAA to end illegal flights over national parks around the country.

(From *National Parks*, Nov/Dec 1988, the magazine of the National Parks and Conservation Association.)

## Sources Of Groundwater Pollution

As the odyssey of the Long Island garbage scow, *The Mobro*, amply demonstrated the waste disposal problem in Canada and the United States is double-edged. Officials in both countries are being pressed to find new methods of disposing of huge amounts of refuse daily while handling them safely.

Safe disposal techniques are of particular concern in areas where groundwater is the primary source of drinking water. Recent EPA surveys of groundwater wells in the United States indicate that several long-accepted methods of disposing of domestic and industrial waste may endanger groundwater supplies.

Heading the list of questionable disposal practices are septic tanks and cesspools, used, according to EPA estimates, by over 16 million American homes to handle water-borne wastes.

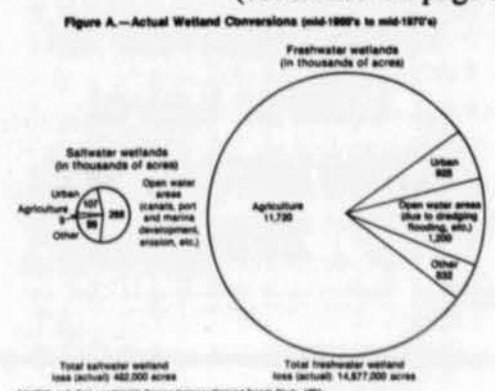
Underground tanks endanger the groundwater because they regularly release wastewater into the surrounding soil. (Total discharge of liquid waste from every cesspool and septic tank in the United States is believed to exceed one trillion gallons each year.) The waste can percolate through the soil, eventually contaminating wells.

The waste stream contains potentially dangerous organisms and chemicals, including coliform bacteria, viruses, nitrates and several heavy metals. Homeowners have contributed to the problem by having their septic tanks and cesspools cleaned with trichloroethylene (TCE). This chemical, a known animal carcinogen, is now commonly found in contaminated groundwater.

The U.S. Congress amended the Safe Drinking Water Act in 1986 to control contamination of groundwater wells. Under provision in the Act, EPA is in the process of setting maximum contaminant levels (MCLs) by 1989 for at least 83 pollutants, including TCE and several heavy metals as well as viruses and other organisms released by septic tanks and cesspools that may pose a threat to human health.

Another leading source of groundwater pollution is underground injection of industrial wastes. The Office of Technology Assessment has estimated that over 250,000 injection wells are in use in the United States to dispose of hazardous and non-hazardous liquid wastes.

(continued on page 3)





## From The Heart Of The Mountains Why K & B?

At a public hearing in the Webster County Courthouse January 12th the President of K & B Coal Company asked, "Why me?! Why single me out and pick on K & B?!"

My presentation on behalf of the Conservancy and several others on behalf of Trout Unlimited and the Bass Federation earlier in the evening provided an answer to that query. K & B was not being singled out. In fact, any proposals to strip the Kittanning Coal Seams in the Holly River drainage, especially the Left Fork, would meet with the same opposition.

Geological, biological and historical data submitted in response to the K & B application indicate that this is an acid prone site and is likely to negatively impact the lightly buffered streams in the area.

The site is near the "hinge line" that divides the acid producing area to the north from the non-acid producing area to the south. There is good reason to believe that K & B will be more like the acid-producing Island Creek operation to the north at Tenmile on the Buckhannon River, rather than the non-acid-producing Julianna mine to the south at Erbacon near Webster Springs.

Ongoing treatment at Tenmile is necessary to maintain the quality of the Buckhannon River so that the City of Buckhannon can use and distribute that water for domestic use throughout the county. Tenmile, its tributaries and the Buckhannon itself were, at one time native trout waters. Some 17 miles of those streams have been killed by drainage from the Island Creek operation and the nearby abandoned — now state owned and operated — DLM site at Alton. The River has also been severely impacted by both over and under treated slugs of water during the past 15 years.

Treatment has cost \$1 Million/year at Tenmile and \$1/2 Million/year at Alton.

K & B has submitted data to show that the Hodam Mountain minesite will not produce acid... But, the tests K & B has run and the Acid-Base Accounting methods they're relying on were also used by Enoxy/Island Creek at their Job #10 site. The tests at Job #10 also indicated that there would be little likelihood of the mine producing acid, but today, acid does flow from Job #10. The drainage has killed 3 more trout streams in the Tenmile area and continues to damage the downstream end of Tenmile Creek as it flows into the Buckhannon River.

Although mining 105 acres on the Holly River won't immediately duplicate the massive problems on the Buckhannon, even the smallest amount of acid will impact the lightly buffered Hodam Creek, the unnamed tributary in Light Hollow and the Left Fork of the Holly.

Furthermore, K & B made it clear at the public hearing that they have bigger plans for more mining once they get underway on Hodam. And, sad to say, history in the state shows that, once begun, the process of granting permits is difficult to stop — even in the most disastrous situations like Tenmile.

There are some areas in the North Central part of the State where strip mining the Kittanning Coal Seams should be prohibited. The Conservancy has supported such a prohibition since the early 1980's and continues to oppose expansion of mining in these areas where water resources are sacrificed for the removal of coal resources.

The Holly River watershed is on the Southern edge of this acid prone area. And the K & B permit promises to be the proverbial foot-in-the-door for extensive mining on the Holly.

### To the Editor:

I would like to share some thought provoking quotes printed in the Sunday Charleston Gazette on May 22, 1988. The excerpts are from a speech given by Denise Giardina in honor of National Library Week:

*"Nor do I believe this state will ever prosper as long as it pulls the burden of the coal industry along behind it like a sprinter trying to win a race while dragging a ball and chain.*

*The coal industry has brought widespread destruction to the state. It has provided jobs but it has withdrawn them just as capriciously and has created conditions which make expansion in other, more dependable economic areas difficult if not impossible. This has to be recognized and spoken of and acted upon or nothing will change in West Virginia."*

*"I hope we can begin to ask why we should support an industry which will employ few of us and force most of us to leave. I hope we can change our assessment of the coal industry, can begin to see it not as our only asset, but as our greatest liability, to be phased out and replaced by more healthy, constructive industries."*

Submitted by Richard diPretoro

**ATTENTION:  
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Dear Editor:

**SPACE-SHIP EARTH—REAFFIRMED.** Remember the shock of the photograph our astronauts took of the Earth from space... How small the Earth looked! The space-ship earth concept naturally followed. The even still global effects of our actions has been validated again.

A Connecticut power company in starting up a coal-fired electric power plant, will plant 50 million trees — in Guatemala. This will prevent further increase in carbon dioxide levels and its greenhouse effects. These trees should take up 15 million metric tons of carbon. The amount the new 180 megawatt plant will emit over its 40-year life span. Tree planting will cost over \$5 million. They are being planted there because the country of Guatemala and C.A.R.E. are helping with the cost as a needed reforestation project.

Sincerely,  
A Voice Reader



## — Book Review —

by Don Gasper

**OUR COMMON FUTURE**, by The World Commission on Environment and Development (383 pp., \$9.95, Oxford University Press).

This recently issued final report should be winter reading for environmentally concerned individuals who recognize the relationships between the local and global environment of spaceship earth.

The world commission was created by the United Nations General Assembly in 1983. Since then it has been meeting to come up with international agreement about the nature of the critical environmental issues and their solutions. It is a twenty-one country agreement. The United States Representative was the first U.S. E.P.A. administrator, William Ruckelshaus. This book is the culmination of this effort. It is the unanimous agreement of very different individuals from twenty-one countries from all parts of the world (the industrialized and developing countries) on such a broad-ranging environmental spectrum that balanced overall perspectives could be drawn.

**Our Common Future** begins with an overview and is followed by twelve chapters dealing with sustainable development, international economic influences, population explosion, starvation and quality of life, species and ecosystems, energy, industry, the urban challenge, managing the "global commons", peace and the arms race, and proposals for legal and institutional change.

Nothing was slighted, and they reached two conclusions. First, human activities are

beginning to affect the environment on a regional, even global scale, and some adverse impacts may be irreversible. Nations must cooperate on an "urgent" basis to protect resources of global import. Otherwise, we soon will exceed nature's limits and leave a diminished heritage to future generations.

Secondly, the developing nations must be allowed the economic growth that is environmentally sustainable. In more detail, it is an enormous challenge to meet the needs of these people without destroying the biological systems — forest, grazing lands, croplands and fisheries — on which they must depend for food, fuel, shelter, and other necessities.

When the report considers solutions, it often consists of merely discussion of many alternatives, without further direction. However, the clear review of alternatives is very valuable. The report recognizes this limitation and suggests a follow-up regionally and ultimately a global conference to review progress. Having provided a world view of our environmental problems, and made the point of urgency; it is perhaps up to us, those outside and inside of government, to be sure the needed actions are taken to turn **Our Common Future** into a national and international agenda — with the United States leading the way.

(Reviewed by *Thos. B. Stoel, Jr.*, *The Amicus Journal*, Fall 1987.)

Also available and of interest:

**Groundwater Protection**, by Conserva-

tion Foundation Staff and The National Groundwater Policy Forum, Spring 1987; 256 pages, figures, indexes, \$15.00/paperback. The product of a joint effort by The Conservation Foundation and the National Groundwater Policy Forum, this book contains the Forum's final recommendations released earlier in the report, "Groundwater: Saving the Unseen Resource," November, 1985. The Forum calls for an aggressive national policy to assure that future generations have adequate supplies of uncontaminated groundwater. The Forum urges "a new environmental partnership" among all levels of government, business, and public interest groups. Its recommendations include a comprehensive 10-point groundwater protection program for state governments to adopt. The book also contains a summary of public comments on the Forum's proposals, presented in writing and at three public hearings, and an extensive analysis of the groundwater pollution problem prepared independently by The Conservation Foundation staff. Included is substantial reference material on groundwater issues discussed in the Forum's report. The National Groundwater Policy Forum was funded by grants from the William H. Donner Foundation, Exxon Company, USA, The Ford Foundation, the H. J. Heinz Company Foundation, The Joyce Foundation, and the F. H. Prince Testamentary Trust. The Conservancy Foundation, 1250 Twenty-Fourth Street, N.W., Washington, D.C. 20037, Telephone (202-293-4800).

### Wetlands

"Protecting America's Wetlands: An Action Agenda," the final report of the National Wetlands Policy Forum, November, 1988. Individual copies are available free.

The full final report of the National Wetlands Policy Forum containing sections on establishing a national goal, planning for wetlands protection, promoting private stewardship, improving regulatory programs, reducing government-caused conversions, improving government acquisition programs, providing better information, restoring and creating wetlands protection management.

"Issues in Wetlands Protection: Background Papers" prepared for the National Wetlands Policy Forum, a research report edited by Michele Leslie, Edwin H. Clark II, and Gail Bingham, approximately 175 pages, \$17.50.

Contains background papers prepared by The Conservancy Foundation staff and consultants. Topics include rates of wetlands loss, wetlands definitions, goals for wetlands programs, advance planning and consensus building, nonregulatory programs promoting wetlands protection, overviews of and gaps in existing regulatory programs, mitigation policies, government programs inducing wetlands alterations, and scientific issues related to the restoration and creation of wetlands.

The Conservancy Foundation, 1250 Twenty-Fourth Street, N.W., Washington, D.C. 20037, Telephone (202-293-4800).

## Monongahela National Forest Hiking Guide Now Out

Edition 5 of the WVHC **Monongahela National Forest Hiking Guide** is now available. This edition is bigger and better than ever, with 320 pages, 60 maps, 39 photographs, descriptions of 164 trails totalling 780 miles, a new section on ski-touring, and a full-color cover. The authors are Allen de Hart and Bruce Sundquist. Allen has hiked all the trails of the Monogahela N.F. over the past few years. Bruce edited Editions 1-4. The hiking community and the U.S. Forest Service provided the authors with trail reports and photographs.

In the U.S. Forest Service's planning process that led to

the 1986 Land and Resource Management Plan, over 35,000 comments were received from the public. The gist of these comments is that the Monongehela is a "Special Place." And indeed it is. The hiking and backpacking opportunities it provides are among the best in the eastern U.S. The more outstanding areas are becoming known far and wide — Otter Creek Wilderness, Dolly Sods Wilderness, Flatrock Plains, Roaring Plains, Blackwater Canyon, Spruce Knob, North Fork Mountain, Shaver's Mountain, Laurel Fork Wilderness, Cranberry Back Country, Cranberry Wilderness, among others. This guide will help you get to know

these and other special places in the forest.

Profits from the sale of these guides support a wide variety of worthy environmental projects in the West Virginia Highlands Conservancy.

To order your copy of **Monongahela National Forest Hiking Guide**, send \$9.95 plus 6% sales tax for WV residents, plus \$1.25 postage (book rate) to West Virginia Highlands Conservancy, 1205 Quarrier St., Lower Level Charleston, WV 25301.

## Sources Of Groundwater Pollution (continued from page 1)

Wastes disposed of in this manner are pumped into deep, underground pockets or into aquifers which cannot be used for commercial or domestic consumption. In theory, these underground disposal sites are safe, as they are to be confined and isolated from wells used for drinking water. Recent studies, however, indicate that underground injection can threaten groundwater reserves. EPA has reported that over 21,000 injection wells require corrective action.

Many of these wells are poorly constructed or designed, allowing injected waste to seep into neighboring aquifers. Others are poorly located, so that waste seeps directly into drinking water supplies. Some wells while located in stable and confined underground pockets, cannot contain the injected wastes, which manage to migrate to active groundwater wells.

EPA has already taken steps to mitigate pollution from underground injection. Under

the Safe Drinking Water Act, it has established underground injection programs in 20 states and partial programs in six states, while granting 31 states and territories full control over their own programs. Working under federal regulations, the states have established guidelines for construction of the wells and rules for monitoring chemicals injected underground.

A third source of groundwater contamination is landfilling. Municipalities and industry have relied extensively on landfills to dispose of hazardous and non-hazardous solid wastes. EPA estimates that there are over 93,000 landfills in the United States, with 75,000 used for industrial waste and 18,500 used for municipal disposal.

However, as the disaster in the Love Canal area of upstate New York clearly demonstrated, landfills can, in addition to other problems, threaten drinking water supplies, especially when they are not prop-

erly constructed and maintained. Chemicals and organisms can leach through the confines of the landfill and contaminate drinking water wells.

A survey of 12,991 municipal landfills by *Waste Age Magazine* found that 2,396 were open dumps, only 37 had artificial liners to contain the waste and only 1,609 had monitoring wells to detect potential contamination of groundwater supplies. The problem is magnified when abandoned municipal dumps are added to the list. The Office of Technology Assessment estimates that the number of abandoned landfills could exceed the number of active ones.

In 1986 Congress passed the Superfund Amendments and Reauthorization Act (SARA) directing EPA to control pollution from previously uncontrolled hazardous waste dumpsites, including leachates which endanger groundwater reserves. EPA is currently using this legislative mandate to clean

up contaminated sites around the United States.

Under provisions in the Resource Conservation and Recovery Act (RCRA), EPA is drawing up regulations for hazardous waste disposal and standards for municipal solid waste disposal. Legislation is pending in both Houses of Congress which would direct EPA to tighten controls over disposal of hazardous ash from municipal waste incinerators.

Canada is also in the process of assessing groundwater contamination from waste disposal sources. The Canadian Parliament is now considering legislation which would require "cradle to grave" management for toxic chemicals, including safe disposal methods for hazardous substances. The House of Commons has recently enacted the Environmental Protection Act. **Environmental Perspectives — Canadian Embassy**



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(Terms expire October 1990)

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Dear Editor:

SPACE-SHIP EARTH—REAFFIRMED. Remember the shock of the photograph our astronauts took of the Earth from space... How small the Earth looked! The space-ship earth concept naturally followed. The even still global effects of our actions has been validated again.

A Connecticut power company in starting up a coal-fired electric power plant, will plant 50 million trees — in Guatemala. This will prevent further increase in carbon dioxide levels and its greenhouse effects. These trees should take up 15 million metric tons of carbon. The amount the new 180 megawatt plant will emit over its 40-year life span. Tree planting will cost over \$5 million. They are being planted there because the country of Guatemala and C.A.R.E. are helping with the cost as a needed reforestation project.

Sincerely,  
A Voice Reader



## — Book Review —

by Don Gasper

**OUR COMMON FUTURE**, by The World Commission on Environment and Development (383 pp., \$9.95, Oxford University Press).

This recently issued final report should be winter reading for environmentally concerned individuals who recognize the relationships between the local and global environment of spaceship earth.

The world commission was created by the United Nations General Assembly in 1983. Since then it has been meeting to come up with international agreement about the nature of the critical environmental issues and their solutions. It is a twenty-one country agreement. The United States Representative was the first U.S. E.P.A. administrator, William Ruckelshaus. This book is the culmination of this effort. It is the unanimous agreement of very different individuals from twenty-one countries from all parts of the world (the industrialized and developing countries) on such a broad-ranging environmental spectrum that balanced overall perspectives could be drawn.

**Our Common Future** begins with an overview and is followed by twelve chapters dealing with sustainable development, international economic influences, population explosion, starvation and quality of life, species and ecosystems, energy, industry, the urban challenge, managing the "global commons", peace and the arms race, and proposals for legal and institutional change.

Nothing was slighted, and they reached two conclusions. First, human activities are

beginning to affect the environment on a regional, even global scale, and some adverse impacts may be irreversible. Nations must cooperate on an "urgent" basis to protect resources of global import. Otherwise, we soon will exceed nature's limits and leave a diminished heritage to future generations.

Secondly, the developing nations must be allowed the economic growth that is environmentally sustainable. In more detail, it is an enormous challenge to meet the needs of these people without destroying the biological systems — forest, grazing lands, croplands and fisheries — on which they must depend for food, fuel, shelter, and other necessities.

When the report considers solutions, it often consists of merely discussion of many alternatives, without further direction. However, the clear review of alternatives is very valuable. The report recognizes this limitation and suggests a follow-up regionally and ultimately a global conference to review progress. Having provided a world view of our environmental problems, and made the point of urgency; it is perhaps up to us, those outside and inside of government, to be sure the needed actions are taken to turn **Our Common Future** into a national and international agenda — with the United States leading the way.

(Reviewed by Thos. B. Stoel, Jr., *The Amicus Journal*, Fall 1987.)

Also available and of interest:  
**Groundwater Protection**, by Conserva-

tion Foundation Staff and The National Groundwater Policy Forum, Spring 1987; 256 pages, figures, indexes, \$15.00/paperback. The product of a joint effort by The Conservation Foundation and the National Groundwater Policy Forum, this book contains the Forum's final recommendations released earlier in the report, "Groundwater: Saving the Unseen Resource," November, 1985. The Forum calls for an aggressive national policy to assure that future generations have adequate supplies of uncontaminated groundwater. The Forum urges "a new environmental partnership" among all levels of government, business, and public interest groups. Its recommendations include a comprehensive 10-point groundwater protection program for state governments to adopt. The book also contains a summary of public comments on the Forum's proposals, presented in writing and at three public hearings, and an extensive analysis of the groundwater pollution problem prepared independently by The Conservancy Foundation staff. Included is substantial reference material on groundwater issues discussed in the Forum's report. The National Groundwater Policy Forum was funded by grants from the William H. Donner Foundation, Exxon Company, USA, The Ford Foundation, the H. J. Heinz Company Foundation, The Joyce Foundation, and the F. H. Prince Testamentary Trust. The Conservancy Foundation, 1250 Twenty-Fourth Street, N.W., Washington, D.C. 20037, Telephone (202-293-4800).

### Wetlands

"Protecting America's Wetlands: An Action Agenda," the final report of the National Wetlands Policy Forum, November, 1988. Individual copies are available free.

The full final report of the National Wetlands Policy Forum containing sections on establishing a national goal, planning for wetlands protection, promoting private stewardship, improving regulatory programs, reducing government-caused conversions, improving government acquisition programs, providing better information, restoring and creating wetlands protection management.

"Issues in Wetlands Protection: Background Papers" prepared for the National Wetlands Policy Forum, a research report edited by Michele Leslie, Edwin H. Clark II, and Gail Bingham, approximately 175 pages, \$17.50.

Contains background papers prepared by The Conservancy Foundation staff and consultants. Topics include rates of wetlands loss, wetlands definitions, goals for wetlands programs, advance planning and consensus building, nonregulatory programs promoting wetlands protection, overviews of and gaps in existing regulatory programs, mitigation policies, government programs inducing wetlands alterations, and scientific issues related to the restoration and creation of wetlands.

The Conservancy Foundation, 1250 Twenty-Fourth Street, N.W., Washington, D.C. 20037, Telephone (202-293-4800).

## Monongahela National Forest Hiking Guide Now Out

Edition 5 of the WVHC **Monongahela National Forest Hiking Guide** is now available. This edition is bigger and better than ever, with 320 pages, 60 maps, 39 photographs, descriptions of 164 trails totalling 780 miles, a new section on ski-touring, and a full-color cover. The authors are Allen de Hart and Bruce Sundquist. Allen has hiked all the trails of the Monogahela N.F. over the past few years. Bruce edited Editions 1-4. The hiking community and the U.S. Forest Service provided the authors with trail reports and photographs.

In the U.S. Forest Service's planning process that led to

the 1986 Land and Resource Management Plan, over 35,000 comments were received from the public. The gist of these comments is that the Monongehela is a "Special Place." And indeed it is. The hiking and backpacking opportunities it provides are among the best in the eastern U.S. The more outstanding areas are becoming known far and wide — Otter Creek Wilderness, Dolly Sods Wilderness, Flatrock Plains, Roaring Plains, Blackwater Canyon, Spruce Knob, North Fork Mountain, Shaver's Mountain, Laurel Fork Wilderness, Cranberry Back Country, Cranberry Wilderness, among others. This guide will help you get to know

these and other special places in the forest.

Profits from the sale of these guides support a wide variety of worthy environmental projects in the West Virginia Highlands Conservancy.

To order your copy of **Monongahela National Forest Hiking Guide**, send \$9.95 plus 6% sales tax for WV residents, plus \$1.25 postage (book rate) to West Virginia Highlands Conservancy, 1205 Quarrier St., Lower Level Charleston, WV 25301.

## Sources Of Groundwater Pollution (continued from page 1)

Wastes disposed of in this manner are pumped into deep, underground pockets or into aquifers which cannot be used for commercial or domestic consumption. In theory, these underground disposal sites are safe, as they are to be confined and isolated from wells used for drinking water. Recent studies, however, indicate that underground injection can threaten groundwater reserves. EPA has reported that over 21,000 injection wells require corrective action.

Many of these wells are poorly constructed or designed, allowing injected waste to seep into neighboring aquifers. Others are poorly located, so that waste seeps directly into drinking water supplies. Some wells while located in stable and confined underground pockets, cannot contain the injected wastes, which manage to migrate to active groundwater wells.

EPA has already taken steps to mitigate pollution from underground injection. Under

the Safe Drinking Water Act, it has established underground injection programs in 20 states and partial programs in six states, while granting 31 states and territories full control over their own programs. Working under federal regulations, the states have established guidelines for construction of the wells and rules for monitoring chemicals injected underground.

A third source of groundwater contamination is landfilling. Municipalities and industry have relied extensively on landfills to dispose of hazardous and non-hazardous solid wastes. EPA estimates that there are over 93,000 landfills in the United States, with 75,000 used for industrial waste and 18,500 used for municipal disposal.

However, as the disaster in the Love Canal area of upstate New York clearly demonstrated, landfills can, in addition to other problems, threaten drinking water supplies, especially when they are not prop-

erly constructed and maintained. Chemicals and organisms can leach through the confines of the landfill and contaminate drinking water wells.

A survey of 12,991 municipal landfills by *Waste Age Magazine* found that 2,396 were open dumps, only 37 had artificial liners to contain the waste and only 1,609 had monitoring wells to detect potential contamination of groundwater supplies. The problem is magnified when abandoned municipal dumps are added to the list. The Office of Technology Assessment estimates that the number of abandoned landfills could exceed the number of active ones.

In 1986 Congress passed the Superfund Amendments and Reauthorization Act (SARA) directing EPA to control pollution from previously uncontrolled hazardous waste dumpsites, including leachates which endanger groundwater reserves. EPA is currently using this legislative mandate to clean

up contaminated sites around the United States.

Under provisions in the Resource Conservation and Recovery Act (RCRA), EPA is drawing up regulations for hazardous waste disposal and standards for municipal solid waste disposal. Legislation is pending in both Houses of Congress which would direct EPA to tighten controls over disposal of hazardous ash from municipal waste incinerators.

Canada is also in the process of assessing groundwater contamination from waste disposal sources. The Canadian Parliament is now considering legislation which would require "cradle to grave" management for toxic chemicals, including safe disposal methods for hazardous substances. The House of Commons has recently enacted the Environmental Protection Act. *Environmental Perspectives — Canadian Embassy*



## How Plants Grow — And Let's Hope They Do!

by O. B. Combs

Fruit and vegetable plants are made up of tiny cells. They grow and reproduce by increasing the number, size and nature of these cells. As growth occurs, several important processes take place. Seeds germinate and become young plants that develop roots, stems, leaves and flowers. When flowers are pollinated, seeds and fruits begin to form.

These processes involve intake of carbon dioxide and oxygen, largely from the air and water, and minerals from the soil. Foods manufactured from these raw materials and stored in fruits, seeds, stems, tubers, leaves and flowers provide nourishment, directly or indirectly, for people and animals.

The most important single process carried on by green plants is called photosynthesis. Energy from the sun is trapped by the green plant, simple sugars are formed, and oxygen is released into the atmosphere. Complex carbohydrates, fats, proteins and vitamins are formed by the incorporation of sugars with mineral elements from the soil.

As plants multiply, enlarge their cells and build new tissues and organs, they break down foods with the aid of oxygen to release energy. This process is known as respiration; carbon dioxide, energy and water are released.

Most vegetables are reproduced sexually from seeds. Most fruits and a few vegetables are reproduced asexually or vegetatively from plants or plant parts. Seeds contain the embryo (live plant) and stored foods. For rapid germination, seeds must be alive and strong enough to break the seed coat and emerge from the soil. They need water, oxygen, and a suitable temperature.

The temperature best suited for rapid germination varies with different plants. Seeds of cool season vegetables such as carrots germinate rapidly at soil temperatures between 50° and 60° F, and seeds of warm

season vegetables such as beans between 70° and 80°. Sweet corn seeds, which may require ten days to germinate at 50°, may germinate in two to three days at 80°.

Roots anchor and support plants and absorb water and minerals from the soil. These materials are taken in through root hairs and then moved through the stem to the leaves. Roots are the major storage organs or such vegetables as beets, carrots, and sweet potatoes.

Roots have no chlorophyll, thus they depend upon the leaves for their food supply. Roots must be healthy, unrestricted and undamaged by diseases, insects, or deep cultivation if they are to perform their functions. They must have adequate oxygen.

Too much water from a high water table or over-irrigation on heavy soils may result in insufficient oxygen and serious interference with proper root growth and function.

Root systems differ markedly in their form, spread and depth, the tap roots of carrots grow almost directly downward to considerable depths, and give off many lateral branch roots. The fibrous roots of onions grow an extensive, relatively shallow network of small roots. Some plants, such as apple and other tree fruits, have several large roots for anchorage, with many smaller branch roots.

Stems make up the above-ground framework of plants. They provide support for the plant and contain the food storage and transport tissues.

Water and nutrients from the soil move to the leaves, where sunlight and leaf chlorophyll — through the process called photosynthesis — manufacture food for plant growth and production of the edible portions. Water, nutrient, and manufactured food movement within the plant occurs in the conductive tissue, known as the xylem

and phloem.

Leaves originate from stems and are the principal food-manufacturing organs of green plants. They take in carbon dioxide from the air and allow oxygen and water vapor to escape through small openings — mainly on their lower surfaces — called stomata. Plants are able to regulate these stomatal openings and thus partially control the loss of water from their leaves.

Flowers are necessary for production of seeds. Beans, peas, and sweet corn are annuals; they produce seeds each year and die when the seeds have matured. Cabbage, beets and carrots are biennials and need some part of two seasons to produce seeds; they die when their seeds have matured. Asparagus and rhubarb are perennials which — once established — may produce and mature seeds each year, but the plants continue to grow in the same location for several years.

Light is the source of energy for photosynthesis, the food manufacturing process carried on only by green plants. It also influences the movement and position of plant organs and the size, form and structure of plants. The amount of food manufactured depends upon the duration, intensity and quality of light. Whether a plant flowers or not is often determined by the relative length of day and night.

Formation of the green coloring matter (chlorophyll) in plants goes on only in light. Pure white cauliflower and creamy white, blanched celery, endive hearts and asparagus spears are produced by excluding light from these plant parts.

Plants arrange their leaves to insure suitable exposure to light. Excess exposure causes stunting; insufficient light causes tall, weak, light green plants.

Plants such as spinach and chinese cab-

bage go to seed if growing when days are longer than 15 hours.

The above-ground parts of plants generally are positively phototropic, they grow toward light; roots of most plants are negatively phototropic, they grow away from light. Tops of plants are negatively geotropic, they grow upward away from the force of gravity; plant roots are positively geotropic, they grow downward toward the force of gravity.

Temperature markedly influences plant growth. All important functions of plants — respiration, photosynthesis, absorption, digestion and reproduction — are influenced by temperature. Each plant has a temperature range in which it grows best, other factors being equal.

Cool season vegetables such as carrots and spinach grow best at lower temperatures than those preferred by warm season vegetables such as beans and melons. Likewise, cool season vegetables are less susceptible to injury from frost.

Plants started indoors frequently are "hardened" by gradually exposing them to somewhat lower temperatures before they are set outdoors. Certain vegetables such as asparagus, horseradish, Jerusalem artichoke, parsnip, rhubarb and salsify will withstand very low temperatures and may be left in the soil over winter even in areas with severe climate.

Water is the most frequent factor limiting plant growth. It is the principal constituent of plants, and an essential raw material in the manufacture of food. Mineral salts must be dissolved in water before they can move into plants through the root hairs. Oxygen and carbon dioxide enter and leave plants in water solution. Mineral salts and manufactured foods move throughout the plant in water solution.

(continued on page 6)

### A Calendar Of WV Conservation Organizations' Outings and Other Nature-Related Activities

- Mar. 3 Kyger Creek and Cheshire OH Field Trip, HTSAS  
 Mar. 3-5 Early Spring Meeting at Jacksons Mill, BBC  
 Mar. 4 Dolly Sods XC Skiing (G Good, 296-6850), WVSC  
 Mar. 12 Waterfowl Trip to Seneca Lake, OH, BBC & MAS  
 Mar. 15 "Acid Rain and Spruce Decline in WC," Mgmt, MAS  
 Mar. 19 Winter Botanizing and Nature Study, 2 pm, Mgmt, BRAD  
 Mar. 23 "Spiders" w/Jim Arnold, 7:30, Huntington, HTSAS  
 Mar. 25 Glenwood Swamp Field Trip, HTSAS  
 Apr. Canoe Trip, TNC  
 Apr. 6, 7, 11, 12 "Birding for Beginners," Mgmt, MAS  
 Apr. 8 Folk Medicine and Herbal Remedies, 1-4 pm, Mgmt, BRAD  
 Apr. 12 Joint Meeting MAS and WVSC in Mgmt.  
 Apr. 15 Lesage WV (wildflowers) Field Trip, HTSAS  
 Apr. 15-16 Spring Review, Blackwater Falls State Park, WVHC  
 Apr. 22 Lake Vesuvius OH Field Trip, HTSAS  
 Apr. 23 Identifying Wildbirds of Spring, 7-9 am. Mgmt, BRAD  
 Apr. 27 "Birds of the Tri-State (for beginners), Huntington, HTSAS  
 Late Apr. Medicinal Herbs Hike (T Saxe, 292-0605), Mgmt, MAS  
 Apr. 28-30 Old Hemlock Weekend at Terra Alta, BBC  
 Apr. 29 Neighborhood bird walks, HTSAS  
 Apr. 29 Exploring the Unusual Courtship of Woodcock and Snipe & Stalking Wild Turkey with a Camera in Canaan Valley, BRAD

#### Key and Contact for more information (if none listed above):

- BBC — Brooks Bird Club, Helen Conrad, Wheeling, 547-1053  
 BRAD — Back Roads Adventures, Mgmt, 296-0565. RESERVATIONS ESSENTIAL.  
 HTSAS — Huntington Tri-State Audubon Society, Tom Igou, 429-5409  
 MAS — Mountaineer Audubon Society, Mgmt, 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

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 more 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.

### Galen Rowell To Present Natural World Photo Workshop March 11

Galen Rowell, the world's premier mountain photographer, will be at the Carnegie Museum on March 11, 1989, to present an all-day lecture-workshop based on his own widely published photography. Mr. Rowell, who has climbed in virtually every mountain range of consequence in the world, has also published his work extraordinarily widely. A partial list of his credits includes:

- \* An hour-long video on his work, published in October, 1988, by KODAK
- \* A 16-year-long string of images in the Sierra Club Calendars
- \* Six National Geographic articles, including a major one in October, 1987, on the Himalayas.
- \* Six of his own books of photography, including most recently The Sierra Club book, "Mountain Light: The Search for the Dynamic Landscape", in 1984 and the remarkable "Throne Room of the Mountain Gods", also by the Sierra Club.
- \* Nine of his own calendars, including one exclusively of bears in the wild, and one of the people of China.
- \* Thirty-seven articles in national or international publications in 1987 alone, including 22 feature or cover articles. These include such magazines as *Wilderness*, *Audubon*, and *Sierra*.

The workshop is sponsored by the Sierra Club, Allegheny Group, and will take place in the Carnegie Lecture Hall, beginning at 9:30, Saturday, March 11. In a unique format, Galen Rowell will use a multi-projector system to dissolve through a series of failed images discussing the changes that lead finally to the successful one. There will be three one-and-a-half hour lectures, separated by an hour's discussion. Lunch will be on your own in Oakland. The day's program will cost only \$17.50. Places may be reserved by writing: Photography Workshop, Sierra Club, 515 Lloyd Street, Pgh, PA, 15208. (Also sponsored by the Explorers Club of Pittsburgh.)

In the evening, the Sierra Club's Annual Meeting, open to the public, will include a lecture by Galen Rowell titled "Return to Shangri-La". Galen and a group of equally daring friends kayaked some of the great Himalayan rivers and climbed some of the peaks in the Kingdom of Baltistan, the subject of his October, 1987 *National Geographic* article. Added to his other remarkable talents, Galen is an accomplished cultural anthropologist, and he documents the people of this distant place as well as its natural beauty. That lecture will cost \$7, tickets obtainable at the same address as above.



# Radon vs. Lung Cancer New Study Weighs The Risks

"Radon gas cited as cancer source."  
"Your house may be a death trap."

Such overblown headlines have become commonplace over the past two years as public concern increases over the possible health hazards of radon in indoor air.

Radon is a radioactive gas naturally produced in minute quantities in soil and groundwater. Outdoors, it is too diluted to be harmful. When it seeps into modern, air-tight buildings, however, it can become trapped and accumulate in potentially dangerous proportions. Radon is the single largest source of radiation exposure for the average person. It may rank second only to cigarette smoking as a cause of lung cancer in the United States.

Unfortunately, there is no clear-cut method for determining safe levels of radon exposure. Current guidelines are based on data gathered from studies of uranium miners. Because of the uncertainties involved in extrapolating radon risks from miners to the public, a recent government report urged direct investigations of the health effects of indoor radon.

Argonne is responding to this need with a major multiyear study of lung cancer and indoor radon in eastern Pennsylvania, where high levels have been found in many homes. Experts have estimated that billions of dollars would be required to lower radon levels — by sealing entry points and increasing ventilation — to currently recommended levels in all U.S. houses. The Argonne study will determine if this is indeed necessary. Our results should also be of interest to the real estate, construction and banking industries. Banks in Pennsylvania, for example, will not issue a mortgage unless the house involved has passed a radon test.

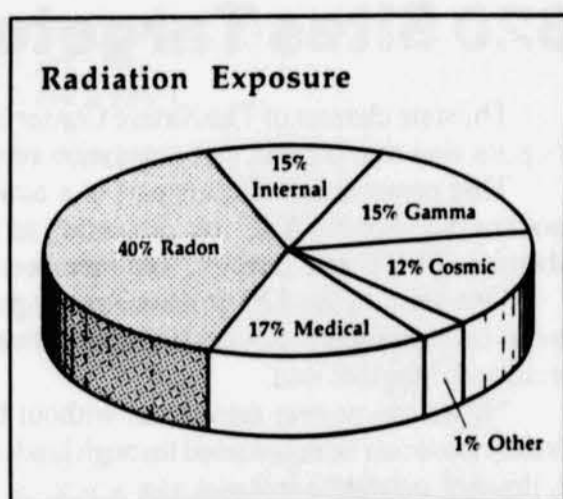
Radon-222 — a colorless, odorless, tasteless inert gas — is a naturally occurring radioactive element. It is continually produced from its parent, radium-226, which is present in trace amounts in all rocks and soil. The radium, in turn, is continually produced from uranium. Consequently, geological formations rich in uranium will produce high levels of radon.

Radon is not chemically reactive, since it is in the same family as helium, neon and argon, and it has a fairly long radioactive half-life of 3.8 days (the time required for it to lose half its radioactivity). Thus, radon can move long distances through the soil in which it is produced and still remain radioactive. It may enter a house through cracks, drains, unpaved crawl spaces, pipe openings, or dissolved in groundwater. Unless the house is very well ventilated, the radon concentration can build to potentially hazardous levels.

Radon is measured in picoCuries per liter of air. One picoCurie (pCi) is equivalent to 2.22 radioactive atoms disintegrating (i.e., emitting radiation) every minute. The typical outdoor concentration of radon-222 is about 0.1 pCi per liter of air, and average indoor concentrations are thought to be 10 or 20 times higher at 1 to 2 pCi/L.

Based on studies of the cancer incidence in uranium miners, the Environmental Protection Agency established an upper limit of 4 pCi/L as a guideline for indoor exposure to radon. Exposure to this amount of radon over a 50-year period may increase the risk of lung cancer by 2 percent. Indoor radon levels exceeding 10 to 20 pCi/L are considered quite dangerous. The highest level observed to date occurred in a house in eastern Pennsylvania, which had a concentration of 2,700 pCi/L in the basement.

The EPA estimates that 12 percent of U.S. houses may have radon levels above 4



Radon is the major source of radiation exposure for most people. Other sources include cosmic rays, potassium within the body, naturally occurring gamma rays and medical procedures.

pCi/L, and that indoor radon may be responsible for 5,000-20,000 cases of lung cancer per year in this country. In the absence of radon, a non-smoker has a lifetime lung cancer risk of about 1 percent, a heavy smoker about 15 percent.

Estimates of lung cancer based on studies of uranium miners may really be worst-case or upper-limit estimates, however. Most miners received their total exposures in a relatively short period, usually a decade or less. These short, intense exposures provided dose rates 10 times higher than in domestic situations.

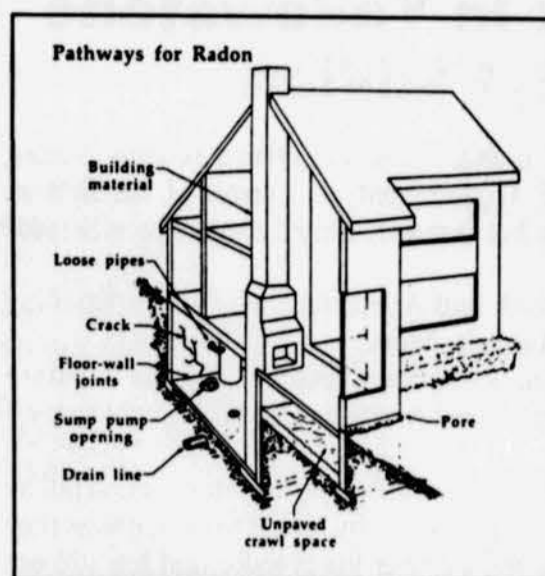
Nevertheless, even at the lower end of risk estimates — 5,000 lung cancers annually in the U.S. — radon is predicted to cause more cancer than everything else the EPA regulates put together. For example, radioactivity in drinking water is estimated to cause about 160 cancers annually. Ironically, the EPA has no jurisdiction over indoor levels of most air pollutants, including radon.

The problems involved in measuring radon levels, computing radiation doses, and setting standards or guidelines are complicated by the fact that radon itself produces very little radiation dose to the lungs. Because it is an inert gas, most inhaled radon is promptly exhaled. The danger comes from radon daughters — radioactive isotopes of lead, bismuth and polonium that are continually produced by radon's decay. Because these elements are solids, they remain in the lung and subsequently irradiate lung tissue.

The scientific community has been well aware of and concerned about radon for decades. At Argonne, radon research has been conducted for more than 30 years. But the problem did not catch the public's attention until December 1984, when a Pennsylvania resident repeatedly set off radiation alarms while at work in a nuclear power plant. The radiation was due to radon and its daughter products. The source of the radon was found to be high concentrations of uranium in the bedrock beneath his house and those of his neighbors.

The rock formation responsible for the high radon levels is called the Reading Prong, a uranium-rich outcropping of granite that runs northeastward from Reading, Penn., through northern New Jersey and into New York state. Subsequent testing revealed extremely high — in fact, incredibly high — levels of indoor radon in several other houses in eastern Pennsylvania. In all, 60 percent of the houses had radon levels above the EPA guideline of 4 pCi/L. Although data from other parts of the country is not as extensive, it is now clear that the radon problem is nationwide.

Argonne's involvement with indoor radon began in the mid-1970s with the discovery of increased levels of radon in the exhaled breath of several employees. The source was



Radon, a radioactive gas naturally produced in soil and groundwater, can enter a house via several routes. Unless the house is well ventilated, the unseen gas can build to potentially dangerous levels.

traced to high concentrations of indoor radon in their homes. The radon level in one employee's house was 30 pCi/L, emanating from an unpaved crawl space under the house.

Because of concern that energy conservation efforts may decrease ventilation, and therefore increase indoor radon levels, we conducted a survey of approximately 150 Chicago-area houses, most owned by Argonne employees. We found that 19 percent of the basements had radon levels of 4 to 10 pCi/L, and 8 percent were above 10 pCi/L.

In 1983, we surveyed nearly 200 homes in and around Bloomsburg, Penn., an area well away from the Reading Prong. We found high radon levels in more than 40 percent of the houses, again from natural sources in the underlying rock. Fifty-seven percent of the basements had radon levels below 4 pCi/L, 24 percent contained 4 to 10 pCi/L, and 19 percent exceeded 10 pCi/L. The definition of "high" in Pennsylvania became 300 pCi/L, still 10 times less than the highest level later discovered.

These studies, however, merely measured radon levels, not their effects on human health. A direct investigation of the health effects of indoor radon is required before society spends the billions of dollars required to lower radon levels to 4 pCi/L or less in all U.S. houses.

The Committee on Interagency Radiation Research and Policy Coordination recently issued a report titled "Radon Protection and Health Effects," which states that research should be accelerated on "additional, well-designed epidemiological studies of lung cancer and radon progeny exposure in housing, including consideration of smoking histories. Case-control studies are especially needed."

In response, Argonne has launched a multiyear case-control study of lung cancer vs. radon exposure in eastern Pennsylvania women. We are concentrating on women for three reasons: Fewer women smoke than do men; they are exposed to fewer carcinogens in the workplace; and women spend more time at home.

We will compile data on approximately 2,000 lung cancer cases, stratified by histological type, from the Pennsylvania cancer registry. Controls will be women without lung cancer who lived in Pennsylvania from 1975 to 1989. For both cases and controls, residential histories will be obtained, and radon measurements will be made in all houses where the subjects lived. We estimate that 15,000 houses will be tested for radon during this study.

The Argonne investigative team has established its headquarters in Gilbertsville, Penn. We have analyzed data provided by the state on 6,000 houses already tested for radon, and are preparing to begin our own site

studies.

Radon levels will be measured using two different methods. The primary technique is year-long exposures of "alpha-track detectors." The detectors are small pieces of specially formulated plastic in a filter cup. Radon diffuses into the cup and decays inside. The daughter products deposit on the surface of the plastic, where they cause microscopic damage as they decay. After chemical treatment, the radiation tracks become large enough to count under a microscope. The number of tracks per unit area is a direct measure of the average radon level during the exposure period.

We will also take a "grab sample" in each house so that at least one number is available in case the house is lost to follow-up. The grab sample involves collecting air and analyzing it for radon using standard radiation counting methods. The technique provides rapid results, but gives only a "snapshot" of the radon situation. Indoor radon levels vary by factors of 10 or more both daily and seasonally, due to variations in air pressure, wind speed and direction, ventilation, and soil porosity. Thus, a longer-term measurement such as the alpha-track detector is needed for an accurate picture of radon exposure.

Argonne's study should establish whether indoor radon levels in the range of 4 to 10 pCi/L are in fact hazardous, and provide a more realistic risk estimate for environmental radon. If indoor radon causes lung cancer in the general population at the rate predicted by the uranium-miner data, then about 80 percent of the lung cancer cases should have spent significant fractions of their lives in houses that fall into the upper 20 percent of radon levels.

Even if the results of this study are negative — that is, there is no increased risk of lung cancer among women living in houses with radon levels above 4 pCi/L — there are still many houses in the country that have indoor radon levels of 100 pCi/L and above. These houses must be located and their radon levels determined.

*Richard E. Toohey is a biophysicist in the environmental health section of Argonne's division of biological and medical research. He received a doctorate in nuclear physics from the University of Cincinnati in 1973. His fields of expertise are radioactivity measurement and internal dosimetry. He joined Argonne in 1971.*

Logos, Spring 1987

*In plants which are temporarily propagated by cuttings, buds, &c., the importance of the crossing both of distinct species and of varieties is immense; for the cultivator here quite disregards the extreme variability both of hybrids and mongrels, and the frequent sterility of hybrids; but the cases of plants not propagated by seed are of little importance to us, for their endurance is only temporary. Over all these causes of Change I am convinced that the accumulative action of Selection, whether applied methodically and more quickly, or unconsciously and more slowly, but more efficiently, is by far the predominant Power.*

*The Origin of Species by Means of Natural Selection or The Preservation of Favoured Races in the Struggle for Life. Charles Darwin*



## NEWS BRIEFS

### Claims From Blazes In Yellowstone Area Total \$1.1 Million

YELLOWSTONE NATIONAL PARK, Wyo., Jan. 16 (AP) — Damage claims totaling \$1.1 million have been filed against the Federal Government as a result of the fires in Yellowstone National Park and surrounding forests last summer, United States Forest Service officials say.

More than two dozen claims are being processed, said Arlene Bateman, who is handling those filed through the Forest Service's office in Missoula, Mont.

Government lawyers will review each claim to determine whether negligence or nature caused the damage, Ms. Bateman said last week. "Decisions on claims could be months away," she said.

More than 700,000 acres of the 2.2-million-acre park were burned last summer and fall by a dozen fires. The Forest Service's policy of allowing fires started by nature to burn unless they threaten lives, property or historic sites generated a debate over the practice that has still not quieted.

Ms. Bateman said she was processing 16 claims totaling \$525,000 arising from the Storm Creek fire, which burned south from Custer National Forest in Montana into Yellowstone. The blaze forced residents of Cooke City and Silver Gate, Mont., to evacuate.

The claims ask payment for damage to cabins and fences, a motel, an outfitting camp, a water system and timber and grasslands, Ms. Bateman said.

At the Forest Service's office in Denver, Colo., claims totaling \$573,000 from fires in Shoshone National Forest are being reviewed. Those result primarily from the loss of 10 mobile homes in a subdivision northwest of Cody, Wyo.

There are no claims on file yet at the agency's Ogden, Utah, regional office.

Joan Anzelmo, a Yellowstone Park spokeswoman, said several small claims had been filed for personal property lost within the park, including claims from firefighters and employees of the park's concession businesses. **NYT, 1-17-89**

### After-hours Crew On Duty At Artel

The Environmental Protection Agency has placed seven after-hours workers — two more than expected — on duty at the closed Artel Chemical Co. plant in Nitro, site of two leaks in the past two weeks.

Such an after-hours crew, EPA spokesman Yates said, is unique in the history of Superfund cleanups in the EPA's Region III, which includes West Virginia, Virginia, Maryland, Pennsylvania, Delaware and the District of Columbia.

The EPA has been at Artel since June, classifying and repacking stored chemicals. Some of the 5,500 drums should be removed from the plant beginning in two weeks. After chemicals are removed, EPA crews can then investigate contamination in soil and water at the site.

Yates said the seven-person crew includes a site safety officer, a communications officer, an equipment officer, a chemist and three field technicians, along with the watchman. A three-person crew tours the site every half hour.

"Their primary responsibility is to respond to an incident, just like a firehouse," Yates said. "When they're not responding, they're maintaining equipment. There are times when there's nothing to do." Yates said he did not yet have cost figures for the crew.

Local officials and Nitro residents have criticized the EPA for waiting to report a leak on the morning of Jan. 19 that sent a cloud of sulfur dioxide and hydrochloric acid over Nitro. It took an EPA crew 20 minutes to arrive at the site after a leak during the evening of Jan. 25.

On Tuesday morning, EPA, Nitro and other local officials began the first of a series of weekly meetings regarding the Artel site. "We will brief the public of the past week's activities and provide a projection of future activities," Yates said. Summaries of the meetings will be available in Nitro City Hall.

Yates gave Woodson an application for an EPA grant that provides money for community groups to hire technical experts to monitor Superfund sites. The EPA can provide \$50,000 in a Technical Assistance Grant if a community group raises \$25,000. **The Charleston Gazette, 2-1-89**

### Mushroom Seminar To Be March 4

Cultivating expensive, gourmet shiitake mushrooms will be the topic of the second annual Mushrooms in the Mountains conference.

The conference will be from 10 a.m. to 4 p.m. March 4 at Davis and Elkins College in Elkins. Topics will include growing techniques and nutrition. People attending the conference will be able to buy supplies and talk to speakers and exhibitors.

The mushrooms grow in 3 to 5 foot logs that are inoculated with fungus. Growers leave the logs outdoors for six to 18 months before soaking them in water and later harvesting the mushrooms. The logs can be harvested several times a year for several years without additional inoculation. **The Charleston Gazette, 1-29-89**

### How Plants Grow — And Let's Hope They Do!

(continued from page 4)

Water keeps plant cells turgid so that they can carry on their functions. It also helps to keep plant surfaces cool through evaporation from the leaves and stems.

At least 15 chemical elements are needed for the growth of fruit and vegetable plants. These include carbon, hydrogen, oxygen, phosphorus, potassium, nitrogen, sulphur, calcium, iron, magnesium, boron, manganese, zinc, copper and molybdenum. Some of these — such as boron, zinc, manganese, iron, copper and molybdenum — are referred to as minor or trace elements, since

they are needed by plants in very small amounts.

The successful gardener must know something about how plants grow. He must also know the essential needs of plants and strive diligently to fulfill these needs with care and at the proper time.

*O. B. Combs is Professor of Horticulture, University of Wisconsin, Madison.*

From *The Yearbook of Agriculture/1977; Gardening For Food and Fun; US Department of Agriculture.*

### 320 Sites Targeted By Nature Group

The state chapter of The Nature Conservancy has identified and plans to protect 320 West Virginia sites that contain rare vegetation or unique wildlife habitat.

That preservation effort is part of a national movement by the Conservancy "to build a modern-day Noah's Ark," by protecting as many plant and animal species as possible, Ed Maguire, TNC's state director, told members of the Charleston Rotary Friday.

One-third of the 320 sites are already protected, while a like number of locations can be found on public land. About 100 sites, however, are located on private property and are not protected, Maguire said.

"If we can protect these areas without buying them, so much the better," Maguire said. Preservation can be maintained through land use agreements, easements and land swaps, as well as through outright purchases.

During TNC's 25 years in West Virginia, the organization has protected more than 30,000 acres of ecologically unique land. While the Conservancy often works with the state and federal government in buying land that is later turned over to the National Forest, National Park or State Forest systems, it has bought and manages 22 West Virginia nature preserves on its own.

Nationally, TNC has 450,000 members, and has protected nearly 3.5 million acres. In recent years, Maguire said, the organization has spent more money on acquiring and preserving unique land than the federal government has. Last year, TNC raised \$88 million with which to acquire new land.

The non-profit, non-government, non-lobbying Nature Conservancy draws from a broad base of support, which includes a number of industrial leaders and corporations, "because we don't get hung up on environmental rhetoric, and we aren't out to save the world," according to Maguire.

The state director said he agrees with a characterization of his organization that appeared in a recent issue of *Sports Illustrated*: "A cross between Century 21 and the Sierra Club."

Maguire said TNC was planning a major fund-raising campaign this spring to raise money for a preservation project he was not yet free to disclose, other than to say it would be located in the western part of the state. **The Charleston Gazette, 1-21-89**

### Male Duck's Timidity Around Flashy Rivals May Threaten Species

The American black duck, whose numbers have shrunk by 60 percent in the last 30 years, may be on the road to extinction because males of the species are too timid to win females away from the flashier and more assertive mallard drake, a study by Canadian scientists suggests.

When challenged by mallard drakes at mating time, male black ducks "don't fight, or they tend to give up real quick," says Dr. C. Davison Ankney of the University of Western Ontario, a zoologist who took part in the study. Not only does this prevent female black ducks from mating with their own species, the researchers say, but it probably also sends them a message: a mallard drake will be a better protector during the critical egg-laying period.

So, in what seems to be a clear-cut instance of natural selection at work, mallard-black duck hybrids are increasingly replacing black ducks across a wide stretch of eastern North America where mallards, more and more, are moving into black-duck territory. And although black ducks are not yet an endangered or threatened species, they could ultimately disappear.

The trend is continuing despite stringent hunting regulations that have reduced the kill of black ducks by 40 percent in the United States and 10 to 15 percent in Canada in about the last five years. So far, no other method of stopping the interbreeding problem has been tried.

Other factors, too, have been implicated in the decline of the black duck. These include acid rain in the lakes frequented by the ducks and human encroachment on habitats. But interbreeding with mallards has been recognized as a major threat and the new study is the first to suggest what may be responsible.

The study was conducted by Lynn M. Brodsky, a post-doctoral student at Western Ontario; Dr. Ankney, a senior faculty member there, and Darrell G. Dennis, a wildlife biologist with the Canadian Wildlife Service.

In every case, the researchers found that every male was more attentive to females of the species with which he had been raised. Similarly, every female quickly gravitated to the most active male of the species with which she had been raised, and stayed in front of his cubicle during the test period. The researchers concluded that early learning primarily influenced the choice of mate.

But in the second half of the experiment, they found that this learning was overwhelmed and overridden when male mallards and male black ducks were allowed to compete for a female's attention. The researchers put males of both species in a test pen in the marsh water, containing no barriers or cubicles. In the middle of the pen was a wooden platform on which the birds could rest.

Why mallards dominate black ducks is not certain. One theory holds that the brighter, more colorful mallard male — with his green head, white neckband, dark chestnut breast, violet wing feathers and orange-red legs and feet — looks bigger than a similar-size black duck, with its dark-brown dullness. Another possibility is that to a male mallard, a male black duck looks like a female mallard, and therefore does not appear to much of a threat in a fight.

#### Caught In Genetic Decline

In the wild, said Dr. Ankney, mallards mate with both species. So while pure mallards continue to be produced, the black duck is caught in a genetic decline: If a male mallard-black duck hybrid pairs with a female mallard, most of their offspring will display the hybrid's partially green head and neck ring that make it look something like a mallard, but darker.

Either way, it appears that the black duck species is being absorbed by that of the mallard. Or re-absorbed. The two species are so genetically similar, Dr. Ankney said, that it is likely that black ducks began splitting off from the mallard line, probably in the last Ice Age, but "never really made it as a species."

**New York Times, 1-10-89**



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# Spring Review April 15-17 Black Water Falls State Park

## Black Water Falls State Park

Several Cabins at the Park have been reserved for WVHC members. The Conservancy has secured the rooms for your convenience. All cabins are heated and well equipped with linen and cooking supplies. For a room at the Blackwater State Park Lodge, please call the lodge directly at (304) 259-5216. The park and the lodge is a popular vacation area, so please plan to make your reservations as far in advance as possible. Canaan Valley State Park, a short drive from Blackwater State Park, also offers lodging. Their number is (304) 866-4121. The Blackwater State Park Lodge has a large restaurant overlooking the canyon which serves country cooking and new American cuisine. The Woodchuck Lounge also serves light sandwiches and drinks. There will be a barbecue cookout for those attending the weekend on Saturday evening at cabin 25.

## Program:

(Registration and meetings will take place at the Blackwater State Park Lodge Conference Room.)

### Friday, April 14, 1989

- 6:00-11:00 P.M. - Registration & Snacks
- 8:00 P.M. - Slides & Movies
- 9:00 P.M. - Social Hour

### Saturday, April 15, 1989

- 7:00 A.M. - Bird Walk
- 8:00 A.M. - Breakfast
- 9:30 A.M. - Outings
- 2:00-4:30 P.M. - Seminar
- 5:30 P.M. - Dinner Cookout at Cabin 25
- 7:00 P.M. - Acid Rain Forum (conference room)
- 9:30 P.M. - Social Hour

### Sunday, April 16, 1989

- 8:00 A.M. - Breakfast
- 9:00 A.M. - Board of Directors Meeting
- 12:30 P.M. - Lunch

## Location

Blackwater Falls is accessible from the south by U.S. 33 to Harmon, then WV Route 32 north to the Park. From the north, take U.S. Route 219 to Thomas then Route 32 south to the Park.

## Registration Form

**Deadlines: Lodging April 1; Meals April 1**

Name \_\_\_\_\_

Address \_\_\_\_\_

Phone \_\_\_\_\_

Registration Fee: \$3/adult ..... \$ \_\_\_\_\_

### LODGING — BLACKWATER STATE PARK CABINS

Cabin Reservations

Friday:	\$13.00 x _____	= \$ _____
Cots:	\$ 3.00 x _____	= \$ _____
Saturday:	\$13.00 x _____	= \$ _____
Cots:	\$ 3.00 x _____	= \$ _____
Total Lodging.....		\$ _____

### CAMPING

Available at nearby Canaan Valley State Park and at MNF Campsites.

### MEALS

The WVHC members will be offering a Saturday evening cookout at cabin 25. We will also prepare a box lunch for those persons going on the outings. The Blackwater State Park Lodge Restaurant will also be available for breakfast and any other meals you wish to have there.

### Saturday

Box Lunch (\$3.50)      Number of people \_\_\_\_\_ \$ \_\_\_\_\_

Dinner Cookout (\$5.00)      Number of people \_\_\_\_\_ \$ \_\_\_\_\_

(\$3.00 children)

Total for Weekend \$ \_\_\_\_\_

### NATURE SKOOL (for children age 3-10)

Nature Skool hours available: (\$2.00 per child payable to worker)

Saturday 9:00 am to 4:30 pm      Number of children \_\_\_\_\_

Saturday 7:00 pm to 11:00 pm      Number of children \_\_\_\_\_

Sunday 9:00 am to 12:00 am      Number of children \_\_\_\_\_

### CHILDCARE

Fee: \$1.00 per hour.

Childcare can be made available for all age children on Saturday (daytime and evening) and Sunday morning if we have enough children. Please list the names and ages of children that may use this service.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Please make checks payable to WVHC Spring Review and return with this form to: Donna Borders, 1012 10th Ave., Marlinton. For information about reservations call Conna at (304) 799-6772 (daytime) or 799-4381 (home). **Please remember to send a check with all reservation forms.**

### ACTIVITIES

The Saturday outings will last 4-5 hours to allow enough time to return for the Saturday afternoon seminar. All outing guides will meet their groups in the conference room at the Lodge.

### OUTINGS

#### EARLY MORNING BIRD WALKS

Gary Worthington will lead morning bird walks on Saturday and Sunday. You can expect to see those early spring arriving birds and a few unexpected species. Dress warmly. The hike will begin at 7:00 promptly and will plan to be back in time for the outings. Meet in the conference room.

#### FOUR-MILE NATURE HIKE ALONG THE DAVIS TRAIL

Most of this trail is on the Monongahela National Forest. Leave from the main park road at Engine Run and hike along Canyon Loop Road, on top of Canaan Mountain.

#### TOUR OF CANAAN VALLEY

Linda Elkinton will lead a tour of Canaan Valley area and will discuss the history of the conservancy's effort to have this valuable wetland protected from industry and residential development.

#### TRIP TO DOLLY SODS WILDERNESS AREA

Ann Brunley will lead a trip to the Dolly Sods Wilderness area and will discuss the efforts of conservation groups to monitor military maneuvers in the area.

#### AFTERNOON FORUM ACID RAIN UPDATE

Rick Webb of the University of Virginia and Ned Helme of the Center for Clean Air Policy will anchor the afternoon symposium on Acid Rain. Scientific and political aspects of this issue will be discussed.







# THE HIGHLANDS VOICE

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## President Appointed Deputy Director

West Virginia Governor Gaston Caperton has appointed Charleston attorney Larry W. George as Deputy Director of the State Department of Natural Resources. George, 34, will be responsible for policy development and state and federal legislation in environmental and resource conservation programs. He took office with the Caperton Administration on January 16, 1989.

George served as President of the West Virginia Highlands Conservancy from 1983 to 1986. On a pro bono basis, George represented the Conservancy in the U.S. Congress on surface mining, river conservation and public lands legislation from 1976 until 1987. His Congressional work included the 1982 legislation designating West Virginia's 35,500 acre Cranberry Wilderness Area and the West Virginia National Interest Rivers Act of 1988 (H.R. 900).

John Purbaugh, Past President of WVHC, succeeded George as President. He was happy to comment on George's new position: "Larry's background as both engineer and lawyer serve as good preparation for his new job. Too often, agency administrators are fluent in either the science or the law and politics of the field, but are unable to combine the two into coherent policy, as Larry can. While President of the Conservancy, Larry began our current emphasis on river corridor protection, and before that, lead our successful effort for Congressional designation of the Cranberry Wilderness area."

George has been engaged in the private practice of law since 1982. While in private practice, he also served as staff counsel for the West Virginia House of Delegates (1988 regular session) and as Majority Counsel of the West Virginia Senate (1984-85 regular sessions).

Prior to his legal career, George was a civil engineer trainee with the Huntington District, U.S. Army Corps of Engineers from 1976 to 1979. He was also an environmental policy specialist with the U.S. Office of Surface Mining in Denver, Colorado during 1981.

In 1978, Governor John D. Rockefeller appointed George to a four year term on the State Water Resources Board. Since 1985, George has served on the U.S. National Coal Council which advises the U.S. Secretary of Energy in coal and energy policy.

George received a B.S. in Civil Engineering from Virginia Polytechnic Institute & State University in 1979 and received his law degree from West Virginia University in 1982.

## Military Overflights Pose Major Threat, Say Parks

Low-flying military aircraft have become a leading threat to the sanctity of our national parks, according to a recent National Park Service survey. Managers consistently ranked "military overflights" an immediate threat.

Around the country, park visitors and wildlife increasingly are being disturbed and frightened by the deafening roar that accompanies F-4 Phantom jets, A-6 Starfighters, F-14 Tomcats, and other military aircraft on low-flying training exercises.

Pilots of the aircraft often swoop over parks at an altitude of several hundred feet or less at hundreds of miles per hour. Though pilots may simply be ignorant of park boundaries, critics charge many overflights result from sightseeing diversions or displays of aerial bravado.

While the problem is not new, its increase in frequency is the result of changes in military strategy over recent years. These changes emphasize the use of low-flying, high-speed jets that avoid radar detection.

## The Greenbottom Society Formally Organized

*We have the right to resist and we have the obligation; not to defend that which we love would be dishonorable!*

—Edward Abbey, *Eco-defense*

The Greenbottom Society, organized to preserve and promote the archaeological, ecological, and historical aspects of Greenbottom (Glenwood Bend Mitigation Area), has been formed. The plight of Greenbottom, with its wetlands habitats, General Albert G. Jenkins historical home, and Clover site, was highlighted in the January issue of the *Voice*. The Greenbottom Society is comprised of conservationists, historical preservationists, archaeologists, civil war re-enactors, Marshall University representatives, and wide variety of other civic and environmental groups. Janet Fletcher has been named acting chairperson for the Society.

The Society has proposed the establishment of the Greenbottom Natural History Preserve, which would restore the General Jenkins home as a living museum for pre-civil war history and develop the 838-acre plantation as West Virginia's first non-game wildlife refuge. The Army Corps of Engineers owns the land and plans call for the WV-DNR to lease and develop the land as a public hunting and fishing area.

Anyone interested in the current controversy over Greenbottom or finding out more about The Greenbottom Society and its efforts should contact the Society, c/o The Huntington Museum of Art, Park Hills, Huntington, WV, 25701. We welcome all input.



Larry W. George appointed Deputy Director of DNR.

Although the Federal Aviation Administration recommends that pilots not fly below 2,000 feet in national parks, the agency is powerless to enforce its advisory. The military itself has a policy barring flights of 3,000 feet or less, and yet NPS files are rife with reports of jets flying low over parks.

Military officials claim disciplinary action has been taken against some errant pilots. Park rangers, however, characterize the military as indifferent, arrogant, and irresponsible to requests to end the flights.

Officers claim there is nothing they can do unless park managers cite the identifying number from the offending plane's tail section — usually an impossible feat. Military officials have even, on occasion, denied flights below 3,000 feet ever occur over parks, despite evidence to the contrary.

In the meantime, the *Sacramento Bee* conducted an in-depth, nationwide investigation into the matter, and published the results in a special report. According to the report, noise from jets has cracked the eggs of endangered birds in the Everglades and dislodged bricks from 142-year-old Fort Jefferson National Monument, a nearby island just off the coast of Florida.

The same article detailed a near mid-air collision over Sequoia National Park this summer between a helicopter carrying park supplies and an F-4 Phantom jet. Reports abound — from North Carolina's Cape Lookout to the desert parks of California — of visitors terrified by the sudden roar of military jets.

Russ Butcher, NPCA's California/Southwest regional representative, called the current situation at Grand Canyon a disaster waiting to happen. Low-flying military aircraft frequently barrel through the canyon in excess of 500 mph, cutting through the same airspace occupied by commercial air tours.

NPCA has long urged the FAA to end illegal flights over national parks around the country.

(From *National Parks*, Nov/Dec 1988, the magazine of the National Parks and Conservation Association.)

## Sources Of Groundwater Pollution

As the odyssey of the Long Island garbage scow, *The Mobro*, amply demonstrated the waste disposal problem in Canada and the United States is double-edged. Officials in both countries are being pressed to find new methods of disposing of huge amounts of refuse daily while handling them safely.

Safe disposal techniques are of particular concern in areas where groundwater is the primary source of drinking water. Recent EPA surveys of groundwater wells in the United States indicate that several long-accepted methods of disposing of domestic and industrial waste may endanger groundwater supplies.

Heading the list of questionable disposal practices are septic tanks and cesspools, used, according to EPA estimates, by over 16 million American homes to handle water-borne wastes.

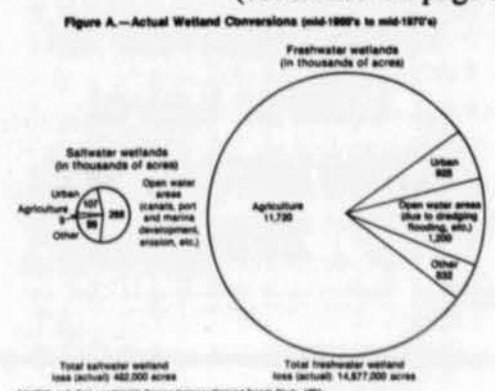
Underground tanks endanger the groundwater because they regularly release wastewater into the surrounding soil. (Total discharge of liquid waste from every cesspool and septic tank in the United States is believed to exceed one trillion gallons each year.) The waste can percolate through the soil, eventually contaminating wells.

The waste stream contains potentially dangerous organisms and chemicals, including coliform bacteria, viruses, nitrates and several heavy metals. Homeowners have contributed to the problem by having their septic tanks and cesspools cleaned with trichloroethylene (TCE). This chemical, a known animal carcinogen, is now commonly found in contaminated groundwater.

The U.S. Congress amended the Safe Drinking Water Act in 1986 to control contamination of groundwater wells. Under provision in the Act, EPA is in the process of setting maximum contaminant levels (MCLs) by 1989 for at least 83 pollutants, including TCE and several heavy metals as well as viruses and other organisms released by septic tanks and cesspools that may pose a threat to human health.

Another leading source of groundwater pollution is underground injection of industrial wastes. The Office of Technology Assessment has estimated that over 250,000 injection wells are in use in the United States to dispose of hazardous and non-hazardous liquid wastes.

(continued on page 3)





## From The Heart Of The Mountains Why K & B?

At a public hearing in the Webster County Courthouse January 12th the President of K & B Coal Company asked, "Why me?! Why single me out and pick on K & B?!"

My presentation on behalf of the Conservancy and several others on behalf of Trout Unlimited and the Bass Federation earlier in the evening provided an answer to that query. K & B was not being singled out. In fact, any proposals to strip the Kittanning Coal Seams in the Holly River drainage, especially the Left Fork, would meet with the same opposition.

Geological, biological and historical data submitted in response to the K & B application indicate that this is an acid prone site and is likely to negatively impact the lightly buffered streams in the area.

The site is near the "hinge line" that divides the acid producing area to the north from the non-acid producing area to the south. There is good reason to believe that K & B will be more like the acid-producing Island Creek operation to the north at Tenmile on the Buckhannon River, rather than the non-acid-producing Julianna mine to the south at Erbacon near Webster Springs.

Ongoing treatment at Tenmile is necessary to maintain the quality of the Buckhannon River so that the City of Buckhannon can use and distribute that water for domestic use throughout the county. Tenmile, its tributaries and the Buckhannon itself were, at one time native trout waters. Some 17 miles of those streams have been killed by drainage from the Island Creek operation and the nearby abandoned — now state owned and operated — DLM site at Alton. The River has also been severely impacted by both over and under treated slugs of water during the past 15 years.

Treatment has cost \$1 Million/year at Tenmile and \$1/2 Million/year at Alton.

K & B has submitted data to show that the Hodam Mountain minesite will not produce acid . . . But, the tests K & B has run and the Acid-Base Accounting methods they're relying on were also used by Enoxy/Island Creek at their Job #10 site. The tests at Job #10 also indicated that there would be little likelihood of the mine producing acid, but today, acid does flow from Job #10. The drainage has killed 3 more trout streams in the Tenmile area and continues to damage the downstream end of Tenmile Creek as it flows into the Buckhannon River.

Although mining 105 acres on the Holly River won't immediately duplicate the massive problems on the Buckhannon, even the smallest amount of acid will impact the lightly buffered Hodam Creek, the unnamed tributary in Light Hollow and the Left Fork of the Holly.

Furthermore, K & B made it clear at the public hearing that they have bigger plans for more mining once they get underway on Hodam. And, sad to say, history in the state shows that, once begun, the process of granting permits is difficult to stop — even in the most disastrous situations like Tenmile.

There are some areas in the North Central part of the State where strip mining the Kittanning Coal Seams should be prohibited. The Conservancy has supported such a prohibition since the early 1980's and continues to oppose expansion of mining in these areas where water resources are sacrificed for the removal of coal resources.

The Holly River watershed is on the Southern edge of this acid prone area. And the K & B permit promises to be the proverbial foot-in-the-door for extensive mining on the Holly.

### To the Editor:

I would like to share some thought provoking quotes printed in the Sunday Charleston Gazette on May 22, 1988. The excerpts are from a speech given by Denise Giardina in honor of National Library Week:

*"Nor do I believe this state will ever prosper as long as it pulls the burden of the coal industry along behind it like a sprinter trying to win a race while dragging a ball and chain.*

*The coal industry has brought widespread destruction to the state. It has provided jobs but it has withdrawn them just as capriciously and has created conditions which make expansion in other, more dependable economic areas difficult if not impossible. This has to be recognized and spoken of and acted upon or nothing will change in West Virginia."*

*"I hope we can begin to ask why we should support an industry which will employ few of us and force most of us to leave. I hope we can change our assessment of the coal industry, can begin to see it not as our only asset, but as our greatest liability, to be phased out and replaced by more healthy, constructive industries."*

Submitted by Richard diPretoro

**ATTENTION:  
WVHC'S  
NEW ADDRESS**

**1205 Quarrier St.  
Lower Level  
Charleston, WV  
25301**



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Dear Editor:

**SPACE-SHIP EARTH—REAFFIRMED.** Remember the shock of the photograph our astronauts took of the Earth from space . . . How small the Earth looked! The space-ship earth concept naturally followed. The even still global effects of our actions has been validated again.

A Connecticut power company in starting up a coal-fired electric power plant, will plant 50 million trees — in Guatemala. This will prevent further increase in carbon dioxide levels and its greenhouse effects. These trees should take up 15 million metric tons of carbon. The amount the new 180 megawatt plant will emit over its 40-year life span. Tree planting will cost over \$5 million. They are being planted there because the country of Guatemala and C.A.R.E. are helping with the cost as a needed reforestation project.

Sincerely,  
A Voice Reader



## — Book Review —

by Don Gasper

**OUR COMMON FUTURE**, by The World Commission on Environment and Development (383 pp., \$9.95, Oxford University Press).

This recently issued final report should be winter reading for environmentally concerned individuals who recognize the relationships between the local and global environment of spaceship earth.

The world commission was created by the United Nations General Assembly in 1983. Since then it has been meeting to come up with international agreement about the nature of the critical environmental issues and their solutions. It is a twenty-one country agreement. The United States Representative was the first U.S. E.P.A. administrator, William Ruckelshaus. This book is the culmination of this effort. It is the unanimous agreement of very different individuals from twenty-one countries from all parts of the world (the industrialized and developing countries) on such a broad-ranging environmental spectrum that balanced overall perspectives could be drawn.

**Our Common Future** begins with an overview and is followed by twelve chapters dealing with sustainable development, international economic influences, population explosion, starvation and quality of life, species and ecosystems, energy, industry, the urban challenge, managing the "global commons", peace and the arms race, and proposals for legal and institutional change.

Nothing was sighted, and they reached two conclusions. First, human activities are

beginning to affect the environment on a regional, even global scale, and some adverse impacts may be irreversible. Nations must cooperate on an "urgent" basis to protect resources of global import. Otherwise, we soon will exceed nature's limits and leave a diminished heritage to future generations.

Secondly, the developing nations must be allowed the economic growth that is environmentally sustainable. In more detail, it is an enormous challenge to meet the needs of these people without destroying the biological systems — forest, grazing lands, croplands and fisheries — on which they must depend for food, fuel, shelter, and other necessities.

When the report considers solutions, it often consists of merely discussion of many alternatives, without further direction. However, the clear review of alternatives is very valuable. The report recognizes this limitation and suggests a follow-up regionally and ultimately a global conference to review progress. Having provided a world view of our environmental problems, and made the point of urgency; it is perhaps up to us, those outside and inside of government, to be sure the needed actions are taken to turn **Our Common Future** into a national and international agenda — with the United States leading the way.

(Reviewed by *Thos. B. Stoel, Jr.*, *The Amicus Journal*, Fall 1987.)

Also available and of interest:  
**Groundwater Protection**, by Conserva-

tion Foundation Staff and The National Groundwater Policy Forum, Spring 1987; 256 pages, figures, indexes, \$15.00/paperback. The product of a joint effort by The Conservation Foundation and the National Groundwater Policy Forum, this book contains the Forum's final recommendations released earlier in the report, "Groundwater: Saving the Unseen Resource," November, 1985. The Forum calls for an aggressive national policy to assure that future generations have adequate supplies of uncontaminated groundwater. The Forum urges "a new environmental partnership" among all levels of government, business, and public interest groups. Its recommendations include a comprehensive 10-point groundwater protection program for state governments to adopt. The book also contains a summary of public comments on the Forum's proposals, presented in writing and at three public hearings, and an extensive analysis of the groundwater pollution problem prepared independently by The Conservancy Foundation staff. Included is substantial reference material on groundwater issues discussed in the Forum's report. The National Groundwater Policy Forum was funded by grants from the William H. Donner Foundation, Exxon Company, USA, The Ford Foundation, the H. J. Heinz Company Foundation, The Joyce Foundation, and the F. H. Prince Testamentary Trust. The Conservancy Foundation, 1250 Twenty-Fourth Street, N.W., Washington, D.C. 20037, Telephone (202-293-4800).

### Wetlands

"Protecting America's Wetlands: An Action Agenda," the final report of the National Wetlands Policy Forum, November, 1988. Individual copies are available free.

The full final report of the National Wetlands Policy Forum containing sections on establishing a national goal, planning for wetlands protection, promoting private stewardship, improving regulatory programs, reducing government-caused conversions, improving government acquisition programs, providing better information, restoring and creating wetlands protection management.

"Issues in Wetlands Protection: Background Papers" prepared for the National Wetlands Policy Forum, a research report edited by Michele Leslie, Edwin H. Clark II, and Gail Bingham, approximately 175 pages, \$17.50.

Contains background papers prepared by The Conservancy Foundation staff and consultants. Topics include rates of wetlands loss, wetlands definitions, goals for wetlands programs, advance planning and consensus building, nonregulatory programs promoting wetlands protection, overviews of and gaps in existing regulatory programs, mitigation policies, government programs inducing wetlands alterations, and scientific issues related to the restoration and creation of wetlands.

The Conservancy Foundation, 1250 Twenty-Fourth Street, N.W., Washington, D.C. 20037, Telephone (202-293-4800).

## Monongahela National Forest Hiking Guide Now Out

Edition 5 of the WVHC **Monongahela National Forest Hiking Guide** is now available. This edition is bigger and better than ever, with 320 pages, 60 maps, 39 photographs, descriptions of 164 trails totalling 780 miles, a new section on ski-touring, and a full-color cover. The authors are Allen de Hart and Bruce Sundquist. Allen has hiked all the trails of the Monogahela N.F. over the past few years. Bruce edited Editions 1-4. The hiking community and the U.S. Forest Service provided the authors with trail reports and photographs.

In the U.S. Forest Service's planning process that led to

the 1986 Land and Resource Management Plan, over 35,000 comments were received from the public. The gist of these comments is that the Monongehela is a "Special Place." And indeed it is. The hiking and backpacking opportunities it provides are among the best in the eastern U.S. The more outstanding areas are becoming known far and wide — Otter Creek Wilderness, Dolly Sods Wilderness, Flatrock Plains, Roaring Plains, Blackwater Canyon, Spruce Knob, North Fork Mountain, Shaver's Mountain, Laurel Fork Wilderness, Cranberry Back Country, Cranberry Wilderness, among others. This guide will help you get to know

these and other special places in the forest.

Profits from the sale of these guides support a wide variety of worthy environmental projects in the West Virginia Highlands Conservancy.

To order your copy of **Monongahela National Forest Hiking Guide**, send \$9.95 plus 6% sales tax for WV residents, plus \$1.25 postage (book rate) to West Virginia Highlands Conservancy, 1205 Quarrier St., Lower Level Charleston, WV 25301.

## Sources Of Groundwater Pollution (continued from page 1)

Wastes disposed of in this manner are pumped into deep, underground pockets or into aquifers which cannot be used for commercial or domestic consumption. In theory, these underground disposal sites are safe, as they are to be confined and isolated from wells used for drinking water. Recent studies, however, indicate that underground injection can threaten groundwater reserves. EPA has reported that over 21,000 injection wells require corrective action.

Many of these wells are poorly constructed or designed, allowing injected waste to seep into neighboring aquifers. Others are poorly located, so that waste seeps directly into drinking water supplies. Some wells while located in stable and confined underground pockets, cannot contain the injected wastes, which manage to migrate to active groundwater wells.

EPA has already taken steps to mitigate pollution from underground injection. Under

the Safe Drinking Water Act, it has established underground injection programs in 20 states and partial programs in six states, while granting 31 states and territories full control over their own programs. Working under federal regulations, the states have established guidelines for construction of the wells and rules for monitoring chemicals injected underground.

A third source of groundwater contamination is landfilling. Municipalities and industry have relied extensively on landfills to dispose of hazardous and non-hazardous solid wastes. EPA estimates that there are over 93,000 landfills in the United States, with 75,000 used for industrial waste and 18,500 used for municipal disposal.

However, as the disaster in the Love Canal area of upstate New York clearly demonstrated, landfills can, in addition to other problems, threaten drinking water supplies, especially when they are not prop-

erly constructed and maintained. Chemicals and organisms can leach through the confines of the landfill and contaminate drinking water wells.

A survey of 12,991 municipal landfills by *Waste Age Magazine* found that 2,396 were open dumps, only 37 had artificial liners to contain the waste and only 1,609 had monitoring wells to detect potential contamination of groundwater supplies. The problem is magnified when abandoned municipal dumps are added to the list. The Office of Technology Assessment estimates that the number of abandoned landfills could exceed the number of active ones.

In 1986 Congress passed the Superfund Amendments and Reauthorization Act (SARA) directing EPA to control pollution from previously uncontrolled hazardous waste dumpsites, including leachates which endanger groundwater reserves. EPA is currently using this legislative mandate to clean

up contaminated sites around the United States.

Under provisions in the Resource Conservation and Recovery Act (RCRA), EPA is drawing up regulations for hazardous waste disposal and standards for municipal solid waste disposal. Legislation is pending in both Houses of Congress which would direct EPA to tighten controls over disposal of hazardous ash from municipal waste incinerators.

Canada is also in the process of assessing groundwater contamination from waste disposal sources. The Canadian Parliament is now considering legislation which would require "cradle to grave" management for toxic chemicals, including safe disposal methods for hazardous substances. The House of Commons has recently enacted the Environmental Protection Act. **Environmental Perspectives — Canadian Embassy**



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Dear Editor:

SPACE-SHIP EARTH—REAFFIRMED. Remember the shock of the photograph our astronauts took of the Earth from space... How small the Earth looked! The space-ship earth concept naturally followed. The even still global effects of our actions has been validated again.

A Connecticut power company in starting up a coal-fired electric power plant, will plant 50 million trees — in Guatemala. This will prevent further increase in carbon dioxide levels and its greenhouse effects. These trees should take up 15 million metric tons of carbon. The amount the new 180 megawatt plant will emit over its 40-year life span. Tree planting will cost over \$5 million. They are being planted there because the country of Guatemala and C.A.R.E. are helping with the cost as a needed reforestation project.

Sincerely,  
A Voice Reader



## — Book Review —

by Don Gasper

**OUR COMMON FUTURE**, by The World Commission on Environment and Development (383 pp., \$9.95, Oxford University Press).

This recently issued final report should be winter reading for environmentally concerned individuals who recognize the relationships between the local and global environment of spaceship earth.

The world commission was created by the United Nations General Assembly in 1983. Since then it has been meeting to come up with international agreement about the nature of the critical environmental issues and their solutions. It is a twenty-one country agreement. The United States Representative was the first U.S. E.P.A. administrator, William Ruckelshaus. This book is the culmination of this effort. It is the unanimous agreement of very different individuals from twenty-one countries from all parts of the world (the industrialized and developing countries) on such a broad-ranging environmental spectrum that balanced overall perspectives could be drawn.

**Our Common Future** begins with an overview and is followed by twelve chapters dealing with sustainable development, international economic influences, population explosion, starvation and quality of life, species and ecosystems, energy, industry, the urban challenge, managing the "global commons", peace and the arms race, and proposals for legal and institutional change.

Nothing was slighted, and they reached two conclusions. First, human activities are

beginning to affect the environment on a regional, even global scale, and some adverse impacts may be irreversible. Nations must cooperate on an "urgent" basis to protect resources of global import. Otherwise, we soon will exceed nature's limits and leave a diminished heritage to future generations.

Secondly, the developing nations must be allowed the economic growth that is environmentally sustainable. In more detail, it is an enormous challenge to meet the needs of these people without destroying the biological systems — forest, grazing lands, croplands and fisheries — on which they must depend for food, fuel, shelter, and other necessities.

When the report considers solutions, it often consists of merely discussion of many alternatives, without further direction. However, the clear review of alternatives is very valuable. The report recognizes this limitation and suggests a follow-up regionally and ultimately a global conference to review progress. Having provided a world view of our environmental problems, and made the point of urgency; it is perhaps up to us, those outside and inside of government, to be sure the needed actions are taken to turn **Our Common Future** into a national and international agenda — with the United States leading the way.

(Reviewed by Thos. B. Stoel, Jr., *The Amicus Journal*, Fall 1987.)

Also available and of interest:  
**Groundwater Protection**, by Conserva-

tion Foundation Staff and The National Groundwater Policy Forum, Spring 1987; 256 pages, figures, indexes, \$15.00/paperback. The product of a joint effort by The Conservation Foundation and the National Groundwater Policy Forum, this book contains the Forum's final recommendations released earlier in the report, "Groundwater: Saving the Unseen Resource," November, 1985. The Forum calls for an aggressive national policy to assure that future generations have adequate supplies of uncontaminated groundwater. The Forum urges "a new environmental partnership" among all levels of government, business, and public interest groups. Its recommendations include a comprehensive 10-point groundwater protection program for state governments to adopt. The book also contains a summary of public comments on the Forum's proposals, presented in writing and at three public hearings, and an extensive analysis of the groundwater pollution problem prepared independently by The Conservancy Foundation staff. Included is substantial reference material on groundwater issues discussed in the Forum's report. The National Groundwater Policy Forum was funded by grants from the William H. Donner Foundation, Exxon Company, USA, The Ford Foundation, the H. J. Heinz Company Foundation, The Joyce Foundation, and the F. H. Prince Testamentary Trust. The Conservancy Foundation, 1250 Twenty-Fourth Street, N.W., Washington, D.C. 20037, Telephone (202-293-4800).

### Wetlands

"Protecting America's Wetlands: An Action Agenda," the final report of the National Wetlands Policy Forum, November, 1988. Individual copies are available free.

The full final report of the National Wetlands Policy Forum containing sections on establishing a national goal, planning for wetlands protection, promoting private stewardship, improving regulatory programs, reducing government-caused conversions, improving government acquisition programs, providing better information, restoring and creating wetlands protection management.

"Issues in Wetlands Protection: Background Papers" prepared for the National Wetlands Policy Forum, a research report edited by Michele Leslie, Edwin H. Clark II, and Gail Bingham, approximately 175 pages, \$17.50.

Contains background papers prepared by The Conservancy Foundation staff and consultants. Topics include rates of wetlands loss, wetlands definitions, goals for wetlands programs, advance planning and consensus building, nonregulatory programs promoting wetlands protection, overviews of and gaps in existing regulatory programs, mitigation policies, government programs inducing wetlands alterations, and scientific issues related to the restoration and creation of wetlands.

The Conservancy Foundation, 1250 Twenty-Fourth Street, N.W., Washington, D.C. 20037, Telephone (202-293-4800).

## Monongahela National Forest Hiking Guide Now Out

Edition 5 of the WVHC **Monongahela National Forest Hiking Guide** is now available. This edition is bigger and better than ever, with 320 pages, 60 maps, 39 photographs, descriptions of 164 trails totalling 780 miles, a new section on ski-touring, and a full-color cover. The authors are Allen de Hart and Bruce Sundquist. Allen has hiked all the trails of the Monogahela N.F. over the past few years. Bruce edited Editions 1-4. The hiking community and the U.S. Forest Service provided the authors with trail reports and photographs.

In the U.S. Forest Service's planning process that led to

the 1986 Land and Resource Management Plan, over 35,000 comments were received from the public. The gist of these comments is that the Monongehela is a "Special Place." And indeed it is. The hiking and backpacking opportunities it provides are among the best in the eastern U.S. The more outstanding areas are becoming known far and wide — Otter Creek Wilderness, Dolly Sods Wilderness, Flatrock Plains, Roaring Plains, Blackwater Canyon, Spruce Knob, North Fork Mountain, Shaver's Mountain, Laurel Fork Wilderness, Cranberry Back Country, Cranberry Wilderness, among others. This guide will help you get to know

these and other special places in the forest.

Profits from the sale of these guides support a wide variety of worthy environmental projects in the West Virginia Highlands Conservancy.

To order your copy of **Monongahela National Forest Hiking Guide**, send \$9.95 plus 6% sales tax for WV residents, plus \$1.25 postage (book rate) to West Virginia Highlands Conservancy, 1205 Quarrier St., Lower Level Charleston, WV 25301.

## Sources Of Groundwater Pollution (continued from page 1)

Wastes disposed of in this manner are pumped into deep, underground pockets or into aquifers which cannot be used for commercial or domestic consumption. In theory, these underground disposal sites are safe, as they are to be confined and isolated from wells used for drinking water. Recent studies, however, indicate that underground injection can threaten groundwater reserves. EPA has reported that over 21,000 injection wells require corrective action.

Many of these wells are poorly constructed or designed, allowing injected waste to seep into neighboring aquifers. Others are poorly located, so that waste seeps directly into drinking water supplies. Some wells while located in stable and confined underground pockets, cannot contain the injected wastes, which manage to migrate to active groundwater wells.

EPA has already taken steps to mitigate pollution from underground injection. Under

the Safe Drinking Water Act, it has established underground injection programs in 20 states and partial programs in six states, while granting 31 states and territories full control over their own programs. Working under federal regulations, the states have established guidelines for construction of the wells and rules for monitoring chemicals injected underground.

A third source of groundwater contamination is landfilling. Municipalities and industry have relied extensively on landfills to dispose of hazardous and non-hazardous solid wastes. EPA estimates that there are over 93,000 landfills in the United States, with 75,000 used for industrial waste and 18,500 used for municipal disposal.

However, as the disaster in the Love Canal area of upstate New York clearly demonstrated, landfills can, in addition to other problems, threaten drinking water supplies, especially when they are not prop-

erly constructed and maintained. Chemicals and organisms can leach through the confines of the landfill and contaminate drinking water wells.

A survey of 12,991 municipal landfills by *Waste Age Magazine* found that 2,396 were open dumps, only 37 had artificial liners to contain the waste and only 1,609 had monitoring wells to detect potential contamination of groundwater supplies. The problem is magnified when abandoned municipal dumps are added to the list. The Office of Technology Assessment estimates that the number of abandoned landfills could exceed the number of active ones.

In 1986 Congress passed the Superfund Amendments and Reauthorization Act (SARA) directing EPA to control pollution from previously uncontrolled hazardous waste dumpsites, including leachates which endanger groundwater reserves. EPA is currently using this legislative mandate to clean

up contaminated sites around the United States.

Under provisions in the Resource Conservation and Recovery Act (RCRA), EPA is drawing up regulations for hazardous waste disposal and standards for municipal solid waste disposal. Legislation is pending in both Houses of Congress which would direct EPA to tighten controls over disposal of hazardous ash from municipal waste incinerators.

Canada is also in the process of assessing groundwater contamination from waste disposal sources. The Canadian Parliament is now considering legislation which would require "cradle to grave" management for toxic chemicals, including safe disposal methods for hazardous substances. The House of Commons has recently enacted the Environmental Protection Act. *Environmental Perspectives — Canadian Embassy*



## How Plants Grow — And Let's Hope They Do!

by O. B. Combs

Fruit and vegetable plants are made up of tiny cells. They grow and reproduce by increasing the number, size and nature of these cells. As growth occurs, several important processes take place. Seeds germinate and become young plants that develop roots, stems, leaves and flowers. When flowers are pollinated, seeds and fruits begin to form.

These processes involve intake of carbon dioxide and oxygen, largely from the air and water, and minerals from the soil. Foods manufactured from these raw materials and stored in fruits, seeds, stems, tubers, leaves and flowers provide nourishment, directly or indirectly, for people and animals.

The most important single process carried on by green plants is called photosynthesis. Energy from the sun is trapped by the green plant, simple sugars are formed, and oxygen is released into the atmosphere. Complex carbohydrates, fats, proteins and vitamins are formed by the incorporation of sugars with mineral elements from the soil.

As plants multiply, enlarge their cells and build new tissues and organs, they break down foods with the aid of oxygen to release energy. This process is known as respiration; carbon dioxide, energy and water are released.

Most vegetables are reproduced sexually from seeds. Most fruits and a few vegetables are reproduced asexually or vegetatively from plants or plant parts. Seeds contain the embryo (live plant) and stored foods. For rapid germination, seeds must be alive and strong enough to break the seed coat and emerge from the soil. They need water, oxygen, and a suitable temperature.

The temperature best suited for rapid germination varies with different plants. Seeds of cool season vegetables such as carrots germinate rapidly at soil temperatures between 50° and 60° F, and seeds of warm

season vegetables such as beans between 70° and 80°. Sweet corn seeds, which may require ten days to germinate at 50°, may germinate in two to three days at 80°.

Roots anchor and support plants and absorb water and minerals from the soil. These materials are taken in through root hairs and then moved through the stem to the leaves. Roots are the major storage organs or such vegetables as beets, carrots, and sweet potatoes.

Roots have no chlorophyll, thus they depend upon the leaves for their food supply. Roots must be healthy, unrestricted and undamaged by diseases, insects, or deep cultivation if they are to perform their functions. They must have adequate oxygen.

Too much water from a high water table or over-irrigation on heavy soils may result in insufficient oxygen and serious interference with proper root growth and function.

Root systems differ markedly in their form, spread and depth, the tap roots of carrots grow almost directly downward to considerable depths, and give off many lateral branch roots. The fibrous roots of onions grow an extensive, relatively shallow network of small roots. Some plants, such as apple and other tree fruits, have several large roots for anchorage, with many smaller branch roots.

Stems make up the above-ground framework of plants. They provide support for the plant and contain the food storage and transport tissues.

Water and nutrients from the soil move to the leaves, where sunlight and leaf chlorophyll — through the process called photosynthesis — manufacture food for plant growth and production of the edible portions. Water, nutrient, and manufactured food movement within the plant occurs in the conductive tissue, known as the xylem

and phloem.

Leaves originate from stems and are the principal food-manufacturing organs of green plants. They take in carbon dioxide from the air and allow oxygen and water vapor to escape through small openings — mainly on their lower surfaces — called stomata. Plants are able to regulate these stomatal openings and thus partially control the loss of water from their leaves.

Flowers are necessary for production of seeds. Beans, peas, and sweet corn are annuals; they produce seeds each year and die when the seeds have matured. Cabbage, beets and carrots are biennials and need some part of two seasons to produce seeds; they die when their seeds have matured. Asparagus and rhubarb are perennials which — once established — may produce and mature seeds each year, but the plants continue to grow in the same location for several years.

Light is the source of energy for photosynthesis, the food manufacturing process carried on only by green plants. It also influences the movement and position of plant organs and the size, form and structure of plants. The amount of food manufactured depends upon the duration, intensity and quality of light. Whether a plant flowers or not is often determined by the relative length of day and night.

Formation of the green coloring matter (chlorophyll) in plants goes on only in light. Pure white cauliflower and creamy white, blanched celery, endive hearts and asparagus spears are produced by excluding light from these plant parts.

Plants arrange their leaves to insure suitable exposure to light. Excess exposure causes stunting; insufficient light causes tall, weak, light green plants.

Plants such as spinach and chinese cab-

bage go to seed if growing when days are longer than 15 hours.

The above-ground parts of plants generally are positively phototropic, they grow toward light; roots of most plants are negatively phototropic, they grow away from light. Tops of plants are negatively geotropic, they grow upward away from the force of gravity; plant roots are positively geotropic, they grow downward toward the force of gravity.

Temperature markedly influences plant growth. All important functions of plants — respiration, photosynthesis, absorption, digestion and reproduction — are influenced by temperature. Each plant has a temperature range in which it grows best, other factors being equal.

Cool season vegetables such as carrots and spinach grow best at lower temperatures than those preferred by warm season vegetables such as beans and melons. Likewise, cool season vegetables are less susceptible to injury from frost.

Plants started indoors frequently are "hardened" by gradually exposing them to somewhat lower temperatures before they are set outdoors. Certain vegetables such as asparagus, horseradish, Jerusalem artichoke, parsnip, rhubarb and salsify will withstand very low temperatures and may be left in the soil over winter even in areas with severe climate.

Water is the most frequent factor limiting plant growth. It is the principal constituent of plants, and an essential raw material in the manufacture of food. Mineral salts must be dissolved in water before they can move into plants through the root hairs. Oxygen and carbon dioxide enter and leave plants in water solution. Mineral salts and manufactured foods move throughout the plant in water solution.

(continued on page 6)

### A Calendar Of WV Conservation Organizations' Outings and Other Nature-Related Activities

Mar. 3	Kyger Creek and Cheshire OH Field Trip, HTSAS
Mar. 3-5	Early Spring Meeting at Jacksons Mill, BBC
Mar. 4	Dolly Sods XC Skiing (G Good, 296-6850), WVSC
Mar. 12	Waterfowl Trip to Seneca Lake, OH, BBC & MAS
Mar. 15	"Acid Rain and Spruce Decline in WC," Mgmt, MAS
Mar. 19	Winter Botanizing and Nature Study, 2 pm, Mgmt, BRAD
Mar. 23	"Spiders" w/Jim Arnold, 7:30, Huntington, HTSAS
Mar. 25	Glenwood Swamp Field Trip, HTSAS
Apr.	Canoe Trip, TNC
Apr. 6, 7, 11, 12	"Birding for Beginners," Mgmt, MAS
Apr. 8	Folk Medicine and Herbal Remedies, 1-4 pm, Mgmt, BRAD
Apr. 12	Joint Meeting MAS and WVSC in Mgmt.
Apr. 15	Lesage WV (wildflowers) Field Trip, HTSAS
Apr. 15-16	Spring Review, Blackwater Falls State Park, WVHC
Apr. 22	Lake Vesuvius OH Field Trip, HTSAS
Apr. 23	Identifying Wildbirds of Spring, 7-9 am. Mgmt, BRAD
Apr. 27	"Birds of the Tri-State (for beginners), Huntington, HTSAS
Late Apr.	Medicinal Herbs Hike (T Saxe, 292-0605), Mgmt, MAS
Apr. 28-30	Old Hemlock Weekend at Terra Alta, BBC
Apr. 29	Neighborhood bird walks, HTSAS
Apr. 29	Exploring the Unusual Courtship of Woodcock and Snipe & Stalking Wild Turkey with a Camera in Canaan Valley, BRAD

#### Key and Contact for more information (if none listed above):

BBC — Brooks Bird Club, Helen Conrad, Wheeling, 547-1053  
 BRAD — Back Roads Adventures, Mgmt, 296-0565. RESERVATIONS ESSENTIAL.  
 HTSAS — Huntington Tri-State Audubon Society, Tom Igou, 429-5409  
 MAS — Mountaineer Audubon Society, Mgmt, 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

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 more 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.

### Galen Rowell To Present Natural World Photo Workshop March 11

Galen Rowell, the world's premier mountain photographer, will be at the Carnegie Museum on March 11, 1989, to present an all-day lecture-workshop based on his own widely published photography. Mr. Rowell, who has climbed in virtually every mountain range of consequence in the world, has also published his work extraordinarily widely. A partial list of his credits includes:

- \* An hour-long video on his work, published in October, 1988, by KODAK
- \* A 16-year-long string of images in the Sierra Club Calendars
- \* Six National Geographic articles, including a major one in October, 1987, on the Himalayas.
- \* Six of his own books of photography, including most recently The Sierra Club book, "Mountain Light: The Search for the Dynamic Landscape", in 1984 and the remarkable "Throne Room of the Mountain Gods", also by the Sierra Club.
- \* Nine of his own calendars, including one exclusively of bears in the wild, and one of the people of China.
- \* Thirty-seven articles in national or international publications in 1987 alone, including 22 feature or cover articles. These include such magazines as *Wilderness*, *Audubon*, and *Sierra*.

The workshop is sponsored by the Sierra Club, Allegheny Group, and will take place in the Carnegie Lecture Hall, beginning at 9:30, Saturday, March 11. In a unique format, Galen Rowell will use a multi-projector system to dissolve through a series of failed images discussing the changes that lead finally to the successful one. There will be three one-and-a-half hour lectures, separated by an hour's discussion. Lunch will be on your own in Oakland. The day's program will cost only \$17.50. Places may be reserved by writing: Photography Workshop, Sierra Club, 515 Lloyd Street, Pgh, PA, 15208. (Also sponsored by the Explorers Club of Pittsburgh.)

In the evening, the Sierra Club's Annual Meeting, open to the public, will include a lecture by Galen Rowell titled "Return to Shangri-La". Galen and a group of equally daring friends kayaked some of the great Himalayan rivers and climbed some of the peaks in the Kingdom of Baltistan, the subject of his October, 1987 *National Geographic* article. Added to his other remarkable talents, Galen is an accomplished cultural anthropologist, and he documents the people of this distant place as well as its natural beauty. That lecture will cost \$7, tickets obtainable at the same address as above.



# Radon vs. Lung Cancer New Study Weighs The Risks

"Radon gas cited as cancer source."  
"Your house may be a death trap."

Such overblown headlines have become commonplace over the past two years as public concern increases over the possible health hazards of radon in indoor air.

Radon is a radioactive gas naturally produced in minute quantities in soil and groundwater. Outdoors, it is too diluted to be harmful. When it seeps into modern, air-tight buildings, however, it can become trapped and accumulate in potentially dangerous proportions. Radon is the single largest source of radiation exposure for the average person. It may rank second only to cigarette smoking as a cause of lung cancer in the United States.

Unfortunately, there is no clear-cut method for determining safe levels of radon exposure. Current guidelines are based on data gathered from studies of uranium miners. Because of the uncertainties involved in extrapolating radon risks from miners to the public, a recent government report urged direct investigations of the health effects of indoor radon.

Argonne is responding to this need with a major multiyear study of lung cancer and indoor radon in eastern Pennsylvania, where high levels have been found in many homes. Experts have estimated that billions of dollars would be required to lower radon levels — by sealing entry points and increasing ventilation — to currently recommended levels in all U.S. houses. The Argonne study will determine if this is indeed necessary. Our results should also be of interest to the real estate, construction and banking industries. Banks in Pennsylvania, for example, will not issue a mortgage unless the house involved has passed a radon test.

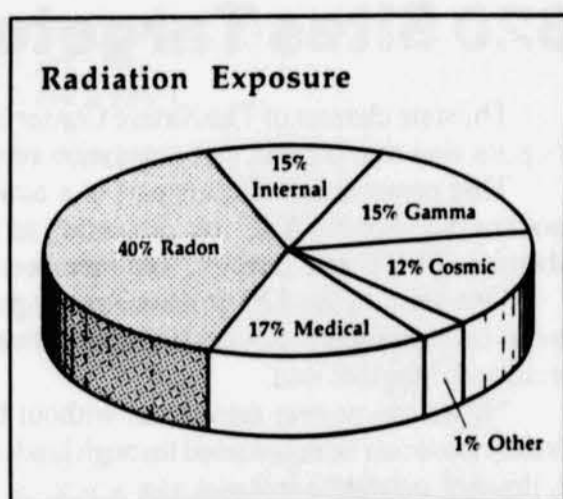
Radon-222 — a colorless, odorless, tasteless inert gas — is a naturally occurring radioactive element. It is continually produced from its parent, radium-226, which is present in trace amounts in all rocks and soil. The radium, in turn, is continually produced from uranium. Consequently, geological formations rich in uranium will produce high levels of radon.

Radon is not chemically reactive, since it is in the same family as helium, neon and argon, and it has a fairly long radioactive half-life of 3.8 days (the time required for it to lose half its radioactivity). Thus, radon can move long distances through the soil in which it is produced and still remain radioactive. It may enter a house through cracks, drains, unpaved crawl spaces, pipe openings, or dissolved in groundwater. Unless the house is very well ventilated, the radon concentration can build to potentially hazardous levels.

Radon is measured in picoCuries per liter of air. One picoCurie (pCi) is equivalent to 2.22 radioactive atoms disintegrating (i.e., emitting radiation) every minute. The typical outdoor concentration of radon-222 is about 0.1 pCi per liter of air, and average indoor concentrations are thought to be 10 or 20 times higher at 1 to 2 pCi/L.

Based on studies of the cancer incidence in uranium miners, the Environmental Protection Agency established an upper limit of 4 pCi/L as a guideline for indoor exposure to radon. Exposure to this amount of radon over a 50-year period may increase the risk of lung cancer by 2 percent. Indoor radon levels exceeding 10 to 20 pCi/L are considered quite dangerous. The highest level observed to date occurred in a house in eastern Pennsylvania, which had a concentration of 2,700 pCi/L in the basement.

The EPA estimates that 12 percent of U.S. houses may have radon levels above 4



Radon is the major source of radiation exposure for most people. Other sources include cosmic rays, potassium within the body, naturally occurring gamma rays and medical procedures.

pCi/L, and that indoor radon may be responsible for 5,000-20,000 cases of lung cancer per year in this country. In the absence of radon, a non-smoker has a lifetime lung cancer risk of about 1 percent, a heavy smoker about 15 percent.

Estimates of lung cancer based on studies of uranium miners may really be worst-case or upper-limit estimates, however. Most miners received their total exposures in a relatively short period, usually a decade or less. These short, intense exposures provided dose rates 10 times higher than in domestic situations.

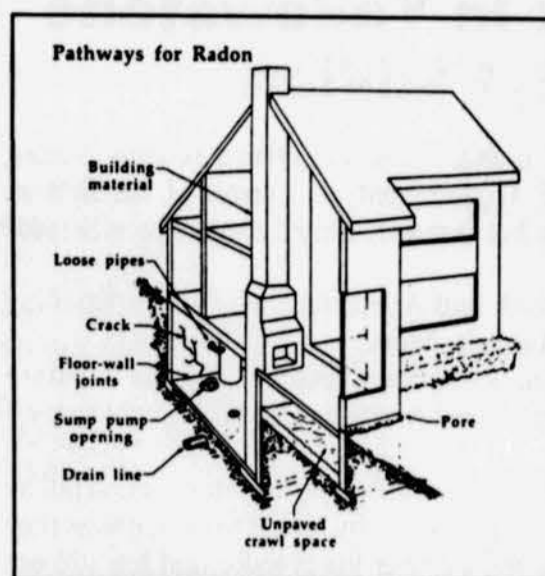
Nevertheless, even at the lower end of risk estimates — 5,000 lung cancers annually in the U.S. — radon is predicted to cause more cancer than everything else the EPA regulates put together. For example, radioactivity in drinking water is estimated to cause about 160 cancers annually. Ironically, the EPA has no jurisdiction over indoor levels of most air pollutants, including radon.

The problems involved in measuring radon levels, computing radiation doses, and setting standards or guidelines are complicated by the fact that radon itself produces very little radiation dose to the lungs. Because it is an inert gas, most inhaled radon is promptly exhaled. The danger comes from radon daughters — radioactive isotopes of lead, bismuth and polonium that are continually produced by radon's decay. Because these elements are solids, they remain in the lung and subsequently irradiate lung tissue.

The scientific community has been well aware of and concerned about radon for decades. At Argonne, radon research has been conducted for more than 30 years. But the problem did not catch the public's attention until December 1984, when a Pennsylvania resident repeatedly set off radiation alarms while at work in a nuclear power plant. The radiation was due to radon and its daughter products. The source of the radon was found to be high concentrations of uranium in the bedrock beneath his house and those of his neighbors.

The rock formation responsible for the high radon levels is called the Reading Prong, a uranium-rich outcropping of granite that runs northeastward from Reading, Penn., through northern New Jersey and into New York state. Subsequent testing revealed extremely high — in fact, incredibly high — levels of indoor radon in several other houses in eastern Pennsylvania. In all, 60 percent of the houses had radon levels above the EPA guideline of 4 pCi/L. Although data from other parts of the country is not as extensive, it is now clear that the radon problem is nationwide.

Argonne's involvement with indoor radon began in the mid-1970s with the discovery of increased levels of radon in the exhaled breath of several employees. The source was



Radon, a radioactive gas naturally produced in soil and groundwater, can enter a house via several routes. Unless the house is well ventilated, the unseen gas can build to potentially dangerous levels.

traced to high concentrations of indoor radon in their homes. The radon level in one employee's house was 30 pCi/L, emanating from an unpaved crawl space under the house.

Because of concern that energy conservation efforts may decrease ventilation, and therefore increase indoor radon levels, we conducted a survey of approximately 150 Chicago-area houses, most owned by Argonne employees. We found that 19 percent of the basements had radon levels of 4 to 10 pCi/L, and 8 percent were above 10 pCi/L.

In 1983, we surveyed nearly 200 homes in and around Bloomsburg, Penn., an area well away from the Reading Prong. We found high radon levels in more than 40 percent of the houses, again from natural sources in the underlying rock. Fifty-seven percent of the basements had radon levels below 4 pCi/L, 24 percent contained 4 to 10 pCi/L, and 19 percent exceeded 10 pCi/L. The definition of "high" in Pennsylvania became 300 pCi/L, still 10 times less than the highest level later discovered.

These studies, however, merely measured radon levels, not their effects on human health. A direct investigation of the health effects of indoor radon is required before society spends the billions of dollars required to lower radon levels to 4 pCi/L or less in all U.S. houses.

The Committee on Interagency Radiation Research and Policy Coordination recently issued a report titled "Radon Protection and Health Effects," which states that research should be accelerated on "additional, well-designed epidemiological studies of lung cancer and radon progeny exposure in housing, including consideration of smoking histories. Case-control studies are especially needed."

In response, Argonne has launched a multiyear case-control study of lung cancer vs. radon exposure in eastern Pennsylvania women. We are concentrating on women for three reasons: Fewer women smoke than do men; they are exposed to fewer carcinogens in the workplace; and women spend more time at home.

We will compile data on approximately 2,000 lung cancer cases, stratified by histological type, from the Pennsylvania cancer registry. Controls will be women without lung cancer who lived in Pennsylvania from 1975 to 1989. For both cases and controls, residential histories will be obtained, and radon measurements will be made in all houses where the subjects lived. We estimate that 15,000 houses will be tested for radon during this study.

The Argonne investigative team has established its headquarters in Gilbertsville, Penn. We have analyzed data provided by the state on 6,000 houses already tested for radon, and are preparing to begin our own site

studies.

Radon levels will be measured using two different methods. The primary technique is year-long exposures of "alpha-track detectors." The detectors are small pieces of specially formulated plastic in a filter cup. Radon diffuses into the cup and decays inside. The daughter products deposit on the surface of the plastic, where they cause microscopic damage as they decay. After chemical treatment, the radiation tracks become large enough to count under a microscope. The number of tracks per unit area is a direct measure of the average radon level during the exposure period.

We will also take a "grab sample" in each house so that at least one number is available in case the house is lost to follow-up. The grab sample involves collecting air and analyzing it for radon using standard radiation counting methods. The technique provides rapid results, but gives only a "snapshot" of the radon situation. Indoor radon levels vary by factors of 10 or more both daily and seasonally, due to variations in air pressure, wind speed and direction, ventilation, and soil porosity. Thus, a longer-term measurement such as the alpha-track detector is needed for an accurate picture of radon exposure.

Argonne's study should establish whether indoor radon levels in the range of 4 to 10 pCi/L are in fact hazardous, and provide a more realistic risk estimate for environmental radon. If indoor radon causes lung cancer in the general population at the rate predicted by the uranium-miner data, then about 80 percent of the lung cancer cases should have spent significant fractions of their lives in houses that fall into the upper 20 percent of radon levels.

Even if the results of this study are negative — that is, there is no increased risk of lung cancer among women living in houses with radon levels above 4 pCi/L — there are still many houses in the country that have indoor radon levels of 100 pCi/L and above. These houses must be located and their radon levels determined.

*Richard E. Toohey is a biophysicist in the environmental health section of Argonne's division of biological and medical research. He received a doctorate in nuclear physics from the University of Cincinnati in 1973. His fields of expertise are radioactivity measurement and internal dosimetry. He joined Argonne in 1971.*

Logos, Spring 1987

*In plants which are temporarily propagated by cuttings, buds, &c., the importance of the crossing both of distinct species and of varieties is immense; for the cultivator here quite disregards the extreme variability both of hybrids and mongrels, and the frequent sterility of hybrids; but the cases of plants not propagated by seed are of little importance to us, for their endurance is only temporary. Over all these causes of Change I am convinced that the accumulative action of Selection, whether applied methodically and more quickly, or unconsciously and more slowly, but more efficiently, is by far the predominant Power.*

*The Origin of Species by Means of Natural Selection or The Preservation of Favoured Races in the Struggle for Life. Charles Darwin*



## NEWS BRIEFS

### Claims From Blazes In Yellowstone Area Total \$1.1 Million

YELLOWSTONE NATIONAL PARK, Wyo., Jan. 16 (AP) — Damage claims totaling \$1.1 million have been filed against the Federal Government as a result of the fires in Yellowstone National Park and surrounding forests last summer, United States Forest Service officials say.

More than two dozen claims are being processed, said Arlene Bateman, who is handling those filed through the Forest Service's office in Missoula, Mont.

Government lawyers will review each claim to determine whether negligence or nature caused the damage, Ms. Bateman said last week. "Decisions on claims could be months away," she said.

More than 700,000 acres of the 2.2-million-acre park were burned last summer and fall by a dozen fires. The Forest Service's policy of allowing fires started by nature to burn unless they threaten lives, property or historic sites generated a debate over the practice that has still not quieted.

Ms. Bateman said she was processing 16 claims totaling \$525,000 arising from the Storm Creek fire, which burned south from Custer National Forest in Montana into Yellowstone. The blaze forced residents of Cooke City and Silver Gate, Mont., to evacuate.

The claims ask payment for damage to cabins and fences, a motel, an outfitting camp, a water system and timber and grasslands, Ms. Bateman said.

At the Forest Service's office in Denver, Colo., claims totaling \$573,000 from fires in Shoshone National Forest are being reviewed. Those result primarily from the loss of 10 mobile homes in a subdivision northwest of Cody, Wyo.

There are no claims on file yet at the agency's Ogden, Utah, regional office.

Joan Anzelmo, a Yellowstone Park spokeswoman, said several small claims had been filed for personal property lost within the park, including claims from firefighters and employees of the park's concession businesses. **NYT, 1-17-89**

### After-hours Crew On Duty At Artel

The Environmental Protection Agency has placed seven after-hours workers — two more than expected — on duty at the closed Artel Chemical Co. plant in Nitro, site of two leaks in the past two weeks.

Such an after-hours crew, EPA spokesman Yates said, is unique in the history of Superfund cleanups in the EPA's Region III, which includes West Virginia, Virginia, Maryland, Pennsylvania, Delaware and the District of Columbia.

The EPA has been at Artel since June, classifying and repacking stored chemicals. Some of the 5,500 drums should be removed from the plant beginning in two weeks. After chemicals are removed, EPA crews can then investigate contamination in soil and water at the site.

Yates said the seven-person crew includes a site safety officer, a communications officer, an equipment officer, a chemist and three field technicians, along with the watchman. A three-person crew tours the site every half hour.

"Their primary responsibility is to respond to an incident, just like a firehouse," Yates said. "When they're not responding, they're maintaining equipment. There are times when there's nothing to do." Yates said he did not yet have cost figures for the crew.

Local officials and Nitro residents have criticized the EPA for waiting to report a leak on the morning of Jan. 19 that sent a cloud of sulfur dioxide and hydrochloric acid over Nitro. It took an EPA crew 20 minutes to arrive at the site after a leak during the evening of Jan. 25.

On Tuesday morning, EPA, Nitro and other local officials began the first of a series of weekly meetings regarding the Artel site. "We will brief the public of the past week's activities and provide a projection of future activities," Yates said. Summaries of the meetings will be available in Nitro City Hall.

Yates gave Woodson an application for an EPA grant that provides money for community groups to hire technical experts to monitor Superfund sites. The EPA can provide \$50,000 in a Technical Assistance Grant if a community group raises \$25,000. **The Charleston Gazette, 2-1-89**

### Mushroom Seminar To Be March 4

Cultivating expensive, gourmet shiitake mushrooms will be the topic of the second annual Mushrooms in the Mountains conference.

The conference will be from 10 a.m. to 4 p.m. March 4 at Davis and Elkins College in Elkins. Topics will include growing techniques and nutrition. People attending the conference will be able to buy supplies and talk to speakers and exhibitors.

The mushrooms grow in 3 to 5 foot logs that are inoculated with fungus. Growers leave the logs outdoors for six to 18 months before soaking them in water and later harvesting the mushrooms. The logs can be harvested several times a year for several years without additional inoculation. **The Charleston Gazette, 1-29-89**

### How Plants Grow — And Let's Hope They Do!

(continued from page 4)

Water keeps plant cells turgid so that they can carry on their functions. It also helps to keep plant surfaces cool through evaporation from the leaves and stems.

At least 15 chemical elements are needed for the growth of fruit and vegetable plants. These include carbon, hydrogen, oxygen, phosphorus, potassium, nitrogen, sulphur, calcium, iron, magnesium, boron, manganese, zinc, copper and molybdenum. Some of these — such as boron, zinc, manganese, iron, copper and molybdenum — are referred to as minor or trace elements, since

they are needed by plants in very small amounts.

The successful gardener must know something about how plants grow. He must also know the essential needs of plants and strive diligently to fulfill these needs with care and at the proper time.

*O. B. Combs is Professor of Horticulture, University of Wisconsin, Madison.*

From *The Yearbook of Agriculture/1977; Gardening For Food and Fun; US Department of Agriculture.*

### 320 Sites Targeted By Nature Group

The state chapter of The Nature Conservancy has identified and plans to protect 320 West Virginia sites that contain rare vegetation or unique wildlife habitat.

That preservation effort is part of a national movement by the Conservancy "to build a modern-day Noah's Ark," by protecting as many plant and animal species as possible, Ed Maguire, TNC's state director, told members of the Charleston Rotary Friday.

One-third of the 320 sites are already protected, while a like number of locations can be found on public land. About 100 sites, however, are located on private property and are not protected, Maguire said.

"If we can protect these areas without buying them, so much the better," Maguire said. Preservation can be maintained through land use agreements, easements and land swaps, as well as through outright purchases.

During TNC's 25 years in West Virginia, the organization has protected more than 30,000 acres of ecologically unique land. While the Conservancy often works with the state and federal government in buying land that is later turned over to the National Forest, National Park or State Forest systems, it has bought and manages 22 West Virginia nature preserves on its own.

Nationally, TNC has 450,000 members, and has protected nearly 3.5 million acres. In recent years, Maguire said, the organization has spent more money on acquiring and preserving unique land than the federal government has. Last year, TNC raised \$88 million with which to acquire new land.

The non-profit, non-government, non-lobbying Nature Conservancy draws from a broad base of support, which includes a number of industrial leaders and corporations, "because we don't get hung up on environmental rhetoric, and we aren't out to save the world," according to Maguire.

The state director said he agrees with a characterization of his organization that appeared in a recent issue of *Sports Illustrated*: "A cross between Century 21 and the Sierra Club."

Maguire said TNC was planning a major fund-raising campaign this spring to raise money for a preservation project he was not yet free to disclose, other than to say it would be located in the western part of the state. **The Charleston Gazette, 1-21-89**

### Male Duck's Timidity Around Flashy Rivals May Threaten Species

The American black duck, whose numbers have shrunk by 60 percent in the last 30 years, may be on the road to extinction because males of the species are too timid to win females away from the flashier and more assertive mallard drake, a study by Canadian scientists suggests.

When challenged by mallard drakes at mating time, male black ducks "don't fight, or they tend to give up real quick," says Dr. C. Davison Ankney of the University of Western Ontario, a zoologist who took part in the study. Not only does this prevent female black ducks from mating with their own species, the researchers say, but it probably also sends them a message: a mallard drake will be a better protector during the critical egg-laying period.

So, in what seems to be a clear-cut instance of natural selection at work, mallard-black duck hybrids are increasingly replacing black ducks across a wide stretch of eastern North America where mallards, more and more, are moving into black-duck territory. And although black ducks are not yet an endangered or threatened species, they could ultimately disappear.

The trend is continuing despite stringent hunting regulations that have reduced the kill of black ducks by 40 percent in the United States and 10 to 15 percent in Canada in about the last five years. So far, no other method of stopping the interbreeding problem has been tried.

Other factors, too, have been implicated in the decline of the black duck. These include acid rain in the lakes frequented by the ducks and human encroachment on habitats. But interbreeding with mallards has been recognized as a major threat and the new study is the first to suggest what may be responsible.

The study was conducted by Lynn M. Brodsky, a post-doctoral student at Western Ontario; Dr. Ankney, a senior faculty member there, and Darrell G. Dennis, a wildlife biologist with the Canadian Wildlife Service.

In every case, the researchers found that every male was more attentive to females of the species with which he had been raised. Similarly, every female quickly gravitated to the most active male of the species with which she had been raised, and stayed in front of his cubicle during the test period. The researchers concluded that early learning primarily influenced the choice of mate.

But in the second half of the experiment, they found that this learning was overwhelmed and overridden when male mallards and male black ducks were allowed to compete for a female's attention. The researchers put males of both species in a test pen in the marsh water, containing no barriers or cubicles. In the middle of the pen was a wooden platform on which the birds could rest.

Why mallards dominate black ducks is not certain. One theory holds that the brighter, more colorful mallard male — with his green head, white neckband, dark chestnut breast, violet wing feathers and orange-red legs and feet — looks bigger than a similar-size black duck, with its dark-brown dullness. Another possibility is that to a male mallard, a male black duck looks like a female mallard, and therefore does not appear to much of a threat in a fight.

#### Caught In Genetic Decline

In the wild, said Dr. Ankney, mallards mate with both species. So while pure mallards continue to be produced, the black duck is caught in a genetic decline: If a male mallard-black duck hybrid pairs with a female mallard, most of their offspring will display the hybrid's partially green head and neck ring that make it look something like a mallard, but darker.

Either way, it appears that the black duck species is being absorbed by that of the mallard. Or re-absorbed. The two species are so genetically similar, Dr. Ankney said, that it is likely that black ducks began splitting off from the mallard line, probably in the last Ice Age, but "never really made it as a species."

**New York Times, 1-10-89**



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# Spring Review April 15-17 Black Water Falls State Park

## Black Water Falls State Park

Several Cabins at the Park have been reserved for WVHC members. The Conservancy has secured the rooms for your convenience. All cabins are heated and well equipped with linen and cooking supplies. For a room at the Blackwater State Park Lodge, please call the lodge directly at (304) 259-5216. The park and the lodge is a popular vacation area, so please plan to make your reservations as far in advance as possible. Canaan Valley State Park, a short drive from Blackwater State Park, also offers lodging. Their number is (304) 866-4121. The Blackwater State Park Lodge has a large restaurant overlooking the canyon which serves country cooking and new American cuisine. The Woodchuck Lounge also serves light sandwiches and drinks. There will be a barbecue cookout for those attending the weekend on Saturday evening at cabin 25.

## Program:

(Registration and meetings will take place at the Blackwater State Park Lodge Conference Room.)

### Friday, April 14, 1989

- 6:00-11:00 P.M. - Registration & Snacks
- 8:00 P.M. - Slides & Movies
- 9:00 P.M. - Social Hour

### Saturday, April 15, 1989

- 7:00 A.M. - Bird Walk
- 8:00 A.M. - Breakfast
- 9:30 A.M. - Outings
- 2:00-4:30 P.M. - Seminar
- 5:30 P.M. - Dinner Cookout at Cabin 25
- 7:00 P.M. - Acid Rain Forum (conference room)
- 9:30 P.M. - Social Hour

### Sunday, April 16, 1989

- 8:00 A.M. - Breakfast
- 9:00 A.M. - Board of Directors Meeting
- 12:30 P.M. - Lunch

## Location

Blackwater Falls is accessible from the south by U.S. 33 to Harmon, then WV Route 32 north to the Park. From the north, take U.S. Route 219 to Thomas then Route 32 south to the Park.

## Registration Form

**Deadlines: Lodging April 1; Meals April 1**

Name \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_ Phone \_\_\_\_\_

Registration Fee: \$3/adult.....\$ \_\_\_\_\_

### LODGING — BLACKWATER STATE PARK CABINS

Cabin Reservations

Friday:	\$13.00 x _____	= \$ _____
Cots:	\$ 3.00 x _____	= \$ _____
Saturday:	\$13.00 x _____	= \$ _____
Cots:	\$ 3.00 x _____	= \$ _____
Total Lodging.....		\$ _____

### CAMPING

Available at nearby Canaan Valley State Park and at MNF Campsites.

### MEALS

The WVHC members will be offering a Saturday evening cookout at cabin 25. We will also prepare a box lunch for those persons going on the outings. The Blackwater State Park Lodge Restaurant will also be available for breakfast and any other meals you wish to have there.

### Saturday

Box Lunch (\$3.50)      Number of people \_\_\_\_\_ \$ \_\_\_\_\_

Dinner Cookout (\$5.00)      Number of people \_\_\_\_\_ \$ \_\_\_\_\_

(\$3.00 children)

Total for Weekend \$ \_\_\_\_\_

### NATURE SKOOL (for children age 3-10)

Nature Skool hours available: (\$2.00 per child payable to worker)

Saturday 9:00 am to 4:30 pm      Number of children \_\_\_\_\_

Saturday 7:00 pm to 11:00 pm      Number of children \_\_\_\_\_

Sunday 9:00 am to 12:00 am      Number of children \_\_\_\_\_

### CHILDCARE

Fee: \$1.00 per hour.

Childcare can be made available for all age children on Saturday (daytime and evening) and Sunday morning if we have enough children. Please list the names and ages of children that may use this service.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Please make checks payable to WVHC Spring Review and return with this form to: Donna Borders, 1012 10th Ave., Marlinton. For information about reservations call Conna at (304) 799-6772 (daytime) or 799-4381 (home). **Please remember to send a check with all reservation forms.**

### ACTIVITIES

The Saturday outings will last 4-5 hours to allow enough time to return for the Saturday afternoon seminar. All outing guides will meet their groups in the conference room at the Lodge.

### OUTINGS

#### EARLY MORNING BIRD WALKS

Gary Worthington will lead morning bird walks on Saturday and Sunday. You can expect to see those early spring arriving birds and a few unexpected species. Dress warmly. The hike will begin at 7:00 promptly and will plan to be back in time for the outings. Meet in the conference room.

#### FOUR-MILE NATURE HIKE ALONG THE DAVIS TRAIL

Most of this trail is on the Monongahela National Forest. Leave from the main park road at Engine Run and hike along Canyon Loop Road, on top of Canaan Mountain.

#### TOUR OF CANAAN VALLEY

Linda Elkinton will lead a tour of Canaan Valley area and will discuss the history of the conservancy's effort to have this valuable wetland protected from industry and residential development.

#### TRIP TO DOLLY SODS WILDERNESS AREA

Ann Brunley will lead a trip to the Dolly Sods Wilderness area and will discuss the efforts of conservation groups to monitor military maneuvers in the area.

#### AFTERNOON FORUM ACID RAIN UPDATE

Rick Webb of the University of Virginia and Ned Helme of the Center for Clean Air Policy will anchor the afternoon symposium on Acid Rain. Scientific and political aspects of this issue will be discussed.

