Cacapon

PUBLISHED BY PINE CABIN RUN ECOLOGICAL LABORATORY

Summer 1990
Vol. 2, No. 3

RIPARIA

by George Constantz

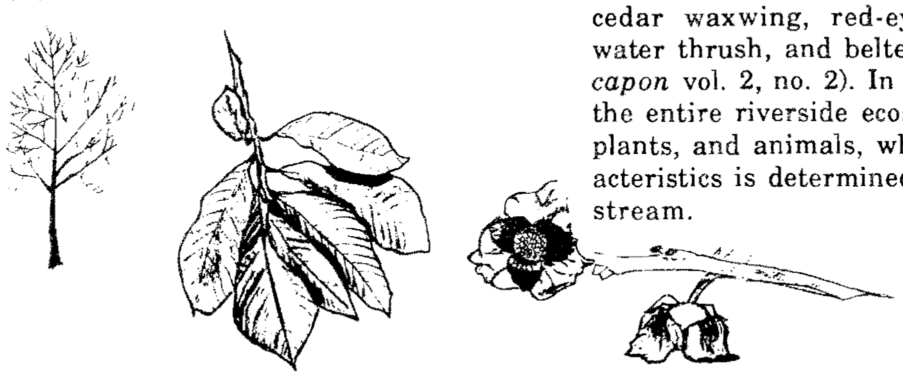
riparia (ri per´ ē ə) *n. pl.* new word; terrestrial ecosystems along water courses; *s.* riparium.

In my opinion, excessive silt is the most damaging current environmental insult to the Cacapon River. If the River were to get muddier, the numbers and kinds of insects and fishes that live and lay eggs on the bottom would dwindle (Berkman and Rabeni 1987). Smallmouth bass and rock bass, and the insects they eat, will decline, whereas carp and mud will increase. The River will also get a lot uglier. Failing (= slumping) riverbanks are major sources of this silt. The most effective measure we can take to reverse this degradation is to enhance the Cacapon's riparia. Therefore, we dedicate this issue to the Cacapon's riparia, their structure, function, abuse, and husbandry.

Ecological Importance of Riparia

What is a riparium? As the above definition states, "riparium" is my word for the terrestrial ecosystem found along a river. I prefer this term because "riparian ecosystem", "riparian corridor", and other widely used phrases are more cumbersome.

A typical Cacapon riparium might include alluvial soil, log jams, various ferns, virginia bluebell, spicebush, red osier dogwood, black willow, tulip poplar, silver maple, sycamore, paw paw, river birch, American elm, beaver, wood duck, wood turtle, northern water snake, cedar waxwing, red-eyed vireo, Louisiana water thrush, and belted kingfisher (See *Cacapon* vol. 2, no. 2). In essence, a riparium is the entire riverside ecosystem, including soil, plants, and animals, whose presence or characteristics is determined by the nearby mainstream.



Three views of paw paw, a common riparian plant along the lower half of the Cacapon.

If you have spent any time sitting on the Riverbank wondering how the whole thing works, you have probably arrived at an intuitive feeling for the importance of riparia. In this section, I briefly discuss seven scientific reasons why riparia are crucial to the Cacapon's health.

First, the roots of riparian plants hold soil particles. Streamflow velocity increases on the outside of a bend, increasing the drag on the streambank caused by passing water (Kunzig 1989). Thus, all streambanks erode, even in pristine forests (Wehnes 1989). Man-caused, accelerated streambank erosion, however, adds excessive silt, which degrades the River Turner and Speas 1988).

Second, riparian trees contribute to the Cacapon's fishery. Trees shade the water, keeping it cool; they topple into the river, providing cover; and they create overhangs, which are yet another kind of cover site (Hunt 1988).

Third, stream ecosystems receive much of their energy from riparia. Leaves and twigs from streamside plants fall into the River. This organic debris is the food for many types of aquatic insects which in turn nourish fish and birds. Bacteria and fungi break this plant material into even smaller particles (Kundt 1988). Because of the dependence of aquatic insects on terrestrial plants, the insect species in the Cacapon may actually reflect the characteristics of the riparian vegetation more than the River's mainstream features (Petersen *et al.* 1987).

Fourth, riparia serve as wildlife refuges. There are more individuals and a greater diversity of species along the Cacapon than elsewhere throughout our basin. One reason for this is that riparia are ecotones, a type of ecological community bordering two different communities. Ecotones support more species than either adjacent habitat because, in addition to attracting species typical of each habitat, ecotones host organisms that require both. Farmstead shelterbelts, another type of ecotone, also show a high species diversity (Yahner 1983).

Riparia export animals to upland areas. Doyle (1990) suggested that riparia act as sources of mammalian species, while uplands act as dispersal sinks. Sinks are marginal areas to which surplus individuals disperse, and where survival and reproduction are poorer than in high-quality habitats.

Fifth, riparia serve as corridors for dispersal. As the forest of the Cacapon River basin becomes more fragmented into isolated woodlots, riverside greenbelts will hold together these biological islands, allowing movement of living things among patches and consequent outbreeding, and promoting the recolonization of patches that have lost their original natural populations (Hunt 1988).

Sixth, riparia contribute to the health of the floodplain. An intact streamside plant community slows flood waters, allowing silt to precipitate and enrich the floodplain (Naiman *et al.* 1988). During extreme flood, streamside trees buffer bottomlands from scour and gravel deposits (Wehnes 1989).

And seventh, and to me most important, riparia play crucial roles in maintaining the Cacapon's high water quality. Riparia fulfill this crucial function by removing excess sediment, nutrients, and other pollutants from water running off the land (Naiman *et al.* 1988). In one study, riparian galleries reduced sediment entering a river by 94%.

How do riparia neutralize the pollution carried by run-off? Sediment particles precipitate as the water is slowed by the greenbelt (Hunt 1988). Nutrients, which would cause blooms of nuisance plants, are also removed. For example, phosphorus, carried by sediment in surface run-off (Peterson *et al.* 1987), is trapped by the forest. Nitrogen, on the other hand, which is primarily carried in the groundwater, is retained within the riparium's soil, where it is denitrified and contributes to the growth of riparian plants (Peterson *et al.* 1987, Kundt 1988).

Hill and Warwick (1987) provided a spe-

Cacapon *is published quarterly, with the arrival of each equinox and solstice, by* ***Pine Cabin Run Ecological Laboratory****, Route 1, Box 469, High View, WV 26808; (304) 856-3911.*

cific example of how a healthy riparium neutralizes pollution. They discovered that riparian substrates quickly remove ammonium from springwater. They suggested that microbial activity, rather than adsorption, was the more likely cause of ammonium uptake. This example underscores why feedlots should be separated from streams by a riparian buffer strip.

Factors that affect the efficiency of riparia to neutralize pollution in run-off include pollutant load, width of the buffer, slope, resistance to flow, infiltration capacity, vegetation species, and ability of the soil to hold moisture (Peterson *et al.* 1987, Phillips 1989a).

From a cost-benefit point of view, healthy riparia pay for themselves. In Sweden, the monetary value of nutrient retention by riparia equals the cost of building a water treatment plant, the cost in agricultural produce, or the going rate for land as farmland (Peterson *et al.* 1987).

In summary, riparia are ecologically important because they reduce riverbank erosion, enhance fish habitat, contribute nutrients and energy to the stream, serve as wildlife refuges, provide dispersal corridors, promote fertility of the floodplain, and safeguard the water quality of the River's mainstream. And yet these valuable ecosystems need help.

Riparia Under Siege

In the early 1900's, Appalachia's riparia were being raped, causing streams to be undercut and to fill with silt (Glenn 1911). Large-scale changes of native riparian vegetation were largely complete by the 1930's (Petersen *et al.* 1987). Of America's 123 million riparian acres within the 100-year floodplain, only about 23 million remain now in semi-natural condition (Hunt 1988).

Compared to other rivers in the mid-Atlantic region, the Cacapon's riparia are in fair shape, but they could still use more protection and rehabilitation. Local threats include all-terrain vehicles, logging, land development, and cattle herds.

Ideal Riparia

Riparia should be wide enough to filter and ameliorate run-off, as I described above. Recommended widths vary from 25 to 250 feet (Jones and Battaglia 1986, Kundt 1988, Wehnes 1989, Phillips 1989, Gore and Bryant undated). Considering this variation (mean = 104 ft., range = 25-250 feet), and the Cacapon's soil and slope characteristics, I recommend 100 feet as a general width for initial consideration, to be adjusted according to local circumstances. I am currently counseling two land developers along the Cacapon to meet this goal.

In addition to having a minimum width, a riparium should contain no buildings, minimal bank erosion, no failing banks, and a natural riparian plant community that includes trees, shrubs, and thick leaf litter (Jones and Battaglia 1986, Wehnes 1989).

Aerial view of a riparium that is too [illegible] for [illegible] protection...but [illegible]

Husbanding Riparia

By promoting ideal riparia, we have the power to ultimately determine the quality of our River. What can we do to promote the Cacapon's riparia?

First, stabilize failing and rapidly eroding streambanks. Depending on the nature of the problėm, the solution may be simple (= inexpensive) or complex (= expensive) (Jones and Battaglia 1986, Keown 1983). Available methods include vegetation plantings, bank shaping, mats of used tires, stone riprap, gabions (wire baskets filled with rocks), and combinations of these and other techniques. Consult experts at the U.S. Soil Conservation Service, WV University Extension Service, WV Div. Forestry, or WV Div. Wildlife Resources.

For erosion problems that are correctable with tree plantings, Lorenz *et al.* (1989) suggest three varieties appropriate for the Cacapon River area: 'streamco' purpleosier willow *(Salix purpurea)*, 'Bankers' dwarf willow *(Salix cottei)*, and 'ruby' redosier dogwood *(Cornus stolonifera)*.

Second, avoid disturbing the soil and plants within the riparium. Keep vehicles, soil fill, dumps, and buildings out of the floodplain. Roads and buildings should be separated from the River by a riparium.

And third, the most important step we can take toward improving riparia, indeed towards aiding the overall health of today's Cacapon River, is to exclude cattle herds from riverbanks. Cows trample plants, loosen bank soil, and wallow in the stream. Further, cattle add sewage pollution: on average, a single cow produces as much sewage as ten humans (Turner and Sepas 1988). Thus, the effect of a 100-head herd is equivalent to 4-5 Capon Bridges discharging sewage directly into the River.

I am not suggesting that we stay completely out of the Cacapon's riparia. For example, cattle may access the River in small areas stabilized by stone or bedrock. The corridor may be selectively cut (Wehnes 1989), but trees whose roots hold the bank together must be spared.

The Effects of Dams on Riparia

A flood-control dam, such as the one proposed by the U.S. Soil Conservation Service for Kimsey Run in the Lost River valley (See *Cacapon* vol. 1, no. 4.) is designed to dampen floods. It will also trap silt.

However, healthy riparia are products of water and silt supplied in pulses that approximate the rhythms of natural streams (Hunt 1988). Both the timing and amount of flow are crucial. As floods are controlled, the riparian plant community changes from a system influenced by seasonal flooding to a primarily terrestrial forest (Naiman *et al.* 1989). For example, riparian trees that depend on a springtime deposit of silt for seedling establishment will not regenerate (Hunt 1988).

If the Cacapon's flow were to become more even through the year, the riparian plant community would change from a pioneer forest determined by changing flood regimes, to more of an oak hardwood forest, typical of pure terrestrial habitats. Such a change in plant species would lessen a riparium's capacity to filter run-off from uplands to the River.

In order to preserve the Cacapon's riparian ecosystem, that unique natural association of soil, flora, and fauna that depends on periodic flooding, and that contributes so much to the health of the River, *the Cacapon must have guaranteed in-stream flows.* This is one of several reasons why Nancy and I are plaintiffs in the Lost River Committee's legal suit to stop the construction of the Kimsey Run dam.

Conclusion

Although the entire Cacapon River basin is the ultimate unit of ecological preservation, we can begin the task by focusing on riparia as the most crucial immediate priority. This is why I am supportive of the Cacapon/Lost Rivers Land Trust, an embryonic organization dedicated to preserving the Cacapon's riparia.

You've known all along that groves of trees, walls of wildflowers, and songs of birds are rich beside the free-flowing Cacapon. And now I hope this article has helped you understand some of the scientific reasons why riparia are vital to the health of the Cacapon River's flowing mainstream.

What will you do to insure that healthy riparia remain part of our Cacapon heritage?

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