



# THE HIGHLANDS VOICE

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DAMAGE IN WETLANDS OWNED BY MON POWER IN CANAAN VALLEY  
DUE TO UNCONTROLLED ORV-ATV USE. AUGUST, 1989



BLACKWATER RIVER WETLANDS IN CANAAN VALLEY

## CANAAN ALERT 1990

### Call for Support Letters for Establishing A National Wildlife Refuge in Canaan Valley

This request is being made by several groups who have been involved with the Canaan Valley issue for a number of years: WV Highlands Conservancy, WV Council of National Audubon Society, WV Wildlife Federation, WV Council of Trout Unlimited, and WV Chapter of Sierra Club. The Valley is being destroyed as you read this. The Caperton Administration is sympathetic toward protecting it as a National Wildlife Refuge. Many WV environmentalists feel that the time is right to have people from around the state encourage state officials to proceed with protection for Canaan Valley.

Canaan Valley is a wetland ecosystem which lies east of Blackwater Falls State Park and the towns of Davis and Thomas, and northwest of Dolly Sods Wilderness. The Valley contains very unique vegetation for this area. Due to its high altitude, it harbors species that normally live far north of here in a northern tundra type of environment. It also is rich in wildlife and provides a haven for migrating birds and other waterfowl.

Many of you are aware of the emphasis being placed on wetland protection nationwide these days. Not only is Canaan Valley a major wetland (it contains some 40% of all West Virginia wetlands), but its special high-country vegetation caused it to be named a National Natural Landmark by the U. S. Department of Interior. Such designation does little to protect it.

Currently there are serious pressures on the integrity of the Canaan Valley ecosystem. These include hydroelectric power facilities; vacation homes and condominiums; all-terrain vehicles; and ski slope, golf course and bar/restaurant development. Reason—the Valley is privately owned, primarily by Monongahela Power Company.

The Valley also suffers from an underdevelopment. These include inherent difficulties in appreciation of the beauty and uniqueness of bog areas; lack of status and prestige necessary to develop interest of powerful people or enough people to create a National Wildlife Refuge; past degradations cause potential stewards to look elsewhere; evidence of environmental groups and the Fish & Wildlife Service not convincing enough to elected officials; lack of "intergenerational equity"—insufficient commitment by the present generation to examine long-term consequences for the loss of diversity.

There is renewed interest from many different parties in encouraging the federal government to purchase Canaan Valley for the purpose of designating it as a National Wildlife Refuge, similar to what is ongoing with the Ohio River Islands. Importantly, the land purchase would be at fair market value on a willing-seller basis, not by condemnation. The Fish and Wildlife Service has estimated that the income to depressed Tucker

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## WV Archeological Society, Inc.

### Lower Kanawha Chapter

The monthly meetings held by the Lower Kanawha Chapter of the WV Archeological Society represents the activities of some 80 members. The informal atmosphere encourages exchange of information and keeps members up-to-date.

Structure to the random activities involved in discovery and identification, come together under Society guidelines for responsible and proper digging and cataloging procedure for all authenticated finds. Outreach activities by the Chapter include guest speakers at the monthly meetings and presentations at area schools. Cooperative tasks with the WV Department of Culture and History have happened in the past.

Individual members focus on building a collection of arrowheads and implements, exploring the function of the points and their utility or trace a historical trail in documents. Several members expressed concern over exclusionary policies of the US Corps of Engineers at state sites and lack of awareness about the history of places. Members have combined valuable contributions of expertise and time in the field; and, in the record room, and plan to continue a recreation of the past.

A current emphasis of the Chapter focuses on late prehistoric finds by awarding a special certificate for authenticated points dating from 0-1000 A.D. Although

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## Reporting: WVHC Spring Review

The weekend began on Friday, May 11, 1990, as scheduled. Many late comers, underestimating the travel time on Route 50, arrived later than anticipated. A warming campfire made the action easy to find once Camp Rimrock was located. Cold and rain were unexpected guests, arriving early Saturday and remaining until late in the afternoon. The rain decided to come back Sunday and stayed for the entire Board meeting.

If you doubt the fact of such participants, parts—at least—of the weekend were filmed by the Close Up Foundation. Working in conjunction with the Smithsonian, Cindy Rank was their focus for a video series entitled "Citizen Stories." The

crew was uniformly courteous and the bright lights weren't too disturbing.

Saturday activities began with Dr. George Constantz's presentation about the Cacapon River. A slide show illustrated main concepts about the Cacapon ecosystem. River statistics included descriptions of the unique features of the Cacapon, including its upper third known as the Lost River. Two names designate the same river ecosystem.

Ecological inventory included the geology, the plant life, mammal life, and aquatic life. The greatest threat facing the Cacapon, a river with no industrial polluters, is pollution from stream bank

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## From the Heart of the Mountains

### Three Cheers (Dumps—DOE—Canaan)

by Cindy Rank

We often criticize public officials for things they do that we consider improper or in violation of their public trust.

By rights we should also praise those officials when their actions bespeak some more commendable activities.

Gaston Caperton deserves "kudos" for several things these days.

#### DUMPS

First, KUDOS to the Governor for joining in one cleanup effort at a neighborhood stream and another at a hillside dump.

True, for public figures such activities can be great media events. But, if taken together with Mr. Caperton's campaign promises about out-of-state garbage and his apparent concern about the litter problem and how it affects the beauty of WV, there is hope that all this is just a sign of a deeper commitment to working for a healthier environment in all areas.

Continued example by the Governor and his increased personal support in Legislative and other Administrative actions can encourage stronger environmental laws and stronger enforcement of those laws already on the books.

#### DOE

And speaking of the need for strong environmental enforcement . . .

The second bit of KUDOS goes to Governor Caperton for his proposal to the Special Session of the Legislature that the promotional aspect of the DOE be moved to another Agency, thus leaving DOE to be a regulatory body without some of the real and potential conflicts of the past five years.

Advances have been made in the past year or two, (thanks in part to the lawsuit vs. DOE that the WVHC has been party to) but even these have come slowly and with much difficulty. So much more is still needed, not only in statutory, regulatory and programmatic areas, but also in the underlying intentions and will of the Department.

Hopefully the new director proposed by the Governor will be matched by great resolve on the part of his newly appointed Energy Commissioner and all of WV will benefit.

#### CANNAN

A third KUDOS to the Governor for his apparent interest in protecting the unique treasure of Canaan Valley.

Many West Virginians have a deep and abiding love for Canaan and are committed to preserving the Valley as a National Wildlife Refuge. Apparently Gaston Caperton can be counted among those numbers.

Recent rumors have raised suspicions about special deals that may carve up the Valley even more than it already has been. Response to the suggestion that Governor Caperton and/or those in his Administration might be involved in those deals has brought confirmation from Larry George, Deputy Director of DNR, that indeed the Administration's priority is to protect this "very important resource" and that the DNR's position since 1979 has been in support of a Canaan Valley Refuge.

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All three of these issues have been near and dear to the hearts of many members of the Highlands Conservancy over the years. One very important thing each of us can do is to let our voices of support be heard, especially at this time about Canaan.

With this in mind I urge you all to read the Canaan ALERT printed elsewhere in this issue of the VOICE. The facts and information have been around for so long and progress toward a Wildlife Refuge has been stalled so long that we sometimes stop spreading the word about the benefits a Refuge will bring, and often forget that the people and agencies most directly involved in discussions and decisions that pertain to the Valley need to know the breadth and depth of support that exists for declaring Canaan a National Wildlife Refuge.

Add your voice of support to whatever issues you feel most strongly about . . . Start with Canaan. Write to Governor Caperton. Write to the other officials listed in the Canaan ALERT.

## Letter to the Editor

Mon Power and other utility companies all over the country have been spraying powerline right-of-ways with toxic herbicides for many years now. So why did I become so concerned about this? My entire family: myself, my husband, our three young children, and my father and sister from out of state, we all picked and ate wild raspberries that had been sprayed the day before. And, it seems that this is not an unusual case.

These chemicals are not intended for use on food crops or on crops or hay for animals. Still, homeowners are not warned of these risks. Our neighbor had their sprayed land cut and baled. Where this hay ended up, we can only guess. They didn't seem to care when we expressed our concern to them. At the very least, utility companies have a responsibility to be warning people of these dangers. It seems to be similar to a case of informed consent. Homeowners are not fully informed before they give their consent. I suggested to Mon Power's right-of-way technician that detailed information be included in everyone's bill, since not everyone gets a paper, and what is printed in local papers about

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their spraying programs is terribly inadequate. All I received in response to my suggestion was a grumble.

One of the chemicals used is 2,4-D. The National Cancer Institute found 2,4-D to be related to lymph cancer, reproductive problems and birth defects. 2,4-D is also injurious to fish and bees. Researchers in Oregon found that deer reduce the effectiveness of these poisons because they eat the vegetation before the poison can reach the roots. 2,4-D is stable in frozen deer meat. I often hear people express their appreciation of the healthiness of deer meat. A study in the Chippewa National Forest found that the sampled raspberries has 2,4-D up to 40 times the EPA's legal tolerance.

This issue seems especially critical to West Virginians for many reasons. We live in a very rural state in which many people depend on ground water (wells) for their drinking water. These chemicals can contaminate water. The manufacturer's literature is full of such warnings. They can run off into creeks and ponds, and according to the

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manufacturer's literature, these chemicals 'can travel (seep or leach) through soil and under certain conditions contaminate groundwater which may be used for irrigation and drinking purposes.' The manufacturer warns against its use in areas with conditions which apply to a lot of land in West Virginia (i.e. shallow aquifers and limestone). It is a violation of federal law to use these products in a manner inconsistent with its labeling. Our state has a lot of hunters and fishermen, people who depend on these sources of food. Many out of state hunters and fishermen would also be concerned about this problem if it were more known. Also, many West Virginians, like ourselves, like to forage for food and herbs: ramps, morrel mushrooms, berries, ginseng and goldenseal.

We want Mon Power to stop this environmentally damaging practice. I suppose that we will hear a rebuttal to this letter. We will hear that these positions are EPA approved. By now, this means very little to those of us who have watched one chemical after another be removed from the market. I've heard the defense, I spent much time on the phone with Mon Power's right-of-way technician. He proclaimed himself to be an environmentalist. He appeared to be highly educated and accustomed to defending this practice. Whatever the arguments, it is not a good practice to spray fields used to feed animals in a state with abundant springs and waterways.

Please call Mon Power and express your concern. Refuse to allow poisons to be sprayed on your land, in your neighborhood. Ask them to discontinue this practice—for our children's sake.

*Signed, Kathryn Basham, Health Educator*

## From the Editor

At the direction of the WVHC Board of Directors, the "Highlands Voice" is being printed on recycled paper. Although a slight increase in cost and a loss of quality are axiomatic for our printing circumstances, virtually no debate was entertained. On the one hand, the Board is commended for pursuing a course that will be perceived as a benefit to the environment. On the other hand, this should not be seen as a reactionary acceptance of every product labeled safe for 'green' consumption. Now that it is known that more consumers 'read the label' special dangers have arisen.

Solutions that provide incomplete versions of the greater goals of environmental health and safety should not be allowed to become a mass excuse for inferiority. Paper, so ubiquitous in our society is a special case . . . not only are trees as a resource involved, some processes of paper making and printing use toxic substances and toxic substances remain with the finished product. While purchasing recycled paper (or any 'green' product) is a method of demonstrating responsibility for the environment, it provides no automatic absolution or guarantee of results.

Standards in the printing industry indirectly reflect the technology. Paper was once in short supply in this country. During the colonial period, the citizens of Williamsburg were called upon by printer William Parks. In 1744, he used his *GAZETTE* to persuade Virginians to sell him worn linen.

*Tho' sage Philosophers have said,*

*Of nothing, can be nothing made;  
Yet much thy Mill, O Parks brings forth  
From what we reckon nothing worth . . .  
(And long that gen'rous Patriot live  
Who for soft Rags, hard Cash will give!) . . .*

*Ye Fair, renown'd in Cupid's Field,  
Who fain would tell what Hearts you've killed;  
Each Shift decay'd, lay by with care;  
Or Apron rubb'd to bits at—Pray'r,  
One Shift ten Sonnets may contain,  
To guild your Charms, and make you vain;  
One Cap, a Billet-doux may shape,  
As full of Whim, as when a Cap,  
And modest 'Kerchiefs Sacred held  
May sing the Breasts they once conceal'd.*

*Nice Delia's Smock, which, neat and whole,  
No man durst finger for his Soul;  
Turn'd to Gazette, now all the Town,  
May take it up, or smooth it down.  
Whilst Delia may with it dispence,  
And no Affront to Innocence.*

I hope this latest issue continues to provide an entertaining exploration of local issues. Your comments are always welcome.

*(continued from page 1)*

no statewide archives exist, the Lower Kanawha Chapter documents all finds by recording the location of the find and classifying by archeological periods.

Extent of digs range from dredging in the Kanawha River to just beneath the surface of the ground. An annual field trip, conducted by Institutional Membership Secretary Kenneth R. Pence, introduces new members to field techniques. The Society also assists in obtaining permits required to legally dig for archeological purposes.

### FORT TACKETT

The WVAS plans to observe the 200th anniversary of the burning of Fort Tackett

by a public dramatization and memorabilia exhibition this August 25, 1990. Recreation of the dramatic events leading to the destruction will also demonstrate the true location of the Fort. Never physically located by historians, the evidence for the the original site to have been at the location of the Valley Drive-In is convincing. The first documented reference placing the Fort lower on the Coal River and closer to the Kanawha River occurs in records dating from the Civil War. This mistake has been perpetuated in later documents and lead to the inaccurate siting of a commemorative marker.

Active WVAS member J. W. "Bill" Williams has collected data about the

## Coalition for Environmentally Responsible Economies

The Valdez Principles, developed by CERES, are broad standards designed to provide evaluation criteria for corporate actions that impact the Earth's biosphere. A long term goal set by CERES includes a permanent standards board for environmental audits comparable to audits that measure financial performance. This first step at enunciating general principles points corporate responsibility and accountability at environmental concerns.

Based on a general creed of ten (10) principles, each subscriber is expected to refine and specify commitments and demonstrate compliance. The goal of improved environmental quality and health should be fundamental to all efforts. CERES statement of intent includes this explanation: "Our intent is to create a voluntary mechanism of corporate self-governance that will maintain business practices consistent with the goals of sustaining our fragile environment for future generations, within a culture that respects all life and honors its interdependence."

The Coalition founding members include such familiar names as the Sierra Club, National Audubon Society, and the Wilderness Society. For a copy of the principles, write to CERES, 711 Atlantic Avenue, Boston, Massachusetts 02111.

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County from the refuge could be \$10 million annually. Another major contributor to the County's economy, the Blackwater 100 (motorcycle and all-terrain vehicle race), would not be effected; the organizer has indicated that the part that sometimes goes through the Valley could be relocated.

If you have any questions, don't hesitate to call Suzanne Offut at 258-4730 (h), Linda Elkinton 296-0565 (h) or Mary Wimmer 598-0136 (h). Organizations that support the Canaan Valley National Refuge: WV Highlands Conservancy, WV Chapter Sierra Club, Wildlife Federation, Audubon Society, WV Garden Club, WV League of Women Voters, Trout Unlimited, National Wild Turkey Federation, National Campers and Hikers Association, Friends of the Earth, Defenders of Wildlife, Ruffed Grouse Society, and Environmental Defense Fund.

Responsible for State support for designation  
Governor Gaston Caperton  
State Capitol  
Charleston, West Virginia 25305  
Phone: 304/340-1600

Responsible for designation and management of the refuge  
Manuel Lujan, Secretary  
U. S. Department of the Interior  
Washington, D. C. 20240

Critical appropriation of federal money for land purchase  
Senators Robert Byrd and Jay Rockefeller  
U. S. Senate  
Washington, D. C. 20510  
Phone: 202/224-3954 and 6472 respectively

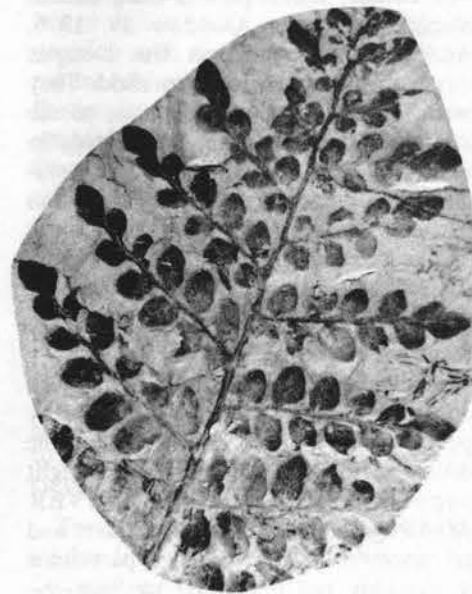
Representative Alan Mollohan, House Appropriations Committee  
U. S. House of Representatives  
Washington, D. C. 20515  
Phone: 202/225-4331

District representative  
Representative Harley Staggers, Jr.  
U. S. House of Representatives  
Washington, D. C. 20515  
Phone: 202/225-4331

Let Representative Bob Wise and Nick Rahall hear from you if they are your representative. Please ask others to call or write especially over the next few weeks. Letters from every part of the state, the more the better, will increase the chances for successful protection of Canaan Valley.

Fort and the families who first settled the area. Tentative plans for the observance will be based on oral history compiled by Mr. Williams and other documented material about the period. Wouldn't it be great if Mary Ingles showed?

Involved with the Society for about seven years, Mr. Williams fears a lack of interest in the past will lead to irretrievable losses. Without proper identification and recording, essential aspects of past events become obscured. Like other resources, mechanisms must be in place to ensure that the delight of discovering a point or tracing a building site remains within the domain of the community. Interested persons are invited to write Mr. Williams, Lower Kanawha Chapter of the WVAS, 429 C Street, St. Albans, West Virginia 25177.



# Lost River Environmental Frontier

No West Virginian tuned to economic forecasts could have missed reports about the eastern panhandle 'boom' and increased exchanges along the Potomac River, less than an hour by car to Washington, D.C. The rural temperment and life style there now compliments the dominant commerce of truck and poultry farms. Physical evidence of economic success is not obvious. Change is sometimes difficult to identify.

Often neglected in economic reports, and with a spectacular physical presence, is a special resource that runs through Hampshire, Hardy and Morgan counties—the Cacapon River.

The role of the river has changed as often as the people surrounding it. Occasionally, the river takes the initiative. Most area residents are against plans to dam the river. They support other flood control measures. For many residents the battle is a familiar one. Support from environmental and recreational grassroots associations promises an exploration of all legal remedies that may help preserve one of West Virginia's cleanest rivers.

## Proposal I and II

The first proposal for flood control was in 1961 by the Mathias Ruritan Club. This proposal went no farther than preliminary questioning of the Conservationist assigned to the area by the Agriculture Department.

The Potomac Valley Soil Conservation District (PVSCD) represents five counties: Hampshire, Mineral, Hardy, Grant and Pendleton. Members may request the services of the State. This was done in a second proposal in 1968 when PVSCD Supervisor Don Biller began gathering support for a watershed project. In May, 1968, the Lost River Watershed Landowners Committee was formed with landowner J. Winston Teets as president.

For several years different sites were investigated. Public meetings were held in 1969 and 1971. Spotty opposition was evident but not seriously noted by the sponsors. A formal work plan and Environmental Impact Statement (EIS) were issued in 1974. Organized opposition to the project came six weeks after an article appeared in the "Moorefield Examiner" on March 17, 1976 (See Voice May 1979).

The Concerned Citizens for the Preservation of the Lost River Valley gathered families from each of the proposed sites and went to Washington by bus to meet with Senator Randolph and Congressman Staggers in person. On July 29, 1976, Agriculture Commissioner Gus Douglas met with the citizens at Moorefield. They were invited to present their case to the State Soil Conservation Committee. In February, 1977, the State Soil Conservation Committee unanimously agreed to suspend the project until there was sufficient demand.

Elizabeth Webster, President of Concerned Citizens for Lost River Valley wrote the following. "Our partial victory—partial because we did not kill the project, only wounded it—was the result of many people working and praying together. The officials that we elected were caught napping, BUT, hopefully, NEVER AGAIN! We have learned, be alert and get involved—attend meetings, participate in elections, and it is never too late—no

matter how far along a project is, it can be stopped, if the opposition is strong enough and willing to fight hard enough."

Principle objections to the proposal included displacement of people and farms, distaste and apprehension for the projected visitor increase, dread of government regulation and disgust at the waste of taxpayer monies. Supporters of the project remained convinced of its value. These same representatives are again publically debating the most recent proposal for flood control on the Lost River.

## Sheets of Facts

The Lost River Committee, the former Concerned Citizens of Lost River Valley, is utilizing its experience to maintain a sophisticated and well-orchestrated dam opposition. Elizabeth Webster, Geraldine Garrett and Charles Foltz, members of the Lost River Committee, led an afternoon tour of the proposed sites at the WVHC Spring Review on Saturday, May 12, 1990. They detailed their efforts to date to increase public awareness, quantify pro and con positions, and evaluate PVSCD actions.

The site to be constructed first is Kimsey Run. A fact sheet addressing the inappropriateness of the Kimsey Run Dam was distributed in the area. Recipients were encouraged to write to local media, state and federal representatives, the Governor, the PVSCD, the Hardy County Commission and other officials. The PVSCD responded with its own fact sheet and contact list. The public awareness efforts have resulted in over 1200 signatures against the proposed Kimsey Run Dam. Committee efforts to verify signatures gathered by the PVSCD in support of the dam were met with that peculiar bureaucratic disinformation.

Examination of the costs and benefits of the Kimsey Run proposal does not appear cost effective to opponents. The estimated cost savings of \$712,200 per annum projected by the sponsors is based upon data that is generally unsubstantiated. A clipping file maintained by the LRC shows no major flood damage even during the drastic flooding of 1985. Topographic features of the valley between two high ridges provided natural barriers and overflowing water from other areas did not enter the Lost River Valley as it did in nearby communities.

The value of flood control protection is also in dispute. Sponsors claim the dam provides the most protection at the best price. The current location of the dam will flood 265 acres of farm land. Seven miles of riverbank will be protected. Previously identified erosion problems above the dam site will not be controlled. More importantly, methods of erosion control such as altering farm practices, altering road building practices, planting trees, and stabilizing streambanks, will be further downplayed.

Undeniably, landowners in the immediate area, estimated at 41 families, would benefit from the increased sedimentation control. The overall emphasis of the 5-dam package tends to characterize this benefit as a coincidental by-product. Less costly techniques could serve these same families at almost no cost to the environment and contribute to the overall health of the river and its ecosystem.

The EIS relied upon by the sponsors to determine effects on the environment was performed fifteen years ago. The site chosen has changed. An update published in 1989 does not fully consider potential impacts in any documentation. If proven, violation of the National Environmental

Policy Act would result in a requirement that the public be informed about dam plans and all of the potential impacts on the environment. Supporters of the LRC include: Cacapon River Committee, Canoe Cruisers Association, American Canoe Association, American Whitewater Association, American Rivers, and Friends of the Earth.

In this third proposal for a 'flood-control' project in the Lost River Valley, several public officials are also landowners in the affected area. Hardy County Commissioner J. Winston Teets and PVSCD Supervisor Donald W. Biller together own thousands of acres on and surrounding the Kimsey Run Dam site. Both believed in the project as it was proposed in the 70's.

Since the defeat of the second proposal fifteen years ago, most area residents have grown to be more protective of the River. A November, 1989, public hearing chaired by Agriculture Commissioner Cleve Benedict was attended by about 400 people. The majority opposed the dam project. Again, opposition demonstrated at the meeting was not seriously considered by the sponsors. Demolishing five homes and flooding farm land is not a common vision for the Valley's future.

Supporters of the dam point to additional recreational benefits traditionally associated with Soil Conservation flood control projects. The only specific plan for the reserve pool at the Kimsey run site calls for DNR fish stocking. Potential development of public or private facilities around the pool is addressed only in vague terms that give no plans to describe future use or purpose.

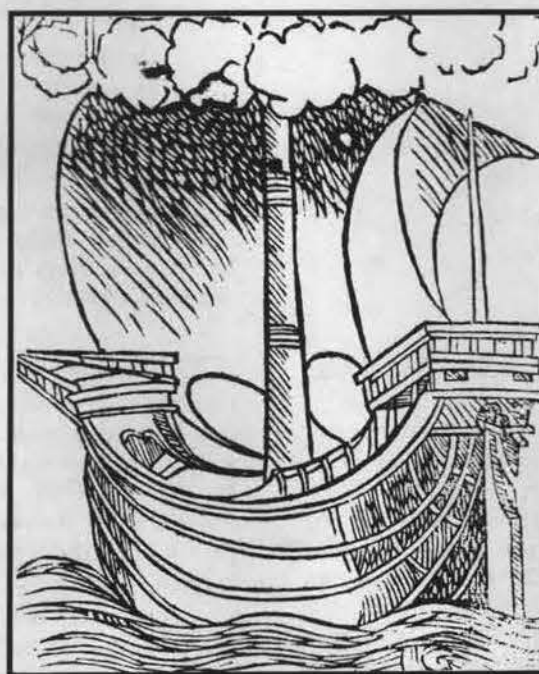
Opponents place a high value on the free flowing and undisturbed character of the River as it is. Support for the existing free condition of the River is not an absolute hands-off policy. The duty to responsibly nurture the river and its surrounding life can also provide flood prevention by a combination of techniques. Stewardship techniques based upon principles intrinsic to the Cacapon River are favored over old, moldy work plans and massive federal spending.

Lance Tabor, Executive Director of the State Soil Conservation Committee, contacted by telephone on May 17, 1990, discussed the project. He described the Kimsey Run site in the context of water management programs.

"The role of Soil Conservation watershed projects has traditionally been to promote proper water resource management. Secondary benefits are enhanced water quality, erosion control and flood control. The Kimsey Run Dam project will benefit West Virginia and the Lost River watershed. The \$10-12 million in federal funds is specifically earmarked for flood control projects and cannot be spent on associated measures not eligible in PL-534 guidelines.

The opposition to the project by residents is unfortunate and leads me to believe that communication has somehow broken down. We share many of the same concerns and goals as the Cacapon River Committee and do not want a wedge to be driven between residents and local sponsors including the Potomac Valley Soil Conservation District.

(continued on page 5)



**Help complete the ark. Join with the Lost River Committee, Cacapon River Committee, Canoe Cruisers Association, American Canoe Association, American Whitewater Association, American Rivers, and Friends of the Earth. Write to Governor Caperton and officials and ask that they support efforts to stop the dam.**

(continued from page 4)

Rather than building one large dam, several small structures were designed to minimize negative environmental impacts. The SCD has expertise in development and management of small watershed projects. Over 70 dams are now in operation on the Potomac River tributaries within the Potomac SCD.

The Kimsey Dam site near the headwaters of the Lost River will not interfere with the free-flowing nature of the river and in fact, will tend to augment low flows downstream. The benefits to the river in erosion control, through controlled velocity releases and in sedimentation control will improve the river as a resource and serve as a water impoundment. Development of wetlands and a fishery will provide environmental and recreational benefits. Support for this project does not signify an alteration of our support or admiration for the small, independent farmer who has traditionally been the best steward of the land, in fact, this dam will reduce flood damages to agricultural land in the flood plain.

We continue our efforts to address issues that can be resolved for the benefit of all residents. By supporting the Kimsey Run Dam project we can significantly lessen the sedimentation problems of the River without impacting the ecosystem in a negative way."

The competence and expertise of the Soil Conservation Service has been demonstrated in all fourteen Soil Conservation Districts. Protection of property and life is of great value and many projects deserve to be favorably assessed. However, each site is unique.

**What Was Then**

Early appreciation of the fertile, narrow valleys and streams first attracted pioneers to settle in what is now the Eastern Panhandle. George Washington surveyed in the area for Lord Fairfax. His knowledge of the area's topography was used in the French and Indian War. The Allegheny frontier, defined by parallel ridges is now identified as the shale barrens, part of a unique ecotone surrounding the Cacapon River.

The Potomac River was essential to industrialization and transportation until the Northwest Turnpike was completed in 1838. It allowed the Tidewater people and other immigrants to travel west. The area was populated by its first European families by 1783 when the Treaty of Paris ended the Revolutionary War and guaranteed that rivers would be open and would remain forever free. During the Civil War, both Confederate troops and Union troops fought for the area. Parts of Hampshire County chnged hands over fifty times, a record for that conflict.

**West Virginia Place Names** gives the origin of the word Cacapon. "Lewis, 1906, p. 253 states that the n. is Shawnee, and that the present form is a contraction of cape-cape-pe-hon "Medicine Water River." Gardiner, **Chronicles**, p. 4, echoes this translation with the slightly different, "the medicine water." and "Maxwell-Swisher, **Hampshire**, p. 366, give the simple form, Capon, and state that is is of Indian origin and means "to appear," "to rise to view," "to be found again." They seem to see a connection between this translation and the fact that the Lost River, when it emerges after its underground disappearance, is called the Capon. Maxwell-Swisher, **Hampshire**, p. 366, declare that it is pronounced

("keipn)." Even today, two pronunciations are used. The local residents favor 'keipn.

Further evidence of the special significance of the area and the Cacapon in particular may be found in a poem written by James W. Horn at the turn of century.

*Capon River, sparkling water,  
Running, never asking rest;  
Old Potomac's southern daughter  
Rushing to your mother's breast.*

*Bathing banks of bramble bushes,  
Shoving sand and shells ashore,  
Outward each broad breaker pushes,  
Reaching for a wider floor . . .*

*Drinking water from the mountains,  
Drinking autumn's chilling rain,  
Quaffing down the brooks and fountains,  
Breaking winter's icy chain.*

*Stealing summer's sunny showers,  
Draining drops that try to stay  
On the bright and blooming bowers  
That above your surface play . . .*

*Sometimes measured murmurs making,  
Sometimes music soft and low;  
Sometimes into torrents breaking  
Louder music, swifter flow.*

*Peaceful, cheerful, ever singing,  
Not dispersed although small;  
No city walls your echo ringing,  
Sounding no Niagra Fall.*

*Treasured not in song nor story,  
Knowing naught of history's page,  
Covered not with fame nor glory,  
Acting in the current age.*

*Yet to me, O, Capon River,  
There's no other river flows,  
That, of half the joy is given,  
Which your daily song bestows.*

*Sing more sweetly, sing more loudly,  
Through the years that are to be;  
Flow more grandly, flow more proudly,  
With the seasons fast and free.*

Today's settlers often wonder where their allegiance lies. Many residents commute to Virginia for employment and shopping. Problems of shrinking population and school closing, common in other parts of West Virginia, are also a problem here. Pressures from the overdeveloped and expanding Washington corridor is in evidence. Residents support a controlled, rational expansion that will at least equal community values. Understanding potential effects of projects like the 5-dam proposal is just a part of the job of a responsible citizen.

**Cacapon River Committee**

Contemporary respect for the river is expressed best by the Cacapon River Committee. Following the 1985 flood, a group of landowners and residents formed the non-profit corporation to "preserve and promote the human values flowing from the Cacapon River and Valley, to protect the purity and free passage of the water and the integrity and beauty of the valley, and to maintain a stewardship of the public interest in the river and the valley."

Their analysis of the dam proposal have been published in their newsletter, "Cacapon," and in letters to Governor Caperton among others. Executive Committee member and ecologist, Dr. George Constanz (see interview page 6), has been evaluating the river for a three-year baseline study. Now in year two, he has identified the principal threats to the river's purity and has compiled significant information about the valley. The globally rare Harparella, an endangered plant species, is found in the Cacapon River.

The vigilant stewardship of the Committee has had success in preventing destruction. During the Faerber DOE era, a permit to allow dredging was denied. A stunning precedent for any West Virginia river, the Cacapon has no industrial polluters! Committee members are intent on developing responsible answers to development and changes in the Valley. Their experiment in stewardship ensures the vitality of this special resource of nature for everyone.

A contribution of support is essential for the Cacapon River to remain pure. Write to officials.

**Contact List**

- Mr. Richard Campbell, President  
Potomac Valley Soil Conservation District  
P. O. Box 87  
Keyser, West Virginia 26726
- Hardy County Commission  
Courthouse  
Moorefield, West Virginia 26836

- Mr. Harold Kessell  
Area Conservationist  
U. S. Soil Conservation Service  
500 E. Main Street  
Romney, West Virginia 26757
- Mr. Rollin Swank  
State Conservationist  
U. S. Soil Conservation Service  
75 High Street, Room 301  
Morgantown, West Virginia 26505
- Governor and Mrs. Gaston Caperton  
State Capitol  
Charleston, West Virginia 25305
- Governor Gaston Caperton  
State Capitol  
Charleston, West Virginia 25305

- Supporters Against the Dam  
Lost River Committee  
Route 1, Box 65A1  
Mathias, West Virginia 26812
- Pine Cabin Run Ecological Laboratory  
Route 1, Box 469  
High View, West Virginia 26808

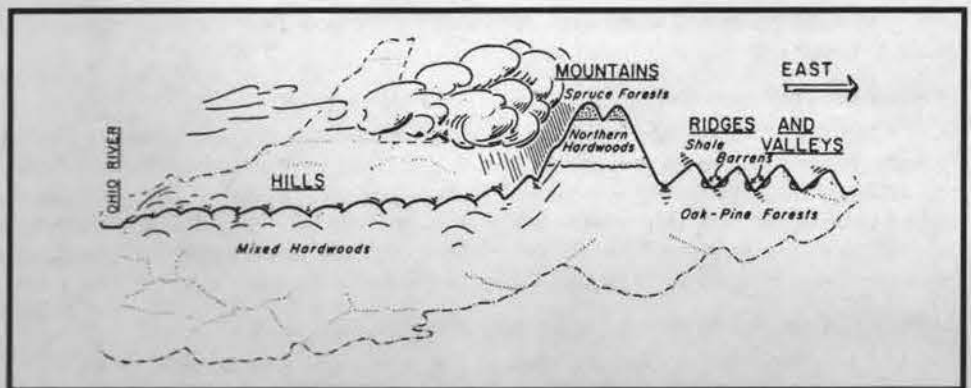


Chart showing exaggerated east-west profile across West Virginia, indicating region of heaviest rainfall and chief phytogeographic regions (from the book, *Vegetation of West Virginia*).

(continued from page 1)

shearing where cattle graze. Several canoers accompanied Dr. Constantz and Nancy Ailes on the River that afternoon. The Cacapon River Committee is also an active opponent to the proposed flood control dam on the river.

Others had the opportunity to learn about the Lost River Committee efforts to stop the proposed Kimsey Run Dam. Elizabeth Webster, Geraldine Garrett and Charles Foltz provided background information about the proposal. Several toured the sites proposed by the Soil Conservation District. Lost River Committee members shared their knowledge about the community and its residents. Tensions of shrinking population and job opportunities familiar to West Virginia reaches a peculiar pitch when it confronts Washington corridor expansion.

Following dinner, Cacapon River Committee member and Camp Rimrock Director J. Matheson and Elizabeth Webster, President, Lost River Committee, reviewed their stewardship role with the river and the dam circumstances with the audience. Words of encouragement and admiration for efforts so far and support for continuation came easily from the audience.

The LRC report set the stage for Mario Palumbo. Even without the fortuitous presence of the cameras and lights, Mr. Palumbo would have been in the spotlight. A work record that includes consulting the WVHC in lobbying the 1988-89 legislature was eclipsed by his upcoming role as Attorney General. The absolute goal of achieving a clean environment through sound fiscal policy sounds complete and reasonable. No one can say

what it will take to achieve. Mr. Palumbo suggests a starting point based upon legislation introduced as the "Environmental Advocate Act." Questions from the audience explored the role of AG. How can the role of counsel for state agencies be reconciled with the role of prosecutor of state agencies? Palumbo felt that given circumstances presenting a conflict, his capacity as advisor would extend to the Governor's office.

Unexpected guests included Senator Sondra M. Lucht, District 16. She graciously made herself available to attendees. She makes you feel comfortable telling troubles or asking about hers . . .

Impromptu music later that evening included sing along favorites as well as instrumental tunes. Perhaps the Board nominating committee should recruit a harp player.

The Sunday meeting of the WVHC Board followed an orderly agenda. A decision was made to have the Voice printed on recycled paper . . . Donna Borders is monitoring the comment period established by the Forest Service for the Cranberry Wilderness . . . Linda Elkinton called for a special alert concerning the Cranberry Valley property owned by Mon Power . . . A total lobbying budget of \$5000 produced tangible results . . . Environmental issues were platform issues in some primaries . . . Plans for a junior WVEC for secondary school is underway . . . Proposals for Corridor H routing is being coordinated by the Sierra Club . . . WVHC recommended Pat McGinlay for DOE director.

The Summer Board meeting is scheduled for July 22, 1990, in Hillsboro at the Current Inn.

## Dr. G. D. Constantz, aka River Steward

In addition to teaching Biology at the secondary and college levels, *The Evolutionary Play in Appalachia* is soon to be published by Mountain Press Publishing Company. Readers familiar with the "Cacapon" or presentations sponsored by the Lab have an inkling of what to expect. Inspired by G. E. Hutchinson's *The Ecological Theater and the Evolutionary Play*, Constantz's book promises to be an original investigation of the interdependencies at work in Appalachia. One section of the book presents descriptive scientific facts about aspects of several readily recognizable species (like a firefly) in a context of personal field observation. Always sensitive, sometimes shocking, individual species become known not only for themselves but for their role in relation to fellow 'players.'

Current professionally related service activities include: Board of Trustees, WV Chapter, The Nature Conservancy; Board of Trustees, Potomac Headwaters Resource Conservation & Development Council; and, Executive Director, Cacapon River Committee.

A special working relationship between the Lab and the Cacapon River Committee allows each independent entity to compliment the work of the other. For information about Lab sponsored field trips on the Cacapon and related activities, write Pine Cabin Run Ecological Laboratory, Route 1, Box 469, High View, West Virginia 26808.



**1) Where did you accomplish your undergraduate and graduate work?**

University of Missouri, BS, 1969 Biology  
Arizona State University, PhD, 1976 Ecology

**2) What were your duties at the Philadelphia Academy of Natural Sciences?**

1976-82 Assistant Curator and Head Fisheries Section, Division of Limnology and Ecology. Began personal program of research.

**3) How did you come to West Virginia? The Cacapon River?**

My wife, Nancy, and I were both working in academic research institutions in the Philadelphia area. Although great career-wise, we yearned for a different lifestyle, offering community, friends, gardening, low density. Nancy grew up in Romney, WV, so when we started shopping around, Hampshire County was a natural. We bought a small farm in a side hollow off the Cacapon River for two reasons. First, the general area was strategically located between our two work places. Second, we fell in love at first sight with the River.

**4) How did the idea to found a laboratory come about?**

I love biology field stations, their setting, work, and camaraderie. I've had for a long time the fantasy of living in the country, starting and running a research lab and continuing my research. And here I am!

**5) What services does the lab offer. What growth opportunities do you envision for the lab?**

The Lab is a non-profit, tax-exempt corporation through which we conduct a variety of teaching, consulting, and basic research. We focus on the ecology of the Appalachian Mountains.

We are also the only private facility in the eastern panhandle certified by the WV Department of Health to test water for potability. Growth areas include: water testing, environmental consulting, and grants for basic research. We teach and hopefully stimulate river stewards, as well, but I would not call that a growth industry, it's fun and valuable, though.

**6) What does the "Ecological" in Pine Cabin Run Ecological Laboratory mean?**

Adjective for ecology — the science of interrelationships among soils, water, air, plants and animals within a particular area.

**7) What uses will there be for the completed three-year baseline study of the Cacapon River?**

The baseline is a body of information that quantifies the River's current ecological health. State laws require the state to maintain the existing uses of West Virginia's surface waters. In turn, "existing uses" are a function of water quality. How else can public officials entrusted with preserving existing water quality enforce laws without knowing the Cacapon's "existing quality"?

Thus, the big picture is that the Cacapon's baseline will serve as a basis for comparison, against which future changes can be evaluated—for perpetuity.

**8) What do you foresee for the Cacapon River?**

Massive land development within the basin over the next decade.

**9) What is the future role of Pine Cabin Run Ecological Laboratory?**

After the River's baseline is documented, the Lab will begin a less intensive monitoring program. The Lab intends to monitor the Cacapon's water quality for perpetuity. By comparing the results of monitoring to the baseline, we have a way of evaluating the severity and causes of environmental changes.

**10) What methodology is applied in the baseline study in the measurement and categorization of data?**

Methods used to document the baseline include: pH meter—acidity, turbidity (water clarity), benthic invertebrates, submerged and emergent aquatic plants, littoral fishes, riparian trees and shrubs. Woody plants that live along the River have roots that hold the riverbank soil nutrient concentrations such as nitrates and phosphates.

**11) What is the role of ecology in understanding today's natural world?**

Ecology is one of several fundamental scientific routes to understanding the natural world. So is cosmology. In addition to researching pristine ecosystems, modern ecology includes urban, stressed, and convalescing ecosystems.

**12) How does ecology provide insight into the Cacapon River that differs from hydrology, biology, geology, geography?**

Ecology is a broad, multi-disciplinary science including findings from hydrology, geology, geography, landuse planning, economics, chemistry, agriculture, computer modeling; and, of course, biology. Thus, ecology can be envisioned as an umbrella science that integrates otherwise disparate ideas.

**13) How is the ecosystem of the River determined in space? in time?**

I define the Cacapon River basin ecosystem as the area that sheds water that eventually reaches the Cacapon River, i.e., from ridge to ridge. Time is defined by the researcher. The baseline study addresses current and future information needs.

**14) What are the major influences in a river's ecosystems? The Cacapon's system?**

A river's ecosystem encompasses the vegetation types of the basin, rocks and soils of the basin, man's activities in the basin, the local climate.

The Cacapon's major influences include autumn leaf fall as an energy source, groundwater inputs as buffer of acid precipitation, farming techniques with livestock and with fertilizers and their effects on soil, run-off from roads creating silt deposits and petroleum residues, soil disruption from road building and land development.

**15) Does a river have seasons? What time scale tells us the most about a river?**

Yes, a river like the Cacapon goes through definite seasons, along with its terrestrial basin. All time scales (e.g., minutes, hours, days, months, seasons, years, decades) are useful in understanding how a river works. It depends on the question being asked. How shiners use various habitats can be understood on an hourly basis, whereas time-to-recovery from a flood is best understood as the mean and variance over many decades.

**16) Are there natural forces that could permanently alter the River as it is today?**

Many natural forces could permanently alter the River: drought and flood are the most important, followed by immigration and extinction of species.

**17) What is the major myth now believed about the River? How does this effect man's use of the River as a resource?**

"It'll be like this forever." It causes a significant block of people to litter, bulldoze, and otherwise exploit the River and its basin.

**18) Is present exploitation of the Cacapon's resources in balance with the benefits received? How can this be evaluated?**

A complex problem. An evaluation on the form of exploitation and the benefits accrued. For example, the benefits of regulated fishing probably does justify the exploitation. In contrast, logging the riverbank clearly does not, neither do flood-control dams. There needs to be evaluation on a specific case-by-case basis. Cost-benefit economic analyses help in evaluation.

**19) What is the recreational history of the river?**

Primary and long-standing are sport fishing, canoeing and kayaking, and camping. More recent activities include recreational housing and birdwatching.

**20) Is there a single most significant discovery to be made about the Cacapon River?**

No single-most significant discovery, but many major questions need to be answered. For example, What is the relationship between shearing banks and the extent of downriver siltation?

How quickly does flow dilute and/or neutralize fecal contamination? What is the role of water willow patches in ecosystem functions? What is the response of the River to acid deposition? How can the basin be developed without degrading the Cacapon's water quality?

## Toxic Top 20

### TOP 20 POLLUTING INDUSTRIES IN THE TRI-STATE

1. **ASHLAND OIL (Catlettsburg)**—emitted 11,337,161 pounds\*\*  
Toxic emissions: Aluminum oxide, ammonia, benzene, biphenyl, 1,3-butadiene, chlorine, chromium, cobalt, cumene, cyclohexane, ethylbenzene, ethylene, lead, methyl ethyl ketone, naphthalene, nickel, propylene, styrene, 1,2,4-trimethylbenzene, toluene, xylene
2. **KENTUCKY ELECTRIC STEEL (Ashland)**—10,220,300 pounds.  
Manganese, lead, zinc, aluminum oxide
3. **INCO ALLOYS INTERNATIONAL (Huntington)**—8,497,763 pounds.  
Nickel, manganese, cobalt, copper compounds, chromium compounds, aluminum oxide, ammonia, hydrochloric acid, nitric acid, sulfuric acid, sodium hydroxide, polychlorinated biphenyls (PCB's), manganese compounds, barium compounds
4. **ARMCO STEEL AND COKE (Ashland)**—4,755,650 pounds.  
Ethylene, ethylene glycol, hydrogen cyanide, sodium hydroxide, aluminum oxide, chlorine, chromium compounds, hydrochloric acid, lead compounds, copper compounds, manganese compounds, nickel compounds, phosphoric acid, sulfuric acid, zinc compounds, 1,1,1-trichloroethane, ammonia, benzene, cyanide compounds, naphthalene, phenol, toluene, xylene
5. **ARISTECH CHEMICAL (Haverhill, OH)**—4,713,498 pounds.  
Aniline, toluene, chlorine, styrene, 4,4-isopropylidenediphenol, ethylbenzene, cumene, phenol, hydrochloric acid, sulfuric acid, ammonia, methanol, acetone, cumene, hydroperoxide
6. **ARISTECH CHEMICAL (Neal, WV)**—4,066,279 pounds.  
Ammonia, methanol, propylene, phosphoric acid, sodium hydroxide, sulfuric acid, xylene
7. **GOODYEAR TIRE AND RUBBER CO. (Apple Grove, WV)**—1,233,750 pounds.  
Acetaldehyde, terephthalic acid, ammonia, ethylene glycol, glycol ethers, methanol, hydrochloric acid, phosphoric acid, chlorine, sodium hydroxide, sulfuric acid
8. **BASF (Huntington)**—1,084,698 pounds.  
Sodium hydroxide, ammonia, sulfuric acid, hydrochloric acid, formaldehyde, aniline
9. **DOW CHEMICAL (Hanging Rock, OH)**—632,803 pounds.  
Dichloromethane, chloromethane, ethylbenzene, acrylonitrile, styrene, zinc
10. **NEW BOSTON COKE CORP. (New Boston, OH)**—614,718 pounds.  
Sodium hydroxide, anthracene, naphthalene, benzene, cyanide compounds, styrene, toluene, xylene, M-Cresol, pyridine, P-phenylenediamine, ammonia
11. **ALLIED-SIGNAL (Ironton)**—433,891 pounds.  
Sodium hydroxide, sulfuric acid, anthracene, benzene, cresol, dibenzofuran, naphthalene, phenol, quinoline, styrene, toluene, xylene, sodium hydroxide, sulfuric acid
12. **AKZO CHEMICALS (Gallipolis Ferry, WV)**—371,992 pounds.  
Ammonia, N-butyl alcohol, chlorine, cresol, diethanolamine, epichlorohydrin, ethylene glycol, ethylene dioxide, formaldehyde, hydrochloric acid, phenol, phosphoric acid, phosphorous, propylene oxide, sodium hydroxide, titanium tetrachloride
13. **IRONTON IRON (Ironton)**—243,167 pounds.  
Aluminum oxide, manganese
14. **DIDIER-TAYLOR REFRACTORIES (South Shore, KY)**—142,355 pounds.  
Aluminum oxide, chromium compounds
15. **ASHLAND CHEMICAL CO. (Neal, WV)**—132,100 pounds.  
Maleic anhydride, acrylic acid, xylene, ethylbenzene, sodium hydroxide
16. **PLIBRICO FIREBRICK (Oak Hill, OH)**—68,700 pounds.  
aluminum oxide
17. **INCO ALLOYS INTERNATIONAL (Burnaugh, KY)**—36,074 pounds.  
aluminum oxide, manganese, chromium, copper, 1,1,1-trichloroethane, nickel
18. **TRANSFAB (Huntington)**—12,775 pounds.  
Toluene
19. **GENERAL REFRACTORIES (Hitchins, KY)**—8,140 pounds.  
Aluminum oxide
20. **DUPONT CHEMICAL (Wurtland, KY)**—7,045 pounds.  
Sodium hydroxide, sulfuric acid

**TOTAL AMOUNT OF TOXIC EMISSIONS BY THE TOXIC TOP 20  
INTO TRI-STATE AIR, WATER, AND LAND:  
OVER 48 MILLION POUNDS!!!**

In the United States, annual production of toxic wastes is over **600 billion pounds**, or about **1 million pounds per minute**. West Virginia produces approximately 6,500-12,500 pounds of hazardous wastes per person each year. National average is about 2,000 pounds per person.

\*\* Data from a U. S. Environmental Protection Agency report released in 1987 for public information. Total pounds include all air, water, and land emissions.

## Challenge To Tri-State Industries

The West Virginia Environmental Council and Ohio Valley Environmental Coalition, with the support and assistance of local, state, and national environmental and citizen organizations, including Citizens Clearinghouse for Hazardous Waste, National Toxics Campaign, Greenpeace, and West Virginia Citizens Action Group, hereby issue the following five-point Pollution Prevention Plan for implementation by Tri-State industries as a progressive mechanism to clean up polluted air, water, and land in the West Virginia, Ohio and Kentucky region by the year 2000:

### 1. TOXIC RELEASE REDUCTION AND ELIMINATION

Facilities will commit to at least a 50% reduction from 1990 levels of hazardous waste, toxic water discharges, and toxic air emissions over the next five years and work toward a goal of zero discharge by the year 2000. Facilities must decontaminate completely all wastewater discharged into public waterways and sewers.

### 2. DEVELOPMENT AND USE OF ALTERNATE TECHNOLOGIES

When non-polluting technologies are available, use must be mandated. Facilities must commit to changing production processes, products, and/or raw materials in order to reduce, avoid, or eliminate use of toxic chemicals. Funding for research and development of alternate technologies to replace use of hazardous chemicals and processes must increase by at least 50%.

### 3. HAZARD ASSESSMENTS AND ACCIDENT PREVENTION

Each facility will prepare and make public, through public libraries and the media, annual "hazard assessments" and "accident prevention plans" to inform the public of the risk and consequences of worst case accidents and actions planned to prevent those accidents. Community representatives, including media and regulatory officials, must be notified of all "accidents" or "spills" within one hour of occurrence.

### 4. FIVE YEAR PLAN WITH BASELINE INFORMATION AND PROGRESS REPORTS

Facilities will prepare and make public a 5-year plan with specific actions and timetables to reduce hazardous wastes and toxic emissions. Annual waste reduction and emission reduction progress reports will be made public. Facilities will make public their history of environmental practices for the last five years, including summaries of hazardous wastes generated, by chemical and amount, and disposal method.

### 5. DEVELOPMENT OF TRI-STATE TASK FORCE ON TOXICS

A task force on toxics must be developed and include representatives of environmental groups, industry, State and Federal government. Mission will be to adhere to long-term reduction and potential elimination of hazardous wastes, toxic water discharges, and toxic air emissions in the Tri-State area by the year 2000.

For more information, contact:

West Virginia Environmental Council, Brian E. Hagenbuch - Reg. Coordinator  
(304) 522-7557 or (304) 346-5891

Ohio Valley Environmental Coalition, Diane Bady (614) 886-5796



## Scientists Are Unlocking Secrets Of Dioxin's Devastating Power

by Jon R. Luoma

Few pollutants have generated as much alarm over their potentially damaging health effects on humans as dioxins.

Research now appears to have established that they can affect animals and humans by mimicking steroid hormones, which are themselves extremely potent chemicals. The same may be true of a host of chemically related toxic agents, including polychlorinated biphenyls (PCB's) and some chlorinated pesticides like DDT.

Hormonal disruption appears to explain the puzzling array of symptoms, some of them fatal, found in laboratory animals exposed to TCDD, one of 75 forms of dioxin, which has been characterized as "the most toxic chemical known" based on its extreme toxicity to some laboratory animals.

Those symptoms range from suppression of the immune system to striking disruptions in cell growth and differentiation, particularly in fetal development. Although researchers now believe that TCDD alone does not cause cells to mutate and become cancerous, as do most chemical carcinogens, the hormonal disruption nevertheless appears to play a role, along with other substances, in promoting some kinds of tumors, notably liver tumors in some animal species.

The hormonal theory also appears to explain why rodents exposed to TCDD showed reductions in rates of other kinds of cancers, notably cancers of the breast and uterus, which are believed to be promoted by the female sex hormone estrogen. Hormonally, TCDD appears to function as an "anti-estrogen."

The finds have led at least one pharmacological research team to begin a search for chemicals that are structurally similar to dioxin but that are not as toxic so that they might serve as anti-estrogenic treatments for breast and uterine cancers.

### No Reason for Complacency

Dioxins are environmental contaminants formed in minute amounts as byproducts of various industrial and combustion processes, including garbage incineration, some kinds of paper manufacturing and automobiles. Virtually everyone carries traces of dioxin in their fatty tissues, at a level of about three parts per trillion. Environmentalists are concerned that the chemical is exceedingly persistent, breaking down slowly in the environment, if at all.

Researchers now generally agree that exposing cells to TCDD does not, as once feared, immediately cause them to become cancerous, although it does accelerate the development of cancers that are initiated in animals by other causes. Nor have dioxins been shown to cause severe health effects in humans comparable to those found in animals. But scientists say that is no reason for complacency.

Dr. Michael A. Gallo, professor of toxicology at the Robert Wood Johnson medical School of Rutgers University, said, "From a toxicological point of view, nothing we've learned has caused us to back away from the idea that these are very, very potent chemicals."

TCDD "is as potent as any hormone," Dr. Gallo said. "And it doesn't take much hormone, or dioxin, to have a tremendous effect."

Probably no pollutant chemical has generated as much fear and controversy as dioxin, especially among Vietnam veterans exposed to Agent Orange, a dioxin-contaminated jungle defoliant. In March the Department of Veterans Affairs agreed to compensate about 1,600 Vietnam veterans with non-Hodgkins lymphoma, a cancer of the lymph glands that studies had shown occurred at much higher rates among the veterans, although the studies did not link the disease to Agent Orange exposure.

### Paper Mill Discharges

Environmentalists have pressed Government regulators to eliminate dioxin discharges from pulp mills and have vigorously opposed the construction of some municipal garbage incinerators because of known discharges of traces of dioxin. Last month, Environmental Protection Agency and the Food and Drug Administration announced that they would take steps to curb discharges from paper mills and to eliminate traces of dioxin found in some paper food containers, including milk cartons.

Scientists have long known that hormones are extraordinarily powerful in minute doses. Because of their role as chemical messengers, single molecules of hormones react biochemically with genes in target cells to catalyze dramatic changes in the body, ranging from regulation of the sugar-insulin balance to intricate control of the reproductive cycle to control of the growth, development and maturation of the body and its organs.

At the molecular level, steroids like testosterone, a male sex hormone, and estrogen function by entering cells and bonding to receptor molecules present in the cell. The

receptor molecules then bond to a specific site on DNA within the cell nucleus. There, the hormone-receptor complex can turn on or off a series of biochemical switches that control bodily functions.

Dr. Donald Barnes, a senior research scientist at the Environmental Protection Agency, said the dioxin molecules were structurally similar to natural hormones. They fit into receptor molecules and then onto the DNA "docking sites" much like precisely machined keys into precisely machined keyholes. Once docked on the DNA, the dioxin-receptor complex apparently sets off the cascade of physiological changes researchers have seen in laboratory animals.

### A Severe Form of Acne

In animal studies, TCDD (2,3,7,8-tetrachlorodibenzo-p-dioxin) has demonstrated a breathtaking toxicity, killing hamsters at a concentration of only one 64-thousandth of the fatal dose of sodium cyanide. But researchers have long been puzzled by the wide ranges in responses to dioxin from species to species.

The hamsters die of a wasting syndrome that appears to destroy muscle and fat tissue. Yet it takes 40 times that dose to kill mice. Rats and mice develop liver tumors when exposed to dioxin, but guinea pigs do not. Humans, monkeys and rabbits develop a severe form of acne, chloracne, but most other species do not.

"With laboratory animals, it seemed as if dioxin caused just about any effect you can think of," said Steven Safe, a professor of toxicology at Texas A & M University. "You name it, it did it, and at extraordinarily low doses. But one of the mysteries has been that unlike most toxic chemicals, it didn't cause all the effects on all species, or even on all strains."

Dr. Safe said the mystery has been largely solved by confirmation that TCDD and other toxic agents interact with DNA, since genetic makeup varies among species, strains and individuals.

The dioxin-hormonal connection with cancers that are promoted or suppressed by sex hormones is obvious. Less obvious is the relationship of dioxin to such symptoms as high rates of cleft palate found in the off-spring in mice.

But Dr. Ellen Silbergeld, a visiting professor in toxicology at the University of Maryland Medical School, said one of dioxin's major effects appears to be disruption of a growth hormone responsible for cell growth and differentiation of skin and membrane tissue. She suggests that such disruptions lead to the misformed palate tissue in mice, chloracne on human skin, and improperly formed tissue enclosing various glands in other animals.

Intrigued by the apparent protective effect of TCDD against breast and uterine cancers in tests with lab animals, Dr. Safe and colleagues are trying to develop chemical analogues of the dioxin. "Dioxin itself is far too toxic to use as a drug," he said. "But an analogue could be a potential treatment for certain cancers."

### Examining Courtship Behavior

In addition to the 75 forms of dioxin, there are a host of similar substances, including dozens of forms of dibenzofurans, PCB's and chlorinated pesticides. Some appear to have no toxic effects. But researchers examining others have discovered different sorts of hormone-like effects, including estrogenic, rather than anti-estrogenic, responses.

In the 1970's, Michael Fry, a biologist at the University of California at Davis, examined male birds that had been exposed to high doses of DDT and PCB's. The birds had failed to exhibit male courtship behaviors.

Dr. Fry found that some of the males had partially developed female sex organs. In follow-up studies, he exposed embryonic male sea gulls to the pollutants. The birds were born with malformed testes and had begun to develop oviducts. "Essentially they were chemically castrated," he said. Other studies have shown that estrogen exposure creates a similar effect in birds.

The researchers caution that, beyond a propensity for chloracne, most effects of dioxins have not materialized among humans. Dr. Barnes of the E.P.A. said the existing 20 to 25 percent rate of human cancers would tend to obscure all but a very dramatic statistical jump in response to a specific toxicant.

Because of the potential risks to human subjects, almost all concerns about dioxin's effects on people have been inferred from animal studies. However, studies of humans exposed accidentally to TCDD have shown unusually high levels of enzymes that are typically induced by steroid hormones, a strong clue that a hormone-like response is triggered in humans exposed to dioxin as well.

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## A Woody Path to Biodegradable Plastics

For thousands of years, people have used vast amounts of wood for such low-tech applications as building their homes and fueling their fires. But wood scientists, who think of wood as "three-dimensional biopolymer composites," want to see this age-old, renewable and biodegradable resource become the fount of high-tech materials, including plastics.

The U. S. pulping industry produces 20 million tons of lignin—the complicated biopolymer that makes trees woody—as a by-product of paper making, says wood scientist Simo Sarkanen of the University of Minnesota in St. Paul. Virtually all of this lignin—the second most abundant biological polymer on Earth—gets burned as waste.

Sarkanen suggests that the huge, renewable stores of lignin could become feedstock for a wide range of biodegradable polymers. Lignin's complicated and only partially understood chemical structure—involving up to three types of molecular units that can

link in as many as 10 ways—so far has discouraged researchers from developing lignin into a routine chemical basis for polymers and other higher-tech materials.

Although the chemical complexity of lignin in trees may be hopelessly daunting, the lignin that emerges from the pulping process appears to follow some structural rules, Sarkanen reports. For example, he and his colleague Sunil Dutta find that lignin components of specific molecular sizes link and dissociate in particular orders. Without disclosing details, Sarkanen says that he and co-workers already are using these rules to develop methods for casting films made of the lignin biopolymer. Since such polymers are nothing more than transformed wood, natural wood-eating microorganisms would make discarded lignin-based plastics disappear, he says.

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