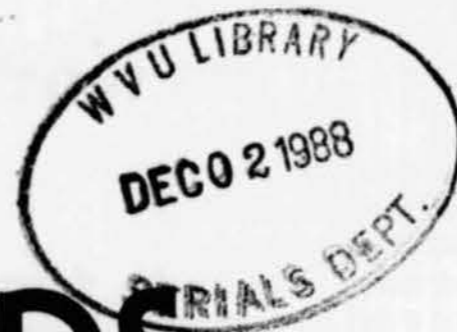




THE HIGHLANDS VOICE

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VOL. 21, NO. 11, NOVEMBER 1988

WV Rivers Bill Protects Gauley, Meadow and Bluestone Rivers

In the closing days of the 1988 session of the 100th Congress, passage of the WV National Interest Rivers Act has protected major portions of the Gauley, Meadow and Bluestone river corridors, and has made minor changes in the boundaries and management of the New River Gorge National River.

The West Virginia Highlands Conservancy, which has long advocated these rivers' protection, credited 4th district congressman Nick Rahall with brokering initial consensus for the bill among diverse groups of river users. "The bill protects these rivers as centerpieces of our natural environment while enhancing their use for whitewater recreation and protecting their use by sportsmen," said Conservancy president John Purbaugh. Senator Jay Rockefeller sponsored the bill in the Senate, and worked to resolve minor differences between the two houses to ensure final passage of the bill, on October 11, 1988. The house bill was cosponsored by representatives Harley Staggers, Jr., Bob Wise and Allan Mollohan. Senate majority leader Robert Byrd played a key role in ensuring the bill's consideration in the hectic closing days of the session.

In addition to its support by conservationists, river runners and sportsmen, the bill has attracted business community support. Doug Maddy, of the Fayette County Chamber of Commerce, testified at an April, 1988 Senate committee hearing, stating that the April, 1988 Senate river rafting and other tourist activities generated by the bill were vital to the region's economy.

Under the bill, the Gauley River from the Summersville Dam downstream to Swiss, and the Meadow River from the Rt. 19 bridge downstream to its confluence with the Gauley at Carnifax Ferry will be protected as a National Recreation Area; 13 miles of the Bluestone River upstream from the Rt. 20 bridge is protected as a national scenic river under the Wild and Scenic Rivers Act.

The Greenbrier River was also included in the house-passed bill but eliminated in the senate due to unresolved local concerns over federal control. "We're actively pursuing local alternatives to planning for the Greenbrier's future," stated Donna Borders, a Conservancy board member from Marlinton. Recent controversial proposals for a power plant and for a chemical wood treatment plant on the banks of the Greenbrier have demonstrated the need for a comprehensive plan for the Greenbrier's future according to Borders.

Because the rivers protected by the bill all flow into the existing New River Gorge National River, the bill creates one of the country's largest networks of protected rivers.

The Conservancy has previously worked to achieve congressional designation of the Cranberry, Laurel Fork, Dolly Sods and Otter Creek Wilderness areas in the Monongahela National Forest. Protection of the State's remaining wild and scenic rivers with state and local involvement in river use planning is the Conservancy's primary current focus.

Acid Snow The Danger Of Spring Shock

Each winter, as snow piles up on the ground, acid pollutants contained in the snow also accumulate. As the weather begins to warm, and the snow to melt, high levels of acid pollutants can be released suddenly into lakes and streams. Some researchers believe that this surge in acidity, or "spring shock," may threaten fish and aquatic wildlife by acidifying water habitats and leaching harmful aluminum ions into lakes and streams.

The first spring melts release up to 70 percent of the acid pollutants trapped in snowpacks. In a recent Canadian experiment, rainbow trout exposed in cages to natural spring melt water died within 28 hours. Fish kills in natural lakes and streams have been less widely documented, although they have been observed in regions of Ontario. In the United States, western lakes are believed to be particularly sensitive to acid shock because they lack the natural buffers (substances which can neutralize acid deposition) found in many eastern lakes.

Spring shock may pose the greatest danger to younger fish and wildlife. Unlike adult fish, the fry may not be able to swim to safer, less acidic habitats when spring shock occurs, and they are generally more sensitive to changes in acidity and aluminum levels. Researchers also believe that short-term exposure to acidic water may be lethal to younger amphibian life, including frogs, toads and other species that form an important link in the food chain of aquatic and land-based wildlife.

Environmental Perspectives, Canadian Embassy

Coal Regulators Not Requiring Identification Of Aquifers As Renewable Resources

by Richard S. diPretoro

Underground coal mine subsidence control plans that I have reviewed in West Virginia, Ohio, Maryland and Pennsylvania over the last four years have all addressed questions of renewable resources as required by both Federal and state regulation. That regulation states:

The application shall include a survey which shall show whether structures or renewable resource lands exist within the proposed permit and adjacent area and whether subsidence, if it occurred, could cause material damage or diminution of reasonably foreseeable use of such structures or renewable resource lands. (emphasis added)

Aquifers and recharge areas for aquifers are renewable resource lands by regulatory definition. Here is the definition:

Renewable resource lands means aquifers and areas for the recharge of aquifers and other underground waters, areas for agricultural or silvicultural production of food and fiber, and grazing lands. An aquifer is defined as:

A zone, stratum, or group of strata that can store and transmit water in sufficient quantities for a specific use.

Nothing in the regulations requires an aquifer to be in use at the time of the application, or, if in use, to be used for any particular purpose, such as domestic, in order for it to receive attention in the renewable resource survey. If an aquifer exists in the mine area which could be used for pasture springs, for instance, it must be identified and discussed in terms of the potential for subsidence to diminish its reasonably foreseeable use. (continued on page 7)

WVHC Fall Review

The WVHC Fall Review provided a combination of informal activities and seminars. The quarterly Board Meeting was held on Sunday, October 23, 1988.

Arrangements of events and accommodations for the small group attending was successfully managed by Donna Borders. Thanks to her from one and all.

Saturday's warm-up schedule included an auto tour by Don McNeel, a hike lead by Donna Borders and Gary Worthington, caving with Martin DiLeggi and mountain biking with Roy Shearer. The afternoon presentation by the Forest Service was given by Tom Hubbard and Harry Maloney. The topics developed were MNF management plan and the Wild and Scenic Rivers Act and its amendments. The foresters emphasized that while suggestions and inquires are always welcome, an effort to be specific and detailed is always appreciated.

After dinner Kim Pritchard discussed DNR's involvement in drafting and exploring legislation for solid waste control. Ann Burnley treated everyone to a slide show (in color) of the Dolly Sods area. Her final triumph of escorting a National Guard staff on a litter detail of the same area was applauded by everyone.

Please plan for the Winter Review on January 14, 1989, tentatively scheduled for Jacksons Mill/Wesleyan College; Spring Review April 14-16, 1989, tentatively scheduled for Blackwater Falls; Summer Review on July 22, 1989.



Citizen Participation

The National Audubon Society has launched a program designed to democratize the debate on acid rain.

The Society's Citizens' Acid Rain Monitoring Network seeks to increase citizen participation by setting up local monitoring stations across the United States. Provided with pails to collect rainfall samples and pH paper to test the acidity of the rain, participants are encouraged to send their

(continued on page 6)

2502 Dudden Fork
Kenna, WV 25248

November 1, 1988

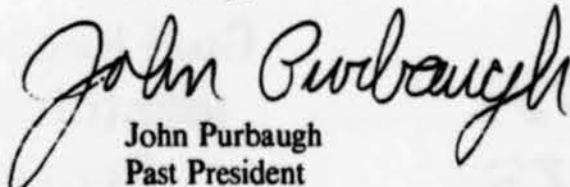
Hon. Nick J. Rahall, II
House of Representatives
Washington, DC 20515

Dear Congressman Rahall:

It has been a long road from your 1985 speech to the WV Highlands Conservancy at Camp Pioneer, where NRA status for the Gauley was first discussed, to President Reagan's signature of H.R. 900 on October 26, 1988. Your leadership in brokering the coalition of river users necessary to gain widespread support is greatly appreciated.

Other organizations have recently honored you with awards for your farsighted river conservation efforts. WVHC doesn't have a formal award presentation for you, but only because we're focusing our volunteer energy on the implementation of H.R. 900 and on protecting other rivers in the Mountain State. Please accept our commitment to continue on this course as both agreement with your vision of river conservation in WV, and as our tribute to your efforts.

Sincerely,



John Purbaugh
Past President

cc: Cindy Rank, WVHC Pres.
Rt. 1, Box 227
Rock Cave, WV 26234

Karen Farris
Editor, Highlands Voice
216 Angel Terrace
Charleston, WV 25314

2502 Dudden Fork
Kenna, WV 25248

November 1, 1988

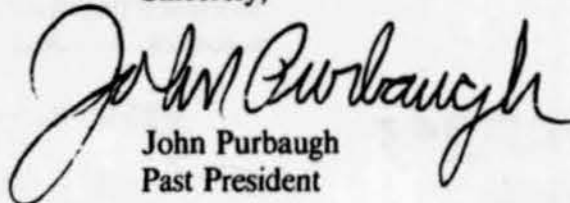
Hon. John D. Rockefeller, IV
United States Senate
Washington, DC 20510

Dear Senator Rockefeller:

Your sponsorship of S. 1720 and your leadership in resolution of issues confronting the conference committee addressing H.R. 900 is greatly appreciated. With President Reagan's signature of the WV National Interest Rivers Act on October 26, 1988, our common efforts to preserve the Gauley, Meadow and Bluestone rivers has become law.

WVHC will work to assist the implementation of this law so that the virtues of river conservation can become better understood in WV. The preservation of the New River in 1978 and its growing commercial importance for outdoor recreation have assisted your successful current efforts to protect the Gauley, Meadow and Bluestone. Similarly, the experience of local people and governments with the implementation of H.R. 900 will have great importance for the future protection of other WV rivers. Please accept our renewed commitment to these common goals as the clearest "thank you" we can offer.

Sincerely,



John Purbaugh
Past President

cc: Cindy Rank, WVHC Pres.
Rt. 1, Box 227
Rock Cave, WV 26234

Karen Farris
Editor, Highlands Voice
216 Angel Terrace
Charleston, WV 25314

Guidelines For Articles & Letters To The Editor

The Voice welcomes any well-researched article or editorial on areas of concern, for example, river conservation, public land management, mining, Canaan Valley. General articles on outdoor activities — canoeing, hiking, caving, climbing — or on unusual places or special outdoor events are also needed. All submissions are subject to editing. To assure accuracy in the printing of these articles, the following guidelines have been established:

1.) Whenever possible, articles should be typed, double spaced on 8½ by 11 inch paper, with at least one-inch margins on each side. If the submission is not typed, the author should use lined paper and write legibly on every other line.

2.) Each article should be accompanied by the author's name, address, and telephone number. (Addresses and telephone numbers will not be printed with the article, but are needed so that the editor may contact the author for additional information, if necessary.) If the article is more than one page, the author's last name should be placed under the page number on each page.

3.) Photographs related to the article are greatly appreciated. Black and white photographs reproduce best, but color photos can be used. Photographs will be returned, if the author requests them.

4.) The deadline for each issue of the Voice is the last Friday of each month.

The Voice also welcomes letters to the editor expressing views on any of the topics covered in previous issues or on other environmental concerns. Letters to the editor should follow the guidelines for articles.

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"But while we are confined to books, though the most select and classic, and read only particular written languages, which are themselves but dialects and provincial, we are in danger of forgetting the language which all things and events speak without metaphor, which alone is copious and standard. Much is published, but little printed. The rays which stream through the shutter will be no longer remembered when the shutter is wholly removed. No method nor discipline can supersede the necessity of being forever on the alert. What is of course of history or philosophy, or poetry, no matter how well selected, or the best society, or the most admirable routine of life, compared with the discipline of looking always at what is to be seen? Will you be a reader, a student merely, or a seer? Read your fate, see what is before you, and walk on into futurity."

WALDEN Henry David Thoreau

AIPM Gypsy Moth Demo Program

The Appalachian Integrated Pest Management (AIPM) Project area covers 20 counties in West Virginia and 18 counties in Virginia. Seven intervention methods may be used alone or in various combinations for managing the gypsy moth on the federal and non-federal lands that make up the project area.

The project has three objectives. First, it seeks to slow the spread and reduce adverse effects of gypsy moth within the Project area. Second, the project is designed to develop and evaluate an integrated pest management (IPM) approach that can be implemented anywhere in the United States. The program as designed, includes sampling methods, decision matrices for gypsy moth intervention activities, computer based geographic information systems, and an educational program. Third, the Project will develop and evaluate intervention tactics for the management of isolated gypsy moth populations within the Project area.

The Environmental Impact Statement (EIS) begins the analysis required by the National Environmental Protection Act (NEPA). The 1985 EIS is not adequate because the AIPM program is new. Four main differences between the new and old: (1) this is a demonstration project and not a normal Forest Service project; (2) low level gypsy moth population intervention tactics are included; (3) 100% federally funded as opposed to cost-share project; (4) some of the lands within the Project area may require several options or combinations of tactics to be consistent with the current management of the area. The 12.8 million acre area includes private, municipal, county, state and federal land.

Letters sent by the Forest Service to determine issues of concern and to inform the public of how to become involved in the EIS process were mailed in March. Responses demonstrated concern about the impact to human health, to other organisms, and the effectiveness of the tactics to be administered.

The tactics considered for the program include using artificially produced gypsy moth sex attractant to disrupt mating activity; forced inherited sterilization; mass trapping; spraying of nucleopolyhedrosis (NPV); spraying of bacillus thuringiensis (Bt); spraying of diflubenzuron; and introducing natural enemies of the gypsy moth into an area.

A wide range of alternatives is given to enhance participation by landowners and land management agencies. Before action is taken, NEPA requires additional documentation and analysis that is site specific. Participation in the AIPM program is voluntary. Comments and concerns should be directed to David P. Smith, USDA Forest Service, Southern Region, 1720 Peachtree Road, NW, Atlanta, Georgia 30367. Telephone: 404/347-4338; FTS 257-4338 by December 12th.

Biology of the Gypsy Moth

The gypsy moth was brought to the northeastern United States in 1869 from Europe. It has slowly spread south and west and has now spread into Virginia and West Virginia.

The gypsy moth causes its damage in the larvae or caterpillar stage, when the insects feed on foliage of suscepti-

ble vegetation. The larvae emerge from eggs about the time the first tree leaves come out in spring. The newly hatched larvae are very small. They climb to the top of trees, suspend themselves on a silken thread, and are blown by the wind to adjacent areas. This is how they spread naturally. They also spread artificially if egg masses are deposited on vehicles or forest products that are moved to uninfested areas. The larvae can emerge and cause an isolated infestation.

The larvae begin feeding and pass through stages increasing in size. Their preferred food is oak, particularly white oak. If an area becomes completely defoliated, larvae crawl to adjacent areas to feed.

The larvae complete their development by early July, emerging a final time as moths. The male moths emerge first and are strong fliers. Emerging females cannot fly. They crawl to suitable sites where they release a strong sex attractant called a pheromone. This chemical attracts the male to the female and they mate. Females deposit their buff-colored egg masses containing a few hundred to 1,000 eggs. The eggs hatch the following spring and the cycle is repeated. The size of egg masses give an indication as to the health of populations. Dime-size egg masses usually indicate declining populations, while quarter-size masses denote building populations.

Gypsy moth outbreaks occur in 5 to 7 year cycles on the average. The worst outbreak in history occurred in 1981 when almost 13 million acres were defoliated. Outbreak phenomenon is not fully understood, however, it is known that weather has an influence.

Oglebay Park Nature Center

The Nature Center has sold quality bird seed for more than 20 years. Once again they are offering high quality Lyric seed. Special mixes formulated and revised for the past few years, are again available. Blends to attract cardinals, titmice, chickadees and other birds attracted to hanging feeders as well as blends to attract song sparrows, white-crowned sparrows, white-throated sparrows and other ground feeding sparrows are available.

"We are again carrying a wildlife mix called 'Quack and Snak' which is attractive to wild turkey, quail, geese, ducks, pheasants, chipmunks and deer," says Sue Stroyls, Nature Center director. "We use this in our bird garden at a separate, stump-type feeder and it works well for us," adds Stroyls. Contents include: whole yellow corn, wheat, whole oats, red millet, proso millet, roasted shelled peanuts, sunflower seed, kibbled corn, canary seed, green peanuts in the shell, Japanese millet, flaked corn, sweet rape seed and buckwheat.

The seed sold at the Nature Center is the cleanest, highest quality that is available, according to Stroyls.

"Our thistle seed is air winnowed to remove infertile, small seeds and chaff. The sunflower seed is thrice cleaned. Our mixed seed is blended with the most popular food for a variety of bird types. All of our blends are based on current research from U.S. Wildlife and Cornell University laboratories," continues Stroyls.

Bird enthusiasts can watch for special sales on Dec. 3 and Jan. 28.

For more information or to place an order for the bird seed sale, call the A.B. Brooks Nature Center (304) 242-6855.

"If we knew all the laws of Nature, we should need only one fact, or the description of one actual phenomenon, to infer all the particular results at that point. Now we know only a few laws... The particular laws are as our points of view, as, to the traveller, a mountain outline varies with every step, and it has an infinite number of profiles though absolutely but one form. Even when cleft or bored through it is not comprehended in its entirety."

WALDEN, Henry David Thoreau

Managing The Public Forest

by Donald C. Gasper

The unique perspectives and cherished traditions within the forestry profession continue to evolve and develop. Introduction of new techniques and subspecialties enrich the available knowledge base. Progress may seem slow and activities may be portrayed as conservative by more narrowly defined disciplines which interact with the forester. Be assured, a measured madness is discernible.

Objective observations can record the forester's method. A first look reveals the circular movements, familiar to anyone honest enough to attempt assimilation of all the facts. A closer, second look confirms the motion as circular, but the circle itself increases in size, strength, and capacity with each completed cycle.

Current challenges that impede the steady progress possible from such a solidly constricted 'circle' include the many separate pressures diverse groups place before the embattled forester as the number one priority. The struggles and compromises implicit in each "multiple use" designation on a state

highway sign, map or brochure, are rarely revealed as a confrontational engagement in absolutes.

This competitive battle is not always exposed to the public. Assessments are never absolute. Applying a concept of stewardship based on a variety of data from technical sources to legal mandates, requires constant vigilance. Every hard won compromise between competing interests and available physical capacities must be revisited when changing conditions dictate. The demonstrated ability to provide leadership and direction continues to place public lands under the protection of the Forest Service and the nation's foresters.

The proliferation of special interest groups with designs on public lands combined with their use of sophisticated techniques to present these demands has become an impediment to the forester's ability to successfully execute his duties.

On the one hand, exaggerated claims presented with convincing data overstate

and puff-up trivial claims; on the other hand, vital interests risk being overlooked due to misrepresentation of the facts or lack of representation. Most importantly, competing groups often ignore any but their personal mandate, making a satisfactory and equitable resolution impossible. A receptive forester should be imagined as the initial premise each group builds upon when formulating the data and emotional detail the forester needs to make a responsible decision.

By definition, foresters are dedicated to a lifetime of discovery and exploration of the dynamic processes of the forest. Insights presented by specialists are eagerly sought and incorporated into the dynamics of the 'cycle' they enhance. By nature generous, foresters appreciate additional theories any speciality of geology or biology offers and applies them to reinforce and expand the critical core of knowledge that holds all the secrets of the forest.

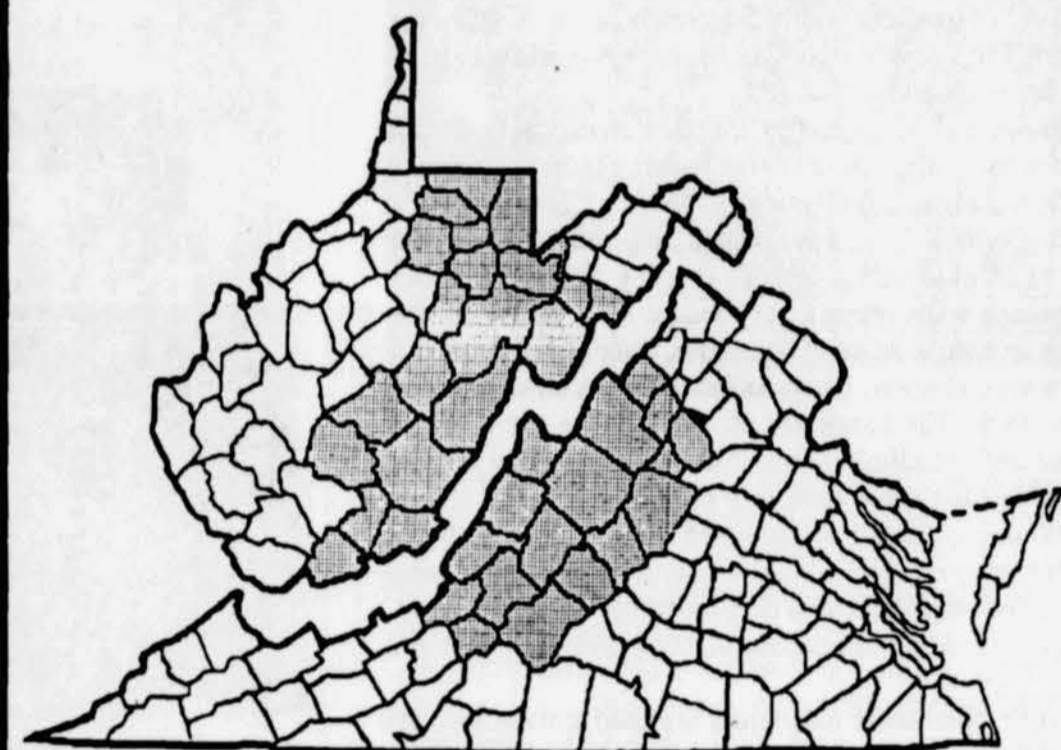
The daily demands of forest management does not always allow for in depth analysis.

The precision of the physical chemist, the sampling and analysis of the soil scientist, the summarized equations of the hydrologist, the sampling techniques of the biologists, the statistics of the economist, the measurements of the engineer, provide the vital essence the forester distills into ideas and quantitative dimensions that expand and increase the core of knowledge.

Each discipline the forester relies upon for decision making has an intrinsic value that is never questioned. The application of specialized knowledge in the context of the forester's perspective and within the given constraints of a particular set of facts, becomes an exercise that requires a temporary assignment of relative status and relative value to each specialized point of view.

The cyclic process of critical evaluation of technical data, traditional standards, dynamic emotions, may seem hopelessly circular to the outside observer. The forester is guided by absolute constraints demanding the circle be closed.

AIPM Project Area
In West Virginia and Virginia



AIPM Project Area in West Virginia and Virginia

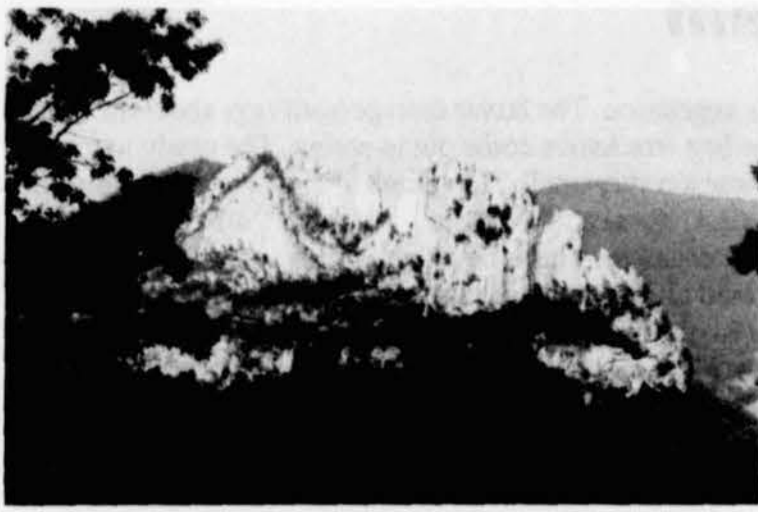


Figure 10. Seneca Rocks, Pendleton County.

The Ups And Downs Of Climbing

The art of scaling a rock wall where the climber relies totally on his or her own abilities to make the ascent is known as *free climbing*. Outside of specially designed shoes, equipment is used only to provide a margin of safety. Rock-climbing shoes look very similar to high-top tennis shoes, except that they have a higher welt and no tread on the underside. The welt and underside are made up of a special rubber polymer designed to bite into small irregularities in the rock surface. These shoes enable the climber to stand comfortably on minute surfaces.

Before attempting to make an ascent in free climbing, the climber must carefully analyze the rock for natural features that will be of assistance. Once a route has been selected, a variety of techniques may be employed to best use the natural features present. These techniques include the *layback*, *jamming*, *stemming*, and *feet and handholds*.

Feet and hands may grasp (or be "smeared" onto) small irregularities such as intersecting fractures on the rock wall. By keeping the knees pointing outward, and legs spread about shoulder width, the body's center of gravity is lowered. This keeps most of the climber's weight away from the upper body and on the feet.

Another efficient method of transferring body weight to the feet is by creating opposing forces. Stemming and the layback technique are often employed here. Stemming is a technique where the feet are placed on opposing walls in a corner or chimney. Both feet pushing in different directions on opposing walls offers a very secure hold. Although the layback technique is more strenuous, once it is mastered it offers a very efficient means of ascending a corner system with a crack. The hands are placed as far in the crack as possible and the climber pulls with the arms while the feet push against the wall below (see Figure 4).

Jamming is the technique used when a crack (such as a large fracture) is present. The climber may place hands and feet in it and twist them until they are firmly wedged in place. This method can be rather painful, but it offers a very secure hold.

Quite often these techniques are used simultaneously: the hands are jammed into a crack while the feet are stemmed on opposing walls in order to work one's way up a rock wall (Figure 5). More often, the climber will create original (sometimes bizarre) methods of ascension, but whatever technique is used, the overriding concern is that the ascent be done safely.

Safety First

With proper training and equipment, rock climbing can be done very safely. Climbing equipment is used to attach the climber to the rock in the event of a fall. The climber's rope is probably the most important piece of safety equipment. Modern ropes are generally 7/16 inch (11 millimeters) in diameter, 150 feet (46 meters) long, and composed of high-strength nylon yarn. Many fine strands are braided to make a resilient core which is surrounded with a tightly-woven nylon sheath. This rope has a high strength-to-weight ratio and is capable of withstanding approximately 10 falls (where each fall has an impact force of over one ton), meeting International Alpine Association standards.

The rope is attached to the body by means of a harness very similar to the ones worn by iron workers constructing tall buildings. The harness is designed to spread impact force throughout the body (relieving stress from the spinal column) and is comfortable enough to sit in without cutting off blood circulation to the legs.

The rope is secured to the rock by the lead climber during the ascent. The first person in a party to climb is the lead climber who carries a selection of *chocks* (see Figure 6) placed in cracks in the rock wall. Chocks are wedged-shaped objects which come in a variety of sizes and shapes to accommodate different-sized cracks in the rock wall. Once a chock has been fitted into a crack, the rope is attached to it (see Figure 7).

The Geology Of Rock Climbing

by Jonathan K. Filer, Petroleum Geologist and Robert F. Kleinschmidt, Statistician Geologist

At first, the sport of rock climbing seems conceptually simple. The climber finds a steep or vertical rock outcropping, and somehow scrambles and pulls his way up the rock face. In the early days, this was true. Climbing rocks was merely a part of the general sport of mountaineering; getting to the top of an alpine peak involved crossing glaciers and snowfields as well as negotiating rocks. It was usually done in bulky boots while carrying a heavy pack. Very limited safety systems were employed, and the results were sometimes tragic.

During the last few decades, rock climbing has evolved into a highly technical sport in its own right. The number of people participating grows each year, and climbing is done in just about every state. Because of its mountainous terrain, West Virginia is a natural for climbers. Rock climbing is becoming a major attraction in the Mountain State, drawing thousands of participants each year.

Rock climbing has changed quite a bit since the early mountaineering days. Safety systems have been developed which, if properly employed, allow a climber to attempt even the most difficult rock wall with limited risk. Today's climber employs a variety of equipment and techniques evolved through years of experience by climbers all over the world.

But one fundamental aspect of climbing hasn't changed — the rocks themselves. Different types of rocks present different climbing challenges. The composition and disposition of rocks play very important roles in climbing. A skilled rock climber uses various features and surfaces of the rocks in a variety of ways in order to make his way up, as well as protect himself from a fall.

The Basic Criteria

To begin with, a climber needs a steep rock *outcrop*



Figure 1. Nearly vertical beds of the Tuscarora at Seneca Rocks. Note the climber (center) negotiating the crack along a bedding plane. The features on either side of the climber are called chimneys.

ping, or cliff. The height of the rock is not important. An interesting climb can be 15 feet, or 1,500 feet high. The rock must be *competent*, that is, hard and not prone to crumbling or breaking off in the hands or beneath the feet. Finally, there must be irregularities on the surface of the rock to enable the climber to use his hands and feet in a series of well-balanced moves up the face.

Granite and well-cemented sandstones are the rock types best suited for climbing, although certainly other types can be climbed as well.

The rocks of West Virginia are almost entirely sedimentary, and all of the important rock climbs in the State are on two sandstones: the Pottsville Group, a sandstone deposited in streams during the beginning of the Pennsylvanian Period (around 300 million years ago); and the Tuscarora Formation, a sandstone formed at the edge of an ocean basin at the beginning of the Silurian Period (about 430 million years ago).

Over time, the sands of these two sandstones have been buried by younger sediments, compacted and cemented into hard sandstones, and uplifted by the forces which formed West Virginia's mountains. In areas around the State, erosion removed the younger rock strata overlying the Pottsville and Tuscarora. In certain places on the sides of hills too steep for soil or much vegetation, the hard sandstones outcrop in rock faces. On these faces, the rocks create a wide variety of climbs.

Bedding

Some of the features important to climbing are related to the original deposition of the sandstone. *Bedding* refers to the primary layers within a sandstone formation. For example, the sandstone of the Pottsville may be made up of several beds, each deposited in a different stream channel and all lying one on top of another.

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Chocks play a key role in a climbing protection system called *belaying*. If the lead climber were to slip off the rock, the second climber, the "belayer" (aided by a friction device called a "belay plate") locks off the rope attached to the lead climber. This limits the lead climber's fall to approximately twice the distance above the last chock. For example, if the lead climber places a chock in the rock every 10 feet, he or she cannot fall more than 20 feet — 10 feet to the last-placed chock and the same distance below it (Figure 8). The second person to climb simply removes the chocks during ascent. The chocks can be used again. If the second climber were to slip, the fall would cover very little distance as the rope is now held securely by the lead climber (now the belayer). The lead climber obviously has the more exciting and demanding role in free climbing.

Other Climbing Styles

Other types of climbing include *aid-climbing*, *top-roping*, and *soloing*.

In aid-climbing, the climber ascends by placing chocks in the rock and using them as foot and handholds. This method is employed in extreme cases when it is impossible to continue using the rocks' natural features.

Top-roping is a form of free climbing done on short climbs where the length of the route is less than half of the rope length. Instead of using chocks, a tree (or other stationary object) at the top of the route is used as an anchor. The rope runs from the climber, around the tree, and down to the belayer. Top-roping is used when learning to climb because it is very safe. Falls are limited because the first climber is not lead climbing.

Soloing is done only by the most competent climbers. The solo climber uses no protection or safety gear (such as rope) and therefore must have total confidence in his or her ability to safely make an ascent and overcome any unforeseen obstacles.

A Safety Note

Climbing is an exciting sport, but it also involves some risks. These can be minimized through common sense and adhering to some basic rules. Novice climbers should attend a climbing school and practice with skilled individuals. Proper safety equipment, such as helmets and rope, in good condition, must always be used. A climber must be in good physical condition.

Climbing on private property can only be done with the permission of the owner. Be aware that, in some public parks and forests, climbing is prohibited. Always check before climbing.

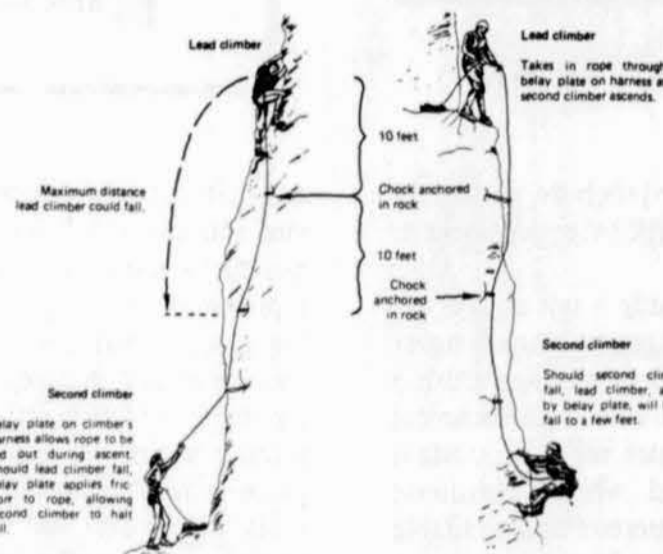


Figure 8. A main protection system in free climbing is belaying. To limit falls, both the lead and second climber depend on solidly anchored chocks and a friction device, called a belay plate, on climbers' harnesses through which the rope is fed. (Illustration by Renee La Valle)



Figure 7. Chock secured in a crack by a lead climber. The second climber will remove it for reuse during the ascent.



Figure 2. Outcrop of the Pottsville at the base of Chestnut Ridge, near Morgantown. Two distinct beds are present. Note horizontal bedding in comparison with Figure 1.



Figure 3. Solution pockets in the Pottsville at Chestnut Ridge.

When sediments are deposited, the bedding is usually close to horizontal. Later in time, tectonic (mountain-building) forces may tilt the bedding into other attitudes, including vertical or overturned. In Figure 1, the beds of the Tuscarora Formation are vertically oriented, whereas in Figure 2, the Pottsville shows horizontal bedding. Bedding influences climbing in a number of ways.

Some beds are harder or more resistant to erosion than others. On a rock face, the harder beds may stick out in relief relative to adjacent beds. If the bedding is horizontal or nearly so, the resistant bed can form a *roof* if its lower surface overhangs a lower bed, or it can form a *ledge* where the upper surface extends beneath a softer, overlying bed. A roof can present a difficult obstacle which the climber must overcome in an unbalanced position with the force of gravity pulling down. A ledge can be a welcome place to rest or *belay* a partner either up from below or while climbing on above (see accompanying story).

If the bedding is vertical, the difference in resistance to erosion between adjacent beds presents different climbing situations. A less-resistant bed between resistant beds may form a vertical, three-sided indentation called a *chimney* (Figure 1). It is climbed by a specialized technique. *Corners* form on the resistant beds where they turn into the chimney. These present a different climbing challenge (see accompanying story).

Roofs and ledges can form on vertical beds as well. A section of a vertical bed oriented parallel to a rock face can break off. If the lower portion breaks off, a roof remains above the missing portion. If the top part detaches, a ledge is formed on top of the remaining section.

Texture

Texture refers to the sizes and shapes of the sand grains (primarily composed of quartz in many sandstones, including the Pottsville and Tuscarora) that make up the rock. They can be coarse (perhaps a millimeter or more in diameter) and angular, giving the rock a rough surface similar to coarse sandpaper. Or, the surface of a sandstone can be very smooth; this is especially true if the rock has been deeply buried or has been involved in processes associated with mountain building. In both cases, high temperatures and pressures can alter a sandstone's texture by causing the grains of sand to dissolve at the points where individual grains come in contact with each other. The dissolved quartz then recrystallizes in the empty spaces (pores) between grains. If this process is extensive enough, the final result is a rock in which the original sand grain texture is replaced by completely interlocked crystals. When a sandstone like this is broken, it breaks through the quartz crystals, and the result is a smooth surface. If the dissolving and cementation process is not so extensive, the rock breaks around the grains, and a much rougher surface results. The nature of the rock surface is important to a climber because his specialized climbing shoes are designed to "stick" to a rough surface by means of friction.



Figure 6. Rack of chocks used by the lead climber to anchor rope to rock.

In West Virginia, the Tuscarora has been exposed to much more heat and pressure than the Pottsville. Because of the dissolving-cementation process, the surface of the Tuscarora is generally smooth, whereas the Pottsville is much grainer or rougher.

Fractures and Cracks

Open cracks, called *fractures*, are common features of sandstone outcrops and are another important feature for the climber. Fractures are breaks in the rock which form as a result of forces affecting the rock after it has become competent. These forces include stresses resulting from burial by younger sediments, and forces involved in mountain building. As younger rocks are stripped away by erosion and a rock formation outcrops at the earth's surface, the release of pressure allows many of these cracks to open up as the two sides shift apart. The result is an open fracture which, depending on its width and orientation, can be used by the climber in various ways.

Somewhat different from fractures (but similar from the climber's viewpoint) are open cracks that often form at bedding surfaces. The interface or *contact* between two beds is often a plane of weakness which can open up as much as a few inches in a surface outcrop. If the sandstone beds are vertical, as in Figure 1, these bedding plane separations can become challenging climbing routes. In Figure 1, the vertical cracks in the Tuscarora Formation are found along bedding surfaces.

If the bedding is horizontal, separation of beds along their contact is still of use to the climber because these features make excellent handholds and footholds.



Figure 4. Climber using the layback technique while ascending a fracture in the Pottsville.

The effect of fractures and bedding planes on a rock face is not always as dramatic as a wide open crack. Often, the fractures are not really open, but form a line of weakness which weathers a little more easily than the main body of rock. This weakness forms a slight indentation or groove. Figure 2 shows a highly fractured face of the Pottsville. There are two *sets* or consistent orientations of grooves in the upper bed in this photo. The horizontal set is probably bedding planes, while the more or less vertical set is a result of fracturing. The overall result is a "blocky" - appearing rock face with numerous shallow grooves the climber can use as foot and handholds to cling to the rock.

The combination of weaknesses in the rock along fractures and bedding often controls how pieces break off a rock face. They also control the orientation of small surfaces on the rock face. When the surfaces are close to horizontal, the result can be a comfortable hold for the climber.

Also visible in the center of Figure 2 is a major horizontal bedding contact. At this contact, a crack has developed between the beds as well as a slight overhang of the upper bed over the lower.

Solution Cavities

Solution cavities or *pockets* are also important to climbers. These are rounded holes that form on an exposed surface where a small patch of the rock is, for some physical or chemical reason, weaker than the rest of the sandstone. The weak area weathers out quickly, leaving the cavity (Figure 3). Often, particular beds within a sandstone formation are especially prone to the development of solution cavities. Lines of these features will form along these beds. Solution cavities can give the climber welcome foot and handholds.

Climbing in West Virginia

There are three important rock-climbing areas in West Virginia (Figure 9). The most widely known is Seneca rocks in Pendleton County. At this scenic location, beds of the highly resistant Tuscarora outcrop vertically along the crest of a ridge (Figure 10). On both sides of a gap in the mountain are vertical or nearly vertical faces of the Tuscarora several hundred feet high. These are the highest rock-climbing faces found between New York and North Carolina, and climbers from all over the country are drawn to the area every year. Climbing routes up the faces of Seneca Rocks range from very easy (easier climbs here frequently follow large, open, and fractured crevices along separated bedding planes) to extremely difficult (such as the very narrow cracks and overhang the climber is negotiating in Figure 1). Other, very difficult climbs at Seneca are found on the smooth faces parallel to bedding. Here, experienced climbers move up the rock using almost invisible irregularities in the rock surface. A hold may be large enough only for the tip of a finger. Because of the relatively smooth texture of the Tuscarora, the climber's special rubber-soled shoes, although still helpful, don't stick by means of friction as well as they do on rougher-surfaced rocks. The Tuscarora forms other major cliffs to the north and south along this ridge, but because of their relative inaccessibility, these are infrequently climbed.



Figure 5. Climber using a combination of climbing techniques. His right foot and both arms are jammed into a rock fracture while his left foot is "smeared" onto the rock face.

Cliffs of the Pottsville are popular for climbing at two main areas in the State. In the north, along Chestnut Ridge, near Morgantown, are several scattered popular climbing areas. The best climbing routes are near the top of Chestnut Ridge in Cooper's Rock State Forest. Unfortunately, this area is currently closed to climbing for environmental and safety reasons. Other areas are found near the base of the ridge south of Cooper's Rock State Forest and north into Pennsylvania. There are some differences between these areas and those at Seneca. The major beds of the Pottsville tend to be thicker than those of the Tuscarora at Seneca. They also lay horizontally as opposed to the vertical attitude of rocks at Seneca. There appear to be significant differences in resistance to erosion of the Pottsville. Combined with the horizontal bedding, the result is the common presence of large, overhanging roofs in these areas. Because the Pottsville has been exposed to much less heat and pressure, it also has a rougher surface, as well as numerous solution cavities in some areas. Both of these features are helpful to climbers.

A third climbing area that has begun to receive national attention is at the New River Gorge in Fayette County. The area was featured in the August 1984 issue of *Climbing* magazine. Climbing here is very similar to the areas around Chestnut Ridge to the north. The rocks are similar, nearly horizontally-lying sandstones of the Pottsville, and their features important to climbers are about the same. At New River, however, the climber is treated to spectacular views of the gorge from his perch on the rocks.

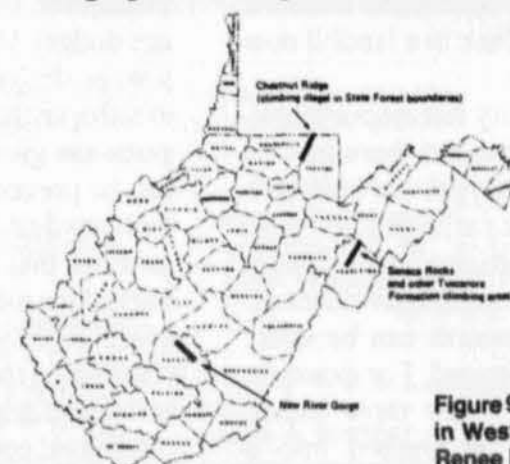


Figure 9. Main rock climbing areas in West Virginia. (Illustration by Renee La Valle).

FAA, EPA, ANG, MOA, ARNG, MNF, GAO, NEPA — One Big Headache

"In our opinion, the Environmental Assessment is seriously flawed in several ways and should not be regarded as a decision document in its current condition. The EA does not fulfill the requirements of NEPA and fails to present a full picture of the situation where the MOA is proposed."

This quotation is an excerpt from a 5-page letter sent in August to the WV Air National Guard by the U.S. Environmental Protection Agency after reviewing the Environmental Assessment prepared by the WV ANG for the September 9-11 air maneuvers over our Monongahela National Forest. The letter details numerous deficiencies, many of which we had brought out early on. As with our comments, the EPA letter was totally ignored.

In August, a review by the U.S. General Accounting Office was released entitled, "Airspace Use: FAA Needs to Improve Its Management of Special Use Airspace." The report focuses on military uses, and includes discussion of how FAA must establish sound and independent environmental review procedures for EA's prepared by the military. In view of EPA's comments and our hard work over the past several months,

we know all too well how FAA currently operates!

Most of you are aware that the Federal Aviation Administration approved the ANG maneuvers despite massive opposition from various public, state and federal agencies, and legislators, and ANG lack of NEPA compliance. Many of you wrote, and I thank you for that. Together we accomplished the elimination of all drop zones proposed on MNF land; they were moved north of the Forest, and considering what we now know, that was a very important change. We have Forest Supervisor Jim Page to especially thank for hanging tough on this aspect, as well as Commander Bill Hartman and LTC Eveett Barnes of the Army National Guard at Camp Dawson, and General John Wilson, head of the WV Air and Army National Guards.

A number of us were on hand to observe the maneuvers Sept. 9-11. The area just north of Dolly Sods near Bear Rocks was not used as proposed, because the private landowner was concerned with liability and did not give consent for drop zones to be established there. Thank goodness! From the helicopter and jet noise we experienced

in and around Canaan Valley, it is now very clear to us that such low-level maneuvers involving numerous aircraft are not compatible with uses of the remote areas of our Monongahela National Forest. It is also clear that if the jets that flew over us in Dolly Sods Wilderness on Sunday morning were flying at 2,000 ft., this level is not high enough to protect our wilderness areas.

WV Sierra Club is far from finished with this issue, as you might guess. Perhaps you could say we took a bruising in one battle, but we have far from lost the war. In addition to continuing our work on acceptable guidelines for military special use of the MNF (air as well as land), we will be working to get FAA procedures revised so that they will obey the law.

In August letters to Senators Rockefeller and Byrd in response to their concerns over the ANG behavior, General Wilson said, "The ANG of WV concedes that their public relations with the Special/Concerned Interest Groups was not one of cooperation in the past and, if planned for this area (MNF), all future exercises will focus on the concerns of these groups and they will be made a part of the planning process." Not

"There is an incessant influx of novelty into the world, and yet we tolerate incredible dullness. I need only suggest what kind of sermons are still listened to in the most enlightened countries. There are such words as joy and sorrow, but they are only the burden of a psalm, sung with a nasal twang, where we believe in the ordinary and the mean... the life in us is like the water in the river. It may rise this year higher than man has ever known it, and flood and parched uplands; even this may be the eventful year, which will drown out all our muskrats. It was not always dry land where we dwell. I see far inland the banks which the stream anciently washed, before science began to record its freshets."

WALDEN, Henry David Thoreau

only do we intend to make this happen, but we also want public participation (NOT "PR"!) in the initial decisions of whether or not to approve planning of particular projects to begin with.

Mary Wimmer
WV Sierra Club Conservation Chair

Citizen Participation

(continued from page 1)

findings to their representatives in Congress.

According to Peter Berle, President of Audubon, the program was established in 1987 for a dual purpose: to educate local communities to the problem of acid rain and, as importantly, to give citizens a voice in Congressional debates over acid rain legislation. "I firmly believe in the power of the individual citizen to influence the legislative process," Berle said.

For a small fee, volunteers receive an acid rain monitoring kit, including a pail and bags to collect rainfall, pH paper and plastic storage bottles. To prevent contamination of the collected rainfall, Audubon also provides plastic sandwich bags to be worn as gloves when handling the rain sample.

Once volunteers have collected and tested their samples, they report their results to National Audubon. If Audubon chooses to use the sample, the volunteer is instructed to send it in a plastic container to Bodega Marine Laboratory in California where the pH level is verified.

Audubon notes that acid rain has a pH value of 5.5 or less ("pure" rain has a pH of 5.6). Acids derived from two man-made pollutants — sulfur dioxide from utility emissions and nitrogen oxides from auto exhausts — are responsible for lowering the pH of the rainfall.

Acid rain is known to cause many harmful effects on the environment. Scientific studies in the United States and Canada have shown that acid rain can lower the pH of freshwater lakes and streams, killing fish and other aquatic life; it causes millions of dollars in corrosion damage to public monuments and buildings; and it is suspected of damaging forests and crops, and endangering human respiratory function.

The citizens' network has recorded its lowest pH levels in the Mid-Atlantic and New England states. Some monitoring stations have recently reported pH values below 4.7 (a very acidic level) in New York, Massachusetts, Maine and Pennsylvania. The network collected rain samples with pH levels below 4.0 in Virginia, Vermont and New Jersey. Low pH readings have also been recorded in Texas, Oklahoma and New Mexico.

Audubon has drawn on these findings to increase citizen awareness of the acid rain problem in local communities. According to Berle, the program has also increased grass-roots support for acid rain legislation. "Over 400 Americans have joined us in our efforts — collecting and testing rainfall all over the U.S. and reporting results to legislators," he said. Berle hopes that the program will boost Congressional efforts to enact acid rain controls.

Environmental Perspectives - Canadian Embassy

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.

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 Monogahela 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, Suite 201, 1206 Virginia Street E., Charleston, WV 25301.

With Right Approach Wastes Become Environmental Asset

by Lawrence T. Beckerle

SEWAGE SLUDGE, the leftover product of municipal treatment plants, is treated as a disagreeable byproduct of society and thus often buried right along with our society's unusable trash and toxic products. This is unfortunate and dangerous. Unfortunate because sewage sludge may be used to solve other environmental problems. It is dangerous because the pathogens that occasionally survive the sewage treatment process are anaerobic. Landfills are typically anaerobic (which is why some are used for producing methane gas). Once in a landfill these pathogens can live for many years and thus pose a serious hazard to our ground water if there is even just a very small leak in a landfill now or in the distant future.

This is an unnecessary risk because sewage sludge can be rendered harmless by exposure to air. (The oxygen we breathe is toxic to these anaerobic pathogens.) Sewage sludge is therefore sometimes put on pasture land. The cost can be prohibitive because only relatively low amounts can be safely applied to land that is grazed. For example, when grass is grazed below three inches, sewage sludge could be washed into a stream, and at that height soil erosion

becomes severe.

But on new strip mine soils grass is usually allowed to grow to full height for at least three to five years. In addition on newly mined land sewage sludge can be disced into the surface soil before the grass is planted, thus lessening any possible risk of a heavy rain washing the sludge from its designated area. Further, unlike most farms, surface mines have sediment control structures to catch particles displaced by rain.

However while people expect a livestock farm to stink, they become alarmed when they smell anything different from a coal mine (even the relatively mild odor of sewage sludge). Unpleasant odor occurs because sewage sludge, especially manure, is so rich in nitrogen that ammonia and other pungent gases are given off. However, this process can be prevented by mixing sewage sludge with sawdust. With fresh sawdust, microorganisms that would feed on sawdust are starved for nitrogen. When sewage sludge is mixed in, they "grab" the available nitrogen ("balancing their diet"), grow fast and strong, and thus digest the sawdust in a hurry. As a result great compost is produced. The potential benefits to land that is usually thought of

as barren, as a new strip mine is, is I think, obvious to any onetime reader of **Organic Gardening** or a similar magazine.

However introducing a source of organic matter early enough to prevent acid mine drainage is an even stronger reason for using sewage sludge on mined land. Currently reclamation law favors an engineering and/or chemical approach to preventing acid mine drainage. The emphasis is totally on preventing the oxidation of sulfur compounds by sealing the sulfur compounds in a coffin made of clay or by mildly poisoning the soil with detergent-like chemicals.

In balanced ecosystem sulfur is oxidized and cycled through the system without detrimental effect. Most crucial to maintaining the balance are sulfur reducing bacteria. Sulfur reducing bacteria are absent from many surface mines both because there is no food for them (they feed on organic matter) and because land mined under current law is too droughty for them to survive anywhere near the surface of the land.

In some ecosystems maintenance of a permanent water table above the sulfur deposits is also crucial for maintaining a balance in the sulfur cycle. The water restricts the

amount of oxygen available to the sulfur for oxidation and helps maximize populations of sulfur-reducing bacteria. Examples abound of land both in the Carolina's and Asia that once was productive rice producing land, but when drained for extended periods became wasteland.

In spite of these lessons Public law 95-87 forces coal operations to use "reclamation methods that keep mined land as dry as the land along our highways. Enough water gets into the compacted soil to get a pleasing green cover, but not enough to make the land usable for sustainable agriculture of for growing trees, and not enough to establish a balanced ecosystem.

So not only do we need different approaches to how we handle sewage sludge and waste sawdust, but we also need drastic changes in our mining reclamation laws

(Lawrence Beckerle is a land reclamation specialist. For more information send a stamped self-addressed envelope to him at P.O. Box 116, Craigsville, WV 26205.)

Coal Regulators Not Requiring ID . . . (continued from page 1)

Yet, despite the clear and unambiguous language of the regulations, none of the applications I have reviewed has identified aquifers or the area for the recharge for aquifers in their renewable resource surveys even though they have identified cropland and grazingland as such.

Aquifers and their recharge areas would have to be identified even if they weren't damaged by subsidence. But, unfortunately, aquifers and their recharge areas do suffer diminution of their reasonably foreseeable use as a result of subsidence.

For example, Coe and Stowe (1984) studied a mine operation in Monroe County, Ohio, and concluded with regard to that mine:

. . . nearly all water sources were affected as the result of the surface fracturing of a shallow sandstone aquifer, which effectively drained the aquifer.

When an aquifer is drained as a result of subsidence, its reasonable foreseeable use is diminished.

High extraction coal mining techniques are known to cause numerous problems to water supplies on or near the surface above and adjacent to the mine area. The sagging of strata above mined out panels causes vertical and horizontal movement in rocks near the surface. Such movements open new fractures and widen existing natural fractures both in the aquifers and in the aquicludes, draining water from higher to lower levels. Some of the induced and widened fractures close somewhat as subsidence runs its course but they cannot close completely because of crumbling into the fracture of chips of rock and because of the differing bulking factors of different types of rock. Fractures resulting from tension at the edges of panels do not close even after subsidence is complete.

Yet, coal companies routinely claim that damage to water supplies is "minimal" and "temporary". However, there is, to date, not a single thorough pre- and post-mining study of water supplies, including measurement of yields under seasonal conditions, which concludes that longwall mining effects on water supplies are minimal and temporary. On the contrary, there are several scientific studies which demonstrate that high percentages of water supplies, once affected by high extraction coal mining, do not fully recover. For example, Shultz (1988) reported the results of a U.S. Geological Survey hydrologic study of a longwall mine in Marshall County, West Virginia:

There were more dry wells in longwall-mined areas than in other areas. Twenty-nine percent of the wells in longwall-mined areas were dry at least once during the study period compared to only 3 percent of the wells in

other areas.

The mean annual discharge was significantly lower for springs in areas where longwall mining had occurred (0.32 gal/min) than for springs in unmined areas (0.94 gal/min). Mean seasonal discharges also were consistently lower for springs in longwall-mined areas than for springs in unmined areas. No flow was observed at least once at all of the seven springs in longwall mined areas but at only three of the nine springs in unmined areas.

Cifelli and Rauch (1986) studied a high extraction mining operation in north-central West Virginia. They concluded:

Ground water sources having at least 50 percent of their recharge areas impacted by complete extraction mining . . . have had a significantly greater frequency of dewatering effects. At least 90 percent of such supplies were partially or totally dewatered. This trend was highly statistically significant.

Only three of the accessible dewatered wells surveyed have shown significant recovery one to three years subsequent to mine induced dewatering. This represents only about 20 percent of the dewatered wells in mine subsided areas.

Baseflow streams were significantly impacted where at least 10 percent of their watershed was undermined and subsided, and had dried up where at least 25 to 30 percent of their watershed was so affected.

Tieman and Rauch (1986) studied a high extraction mining operation in southwest Pennsylvania. They concluded in part:

Of the accessible ground water supplies over longwall panels, all partly dewatered supplies had partial recovery, but only one-half of the completely dewatered supplies had a partial recovery, with no complete recovery observed.

Hiortdahl (1988) found for a high-extraction mine in Maryland that:

The observation wells at site 1, which were affected by nearby mining in the spring of 1981, have exhibited relatively long-term declines in water levels.

Several undermined main-channel segments of Laurel Run lost streamflow to the ground water system.

Johnson (1984), in an internal coal company report of a study of its own longwall operation in the northern panhandle of West Virginia, stated:

Approximately 80 percent of the wells and springs went dry after mining.

Booth (1984) studied longwalling in western Pennsyl-

vania and concluded:

The [mine drainage] behavior indicates a hydraulic connection between the mine and the shallower ground water system.

The response of ground water levels to undermining by longwall panels is considerable. Water levels in the Morgantown Sandstone, about 600 ft. above the mine, fell about 30 ft. in advance of the undermining . . . The aquifer was locally dewatered coincident with the arrival of the subsidence traveling wave.

Hobba (1987) found in West Virginia that:

In mined areas, ground water levels fluctuate more rapidly and greatly than in unmined areas. Underground mining and mine subsidence increase ground water drainage to streams and create annual water-level fluctuation of as much as 100 feet. Mine subsidence caused increased infiltration of precipitation, lowering of the natural water table, and increased mineralization of water.

What this means is that formerly dependable, perennial sources of water often become intermittent: they go dry sooner in dry spells than they otherwise would have (if they formerly went dry at all), and they stay dry longer.

All of these results for wells were based on levels of water in the wells. If any of the results had been based on pumping tests which indicate yield, it is likely that more supplies would have been judged to have been affected. Anecdotal reports by citizens over mines in the northern panhandle of West Virginia indicate the water supplies affected by high extraction may still be dry up to twelve years or more after the mining.

CONCLUSION

Federal and state regulatory agencies are allowing underground coal permit applicants to avoid identifying aquifers and their recharge area as renewable resource lands and are allowing aquifers to be permanently diminished in reasonably foreseeable use.

Aquifers and their recharge areas are renewable resource lands. Once damaged by mining they cannot be restored to a condition capable of supporting the reasonably foreseeable uses they could support before mining. Therefore, aquifer damage must be prevented, since it cannot be corrected.

(See "Groundwater: the environmental problem of the future?", *Voice*, March 1986.)

Richard S. diPretoro is a surveyor and geologist living in the Morgantown area. Complete references given in the article are available upon request.

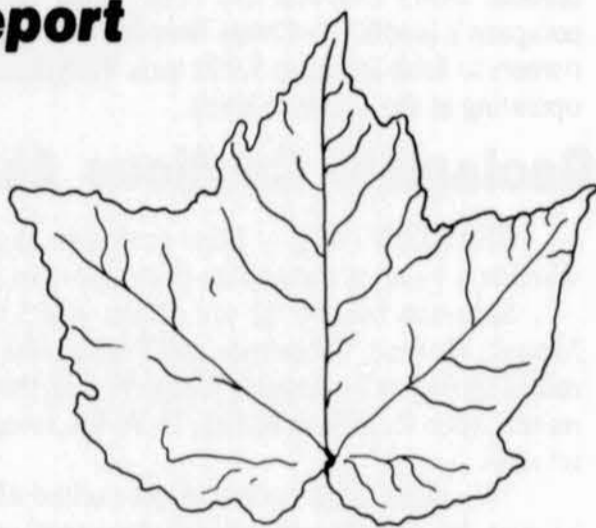
Fall Review — Trip Report

by Jean Rodman

Of the various trips and tours that were offered at the Fall Review, I chose the car trip. There were six of us and we were happy to be going in heated vehicles. The first stop was Beartown Rocks. I hadn't been there since Max Smith showed us the way a long time ago. At that time, we hiked down and looked around in what I now can see was only a small portion of the rocks. The State has made a much safer area by building the most extensive walkway I've ever seen. Some people may feel fenced off from nature, but a family with several adventurous children will love the place.

There was snow everywhere, covered with new-fallen leaves, like a white background for a crazy-quilt. Nobody minded the few sprinkles. The rock formations do look like blocks in a town, and there may even have been bears finding places to den up for the winter. We didn't see any signs of them. There were ferns, fissures, overlooks, steps up, steps down, snow-covered-built-in seats that we didn't use. We did use the hand rails. Everybody thought of someone they wanted to bring here.

Next, we headed for Droop Mountain Battlefield. Bill McNeel had just been to the costumed re-inactment two weeks before and could give us the grand tour and five minute lecture in the museum. We went on to the CCC - built overlook tower and climbed it. The roof was welcome, for by now the weather had changed for the worse and was sleet-rain-snow mixed. The view



was not as good as we could have hoped, but just enough to give a hint of what could be seen on a clear day.

After brief stops to photograph a log church and a one-room school, we went on to the grist mill at Millpoint. Bill had the key because the mill is still owned by the family. Efforts are underway to restore this as a place to visit. It would be a good edition to the Little Levels (local name for the area) along with the Pearl Buck Birthplace, Beartown, the Greenbrier River, Watoga State Park and other attractions; this is a wonderful place to visit. The mill worked up until 1947, but there is quite a lot that could be restored. Talk to Bill McNeel about helping with this endeavor.

Outdoor picnic tables seemed unattractive, so we went to the Rosewood for warmth, hot French onion soup and good conversation. People were nice to us there. Stop in; things were good.

New Approach To Forests Is Urged

The U.S. Forest Service should manage each of the 155 national forests for its "distinctive values," says a new research report published by The Conservation Foundation. This could be the best solution for the sale of national forest timber that does not return the cost of putting it up for sale.

The report, *Below-Cost Timber Sales in the Broad Context of National Forest Management*, was prepared for the Forest Service and written by Foundation Senior Associate William E. Shands and Senior

Fellow Thomas E. Waddell.

"Simply put," says Shands, "the Forest Service should develop management direction for each forest that emphasizes the distinctive characteristics of the land and provides forest environments, recreation, wildlife, and timber not otherwise available in the area in which a forest is located."

(1988. Paperback, 54 pages. \$15.00.) The Conservation Foundation, 1250 Twenty-Fourth St., N.W. Washington, D.C. 20037.

Conservation Foundation Letter

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NEWS BRIEFS

Congress Sends Coal Heritage Bill To Reagan

WASHINGTON (UPI) — A bill aimed at preserving the cultural heritage of Southern West Virginia's coal counties and spurring development of tourism is headed to President Reagan for final approval, Rep. Nick Joe Rahall said Monday.

The West Virginia Coal Heritage Bill, approved by Congress shortly before adjournment, directs the National Park Service to conduct a one-year feasibility study on preserving significant cultural, historic and natural resources associated with coal mining in 11 southern counties.

Rahall tacked the legislation onto a larger bill that dealt with public lands in the West.

The park service's study will identify a tour route that will link coal heritage sites and points of interest with existing state and federal parks and recreational facilities. Counties included in the study are Cabell, Wayne, Mingo, Logan, McDowell, Wyoming, Raleigh, Mercer, Boone, Fayette and Summers.

"The richest resource in these southern counties are the people," Rahall said. "The preservation of our cultural heritage will be advanced by this legislation for the education and benefit of future generations. At the same time, the region will profit from the development of its coal heritage sites."

Rahall said the coal mining industry has left its mark on the history of the nation and that history should be preserved, particularly in towns such as Matewan, site of the Matewan Massacre in which Baldwin-Felts employees and union miners shot it out.

The Charleston Gazette, 10-25-88

Animal Rights Program In Sweden Stringent

by Steve Lohr

STOCKHOLM — In the last few months, Sweden has been putting in place a rights program for farm animals that may be the most stringent in the world. Under an animal-welfare law enacted in July, cattle, pigs and chickens are being freed from the restrictions of intensive, or factory-farming methods, in which animals are kept in crowded conditions and antibiotics and hormones are often administered.

The legislation reflects the extraordinary political clout of an 81-year-old writer, Astrid Lindgren. One of the world's most widely read authors of children's books, perhaps best known as creator of "Pippi Longstocking," Lindgren demonstrated the power of the pen in Swedish affairs by writing a series of satirical allegories in leading newspapers, underscoring the plight of farm animals and fueling the animal welfare campaign.

Swedish cattle have been given grazing rights under the new law. Pigs no longer can be tethered and must be granted separate bedding and feeding places. Both cows and pigs, the law states, must have "access to straw and litter." Chickens must be let out their cramped cages. No drugs or hormones can be used on farm animals except to treat disease.

The program represents the forefront of a movement that is being felt in other parts of Western Europe. The European Community has banned imports of meat from animals raised with synthetic hormones effective next year.

Sweden has had a vocal animal rights lobby for more than a decade. In recent years Lindgren has been responsible for making treatment of farm animals a lively political issue, despite protests that food prices would be forced higher because of new laws.

Animal-rights advocates hope the rest of the world will follow Sweden's example. Already some Europeans will not eat veal because calves often are raised in cramped and dark confinement. There is a market for eggs laid by free-range hens.

The Charleston Gazette, 10-31-88

Petroglyphs Discovered On Mingo Ridge Top

DINGESS (UPI) — On a ridge top in Mingo County, a Morgantown archeologist has found additional evidence that Irish missionaries may have passed through West Virginia a millennium ago.

Archeologist Robert Pyle met Saturday with representatives of the Irish embassy, including Daire O'Criodain, secretary of cultural affairs, to discuss ancient rock carvings called petroglyphs found in a mountain rock shelter near Dingess.

Pyle said the petroglyphs are similar to ancient markings discovered in nearby Wyoming County that indicate the presence of early Irish missionaries known as the Ogam.

"They are very similar. This site in Mingo County is the first site that has two-dimensional markings . . . They do in fact very much resemble the Ogam alphabet (found at sites in Wales, Scotland and Ireland)," said Pyle, who has been studying Ogam petroglyphs since 1982.

The Mingo County petroglyphs are located on land owned by Marrowbone Development Corp., which plans to preserve the site for future study, Pyle said.

"They're really unique . . . They have Christian religious symbols that are identifiable, many of them identifiable were recorded very early, as early as the third century in Europe," he said.

Local residents Oscar Dingess and Jimmy Smith discovered the petroglyphs and reported them to Arnout Hyde of Wonderful West Virginia Magazine. Pyle said excavation of the site was completed earlier this month.

"The markings appear to be from around as early as the eighth century to the 12 century A.D.," he said. "It's really a tremendous discovery."

Pyle said he believes the markings were made by early Irish missionaries who followed major trails through the mountains, in this case a trail near Indian Ridge.

"These early missionaries would have surely utilized these trails; they're the most appropriate ways to get them in contact with various people," he said.

The Charleston Gazette, 10-23-88

Landfill Activists Doubt New Authority Member

Landfill activists say a new member of the state Solid Waste Authority poses a tangle of possible conflicts that could subvert the authority's mandate.

Gov. Arch Moore announced five new appointments to the board this week. The circumstances of the appointments have made some observers question whether Moore, who is running for re-election, is stacking the authority in favor of landfill operators.

The new appointees are landfill lawyer Arden Curry, Parkersburg landfill operator Daniel R. Graham, Wood County Commissioner Holmes R. Shaver, Kanawha County Commission President Douglas Stump and Welch Mayor Martha M. Moore.

In addition, state Director of Health David K. Heydinger and Department of Natural Resources Director Ron Potesta will serve on the board.

Kelly Wazelle, chairwoman of West Virginia Citizens for a Clean Environment, criticized Curry's appointment. Curry fulfills a new state requirement that one board member be knowledgeable in environmental law.

Curry's legal clients include: Don's Disposal Service Inc. in Charleston; John Fleming, owner of the Fleming landfill near Sissonville; Delegate Ken Riffle, D-Harrison, a landfill owner; and Ed Snodgrass, who wants to purchase an option on a Roane County landfill. Curry said he also advises several other owners and their lawyers, including Braxton County landfill owner Kenton Meadows.

"Mr. Curry being appointed to that position seems to be a conflict of interest," Wazelle said.

Larry George, a conservation lawyer who drafted the sweeping state law that imposes strict new landfill regulations, said Curry's appointment violates the spirit of the position.

"The Legislature intended that that person be a citizens' representative with a background in environmental law," George said. "He represents private landfill operators who could in the future be competing with the landfills operated by the Solid Waste Authority."

George said legislators intended the new Solid Waste Act to help the authority build new landfills. The authority already operates a landfill in Monongalia County and plans another in Raleigh County.

Curry has said he sees no conflict and would remove himself from situations posing a conflict, should any arise. "I happen to have a reputation of knowing something about environmental law," Curry said.

The board, created in 1977, consisted of three members whose terms expired as long as two years ago. Under state law, a board member can continue serving past the expiration date until the governor appoints a replacement. One vacancy had been left unfilled for nearly two years.

Graham, of Northwestern Disposal Inc. in Parkersburg, hauls residential and commercial garbage in Wood County and dumps it in a 55-acre landfill nearby. Graham said he takes 12,000 to 16,000 tons a month, including some from nearby towns in Ohio. He represents garbage haulers, as mandated by state law.

Shaver was on the Wood County Commission this summer when commissioners gave permission to Graham to continue operating his landfill at previous levels. Graham said there was no public opposition to his request.

Stump has said in the past that he would oppose a pending request to open a new landfill in Kanawha County. Don's Disposal has asked commissioners permission to build a landfill near Sissonville that would take about 44,000 tons of garbage a month, about three times the amount the county produces.

Kanawha commissioners will soon decide whether to approve increases at another landfill. Don's Disposal had been taking 12,000 to 18,000 tons of garbage a month at the company's landfill on Craigs Branch, also near Sissonville. In August, DNR officials ordered owners to limit intake to 9,999 tons. They have asked commissioners to allow them to resume operating at the previous levels.

The Charleston Gazette, 10-27-88

Geologists Cautious About Manganese Mining

BECKLEY (AP) — State geologists say it will be at least two years before they know whether a band of manganese-bearing ore in southeast West Virginia is worth mining.

Scientists believe the ore occurs in a 5 to 10-mile wide belt that runs through parts of Mercer, Monroe, Greenbrier and Pocahontas counties. Discovered nearly a century ago and mined sporadically through World War II, the manganese deposits gained attention earlier this month when Rep. Nick Rahall, D-W. Va., issued a press release announcing the existence of the mineral.

"We don't want people to get excited about something that doesn't exist," said Dewey Kirstein, head of the economic geology section of the West Virginia Geological and Economic Survey. "You probably couldn't mine it profitably right now. The present market price is only about 6 or 7 cents a pound."

He said the real benefit to the state lies in the potential strategic value of the ore. A critical ingredient in steelmaking, manganese is classified as a strategic mineral, meaning that the U.S. depends on imports for a stable supply.

"The U.S. is virtually 100 percent import dependent," Kirstein said. "Most of ours comes from South Africa."

The Soviet Union and African nation of Gabon also produce manganese. A crisis in U.S. relations with any of the suppliers could make the high-grade West Virginia ore extremely valuable, Kirstein said.

Rahall, who chairs the House Subcommittee on Mining and Natural Resources, has sponsored legislation aimed at finding other sources of manganese and other strategic materials.

A Bluefield, Va., geologist said three factors may combine to make the West Virginia manganese worth mining: the ore is of high quality, it should be easy to mine and the price keeps going up. Black lumps of the manganese-bearing rock have been found in the 100-foot-thick layer of clay that covers some of the limestone ridges in the eastern counties.

Samples tested so far contain up to 42 percent manganese, compared to about 35 percent for most imported ore.

The first step to possible commercialization is finding out just how much ore exists. The state is seeking federal grants to pay for a two-year study to map the deposits.

"Whether it's there in the same concentration that has been shown remains to be seen," Miller said. "If the results are positive, then it could have some economic impact, but we're not going to know that for a couple of years."

The Charleston Gazette, 10-23-88