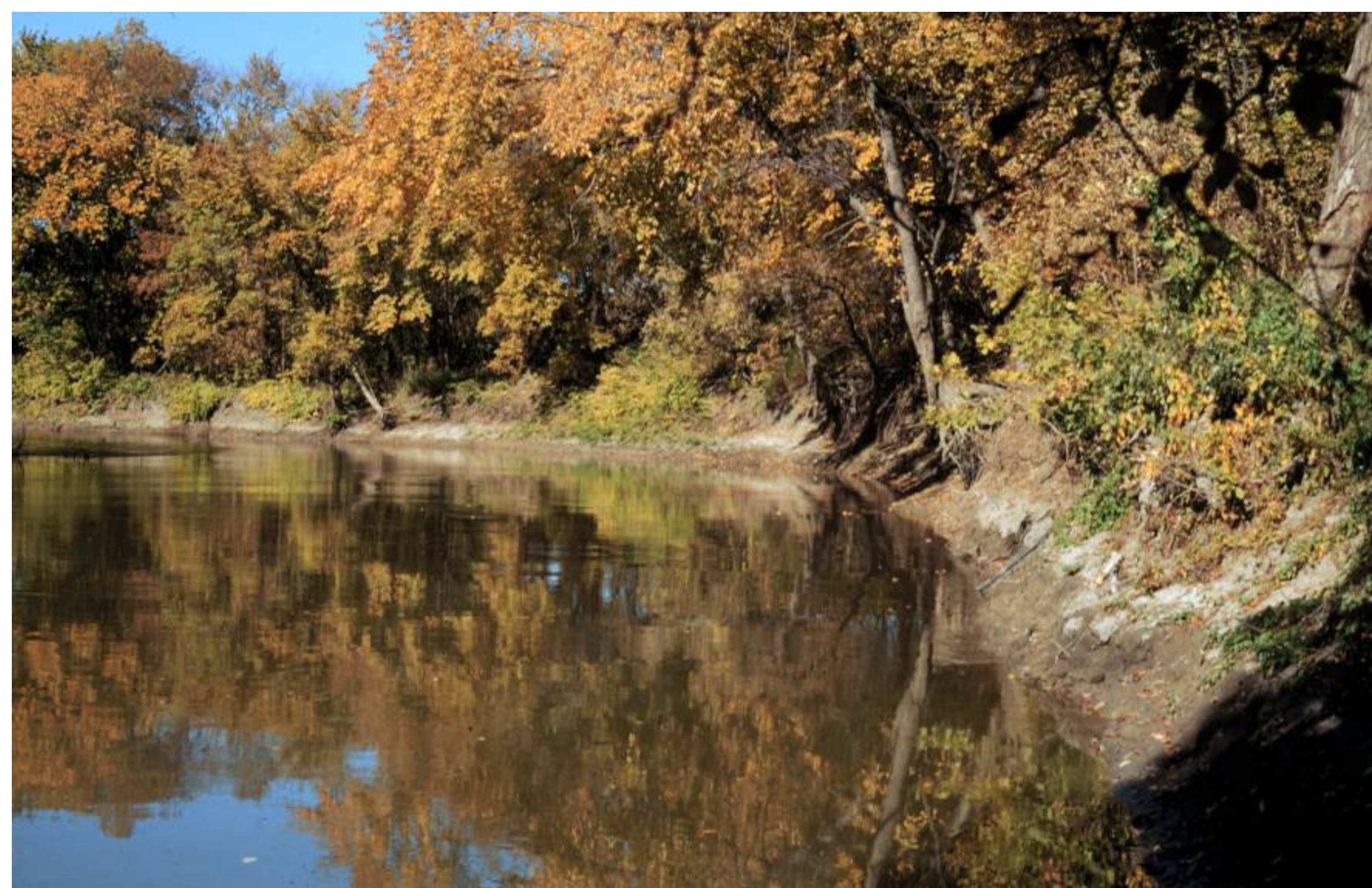


Riparian Zone

What is a Riparian Zone?

A riparian zone is the land adjacent to rivers, lakes, and wetlands where the vegetation and soils are strongly influenced by the presence of water. The size of the riparian zone can vary depending upon the landscape. It may be a small corridor of vegetation that hugs the river or it may be a large network of wetlands stretching far into the floodplain. Riparian zones are formed as the result of water, soil and vegetation interacting with one another. Although they make up only a small fraction of the land, they are among the most valuable of all landscape types.



Riparian zone of the Red River.

Alan Ashworth

The Benefits of Riparian Zones

Riparian zones provide communities with numerous benefits:

Improved soil and water quality -

Above ground, dense stems of native grasses, shrubs, and trees physically slow surface runoff and out-of-bank floodwater, which causes sediment to be dropped on the soil rather than in the waterway. Fertilizers and other pollutants that originate on the land are taken up by tree roots and are broken down by soil microorganisms. Nutrients are stored in leaves, limbs, and roots instead of reaching the river. Bacteria in the forest riparian floor

convert harmful nitrates to nitrogen gas, which is then harmlessly released into the air. Below ground, roots improve soil porosity that allows more surface runoff to soak into the soil and improve soil health. Logs that extend into the river also slow down the water and armor the banks preventing erosion. Studies have shown a 30 to 98 percent reductions of nutrients sediment, pesticides, and other pollutants in surface and groundwater after passing through a riparian zone.

Canopy and shade - Cooler stream temperatures result from the shading created by grasses and a canopy of trees. Aquatic species, such as fish, need moderate water temperatures. Elevated water temperatures decrease available dissolved oxygen, further degrading water quality. The tree canopy also improves air quality by filtering out windblown sediment and air born pollutants caused by erosion, cars, construction, and farm machinery.

Food - Leaves trapped on woody debris and rocks provide food and habitat for small bottom-dwelling creatures (i.e., crustaceans, amphibians, insects, and small fish), which are critical to the aquatic food chain.

Bank stabilization -

River banks in healthy riparian zones are stabilized by permanent woody roots and, by deep roots of native grasses and wildflowers. All river systems move across a floodplain, cutting outside corners of bends. This cutting causes the bank to erode, which may be a major source of sediment. Removing permanent vegetation from the banks and replacing it with lawns, agricultural practices, or overgrazing by livestock accelerates the bank cutting and slumping process.



Landowners often remove vegetation from the riverbank causing erosion and slumping.

River Keepers

Improved habitat - Riparian zones offer a diversity of habitat. Forest corridors provide crucial migratory habitat for birds, some of which are now threatened due to loss of habitat. Herons, wood ducks, pheasants, turkeys, turtles, foxes, and eagles utilize the riparian zone. The width and length of a riparian zone is important because it provides corridors of travel for different wildlife species. A diversity of size, shape, and species of plants will ensure the greatest variety of wildlife.

Hold water - Riparian zones increase the water-holding capacity of soil, moderating flooding and recharging groundwater supplies. Urban irrigation, cultivation, tile drainage, and overgrazing of riparian zones all contribute to increased flow of water to rivers. Channelization of streams and rivers removes the natural meanders resulting in decreased water storage capacity, and increased water flow, and more flooding.

Recreation opportunities - The riparian zone provides opportunities for recreationists to fish, camp, birdwatch, picnic, and enjoy other activities.

Why are Riparian Zones Valuable?

To understand how riparian zones work, it is important to understand how water moves. Surface water flows over the land and can carry sediment, nutrients, pesticides, and fecal coliform bacteria into water bodies. Pollutants can affect the water body in a number of ways. Excess nutrients can cause algal blooms, fecal coliform bacteria can be an indicator of waste-borne disease and pesticides can kill or sicken fish and aquatic invertebrates (water bugs). Vegetation slows and filters runoff water above ground, causing sediment to settle out and be deposited in the riparian zone. If runoff water does not spread over a riparian zone, it cuts channels and flows directly to the

river, rendering the buffer ineffective for reducing sediment and sediment-attached pollutants.

Local History

The riparian zone adjacent to the Red River and its tributaries was the site of many early settlements. Cities were originally located next to rivers and their riparian zones for many reasons:

- Water for drinking and washing
- Water for various manufacturing processes
- Food in the form of fish, birds or mammals
- Ice harvested in winter for food preservation in the summer
- Grazing and water for animals
- A place to dispose of sewage and garbage
- Transportation using boats, canoes or barges
- Clams and their shells used for food and manufacturing
- Wood for fuel in homes, businesses, and steam powered boats
- Wood for building construction, boats and barge construction, and for manufacturing trade goods
- Food and medicine harvested from riparian plants
- A place for recreation

Many of these uses were uncontrolled and resulted in damage to the river and the riparian zone. Today we understand the role of riparian zones and efforts are underway to protect or restore damaged areas.

The Living Lab's riparian zone has had a variety of uses. Over the years, it was used to harvest wood, garden, recreate, and graze sheep. Some of those uses combined with the loss of many trees by Dutch elm disease resulted in damage to the riparian zone and a degraded river ecosystem.



Ice was harvested from the Red River for refrigeration.

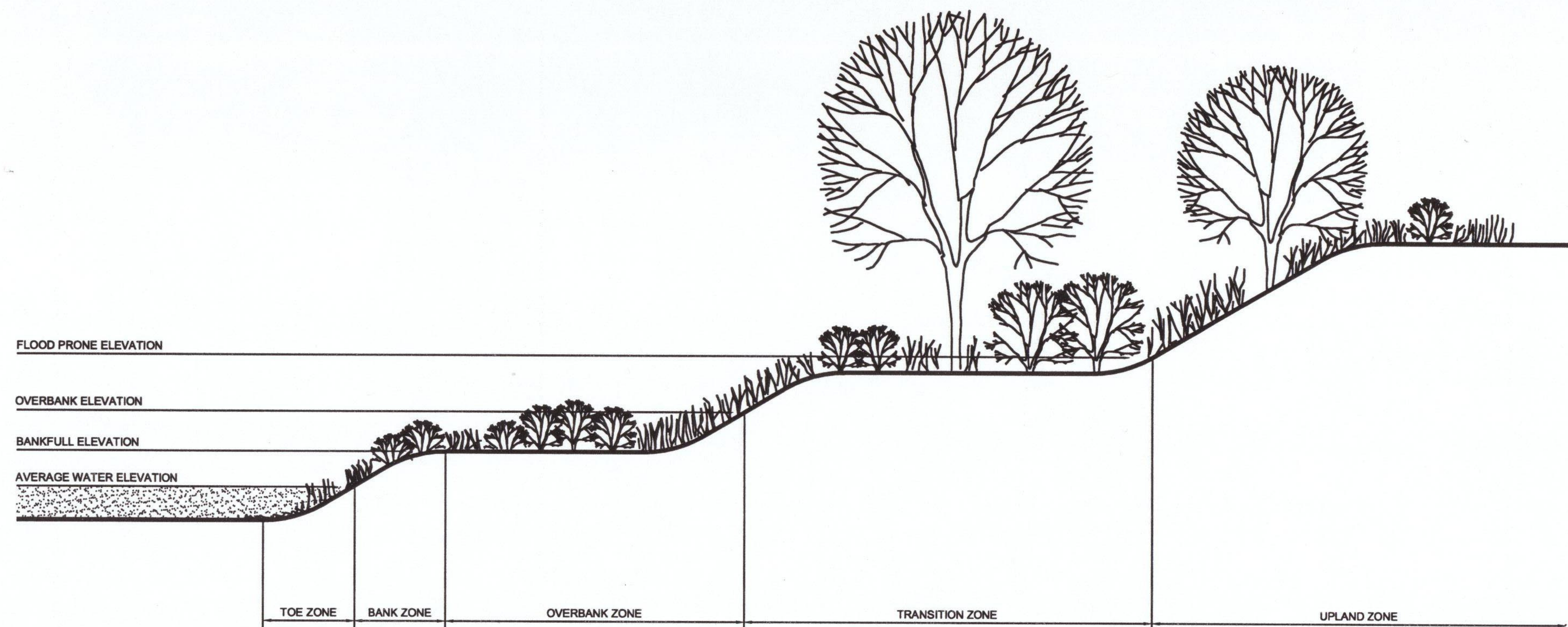
Clay County Historical Society



Steamboats, like the Pluck, used riparian zone trees to fuel their boilers. In the foreground is a barge loaded with wood products.

Clay County Historical Society

Riparian Zone



RIPARIAN PLANTING ZONES N.T.S.
(ref. 'STREAMBANK SOIL BIOENGINEERING FIELD GUIDE FOR LOW PRECIPITATION AREAS')

Riparian Planting Zones

Several zones are featured within the riparian zone:

Toe zone - the area between the river bed and the average water elevation.

Bank zone - the area from the average water elevation to the bankfull elevation. Shrubby willows are the most successful woody species for this zone.

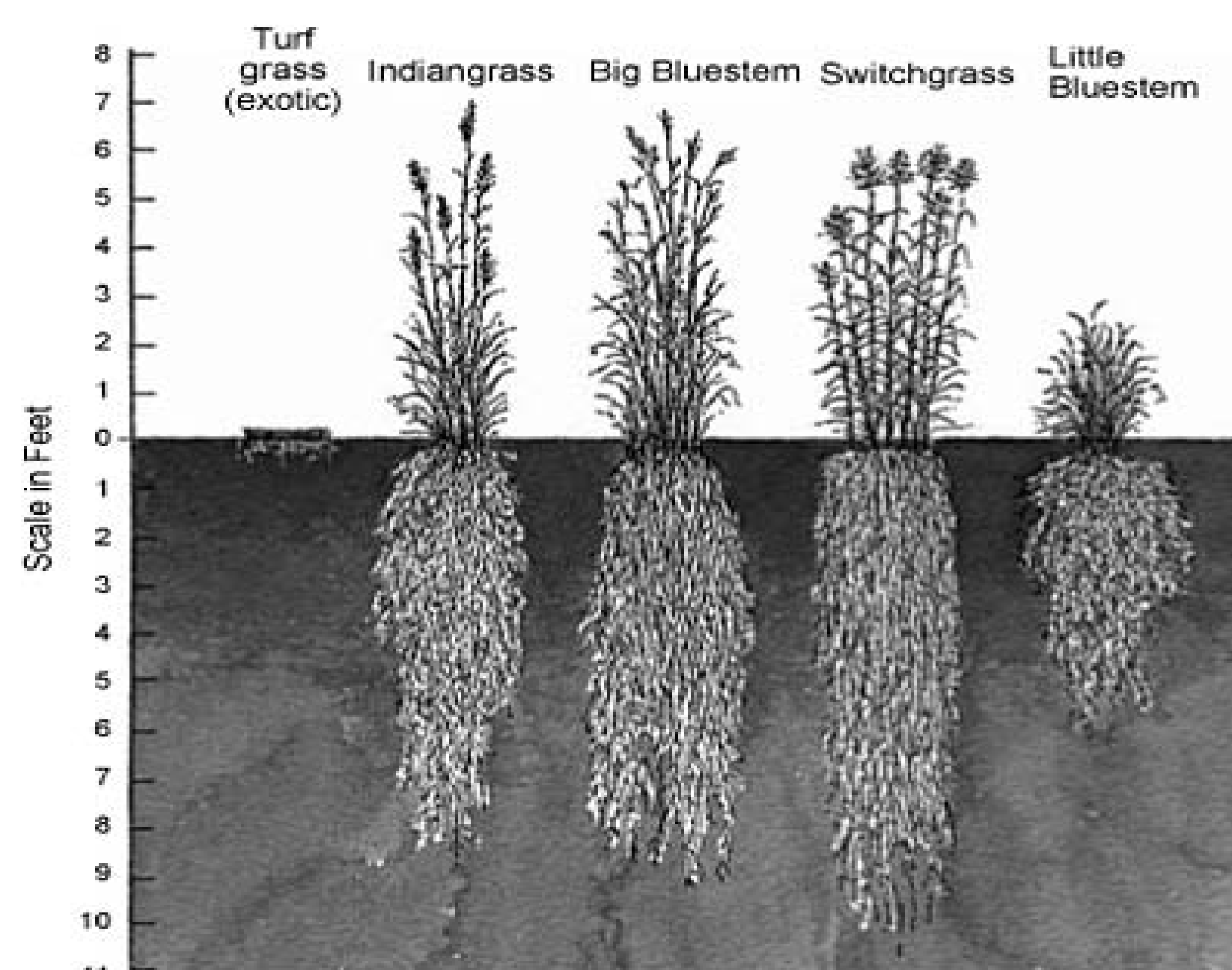
Overbank zone - the area between bankfull elevation and overbank elevation. Shrubby willows, dogwood and others can be found here. Alder, birch, and some larger species of willows will occur in the area nearest the overbank elevation.

Transitional zone - the area between the overbank elevation and the flood prone elevation. This area may be wide or narrow depending upon slope and water level fluctuations. There may be standing water in the spring and moist to dry soil in the summer and fall. Plant species do not have to be extremely flood tolerant.

Upland zone - the area found above the flood prone elevation. Grasses, sedges, rushes, ferns, wildflowers, shrubs, and trees may grow in both the transitional and upland zones.

Native Species

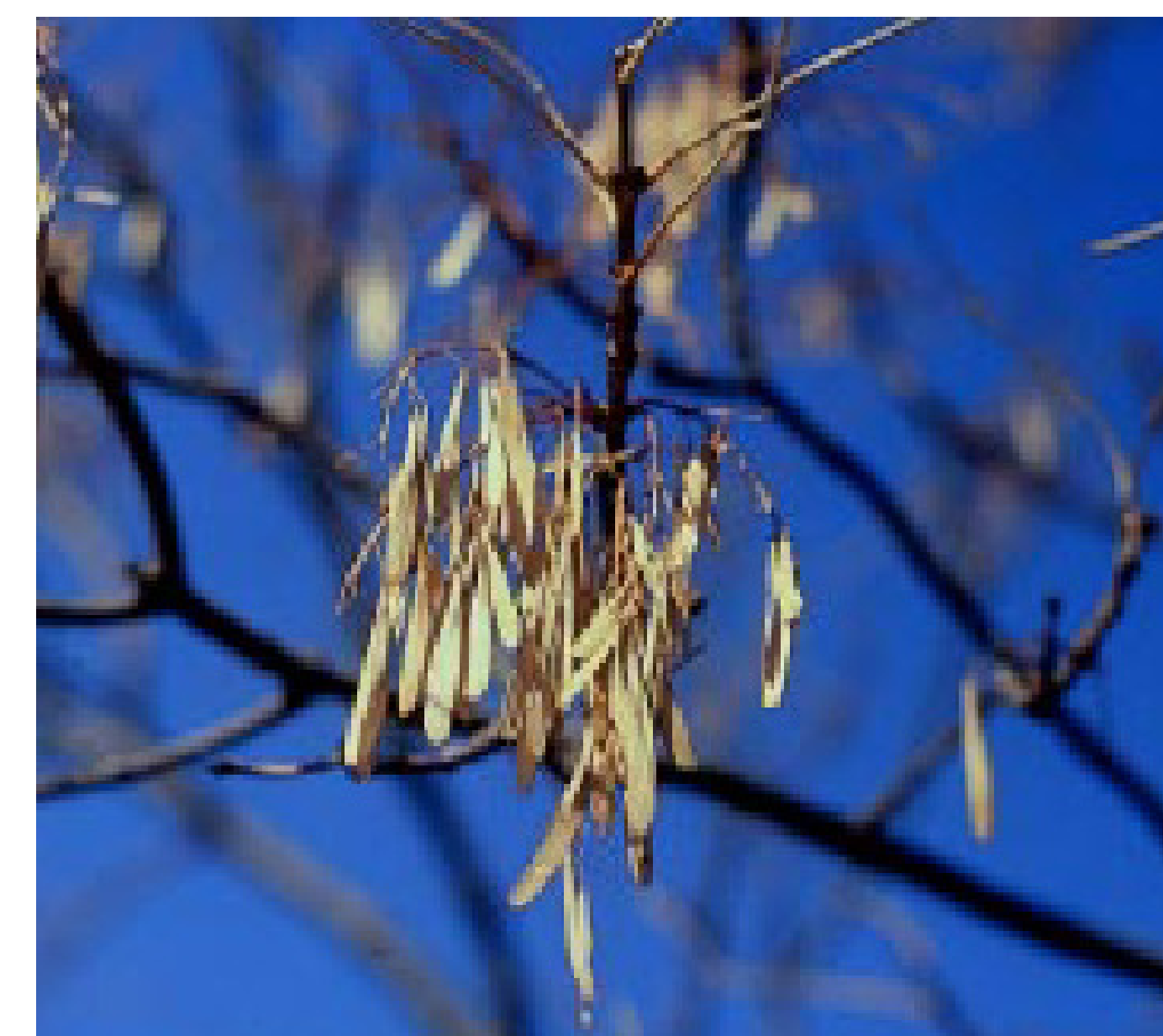
At the Living Lab and in most other riparian restoration projects, native plants are used. Since native species are already adapted to local climate and soil conditions, there is a major benefit in utilizing these plants. Native species generally thrive with very little attention, can survive extreme weather conditions, and provide food and shelter for wildlife. Native trees, shrubs, and grasses develop significantly deeper and greater root masses than crop plants and recently introduced grasses. Native plants are a better alternative than invasive and non-native species, which can cause ecological damage to our natural environments. Some invasive plant species, such as buckthorn and purple loosestrife, can invade our prairies, forests, and water bodies, spread quickly and crowd out native plants.



Trees, Shrubs, Grasses and Sedges

Plants, like people and animals, prefer to live in certain areas. Plants do not thrive if placed in an environment for which they are not adapted. Appropriate plants for riparian restoration include:

- **False Indigo** - 6-12 feet, violet flowers in May/June, yellow fall color
- **Silver Maple** - 75-100 feet, yellow fall color, fast growing
- **Black Ash** - 50-75 feet, golden-yellow fall color
- **Green Ash** - 50-75 feet, yellow fall color, fast-growing,
- **Cottonwood** - 90 feet, attractive bark, poor fall color, drops twigs, seeds in a mass of 'cotton'
- **Hackberry** - 60-100 feet, yellow fall color, corky bark, medium to fast growing, long-lived tree
- **Quaking Aspen** - 60-80 feet, yellow fall color, attractive trunk,
- **River Birch** - 50-70 feet, golden-yellow fall color, bronze exfoliating bark
- **Redosier Dogwood** - 6-12 feet, white flowers in May/June, red twigs in winter, purple fall color
- **Sandbar Willow** - 4.5-9 feet, narrow deep green leaves, spreads by rhizomes, easily transplanted
- **Slew Sedge** - 3-4 feet, hairy stems, coarse textured, spreads by rhizomes



Flowers from the Green Ash tree are greenish-yellow, 1-2 inches long, and produced in large dense clusters.

North Dakota Forest Service



Redosier Dogwood is formed with many stems of dark red bark. The flower is about 2 inches in diameter.

North Dakota Forest Service

Riparian Zone

When Do Riparian Zones Need to be Restored?

Unfortunately, too few people understand the importance of riparian zones. Many people destroy riparian zones unnecessarily through lack of knowledge. Real estate developers clear plants for better views; road builders bury buffers beneath highways; engineers construct culverts and retaining walls over buffers; farmers cultivate down to the riverbank; and homeowners clear trees right to the water line. Erosion on riverbanks is accelerated when native vegetation is removed. Non-native

species usually have shallow-rooted species that cannot protect soil as well as deeper-rooted native plants. Destroying riparian zones causes erosion, siltation of the river, downstream flooding, increase pollution, damage to fisheries and recreation, species and diversity loss and reduction of scenic value. The prevention of river pollution and destruction is far more economical than restoration after the damage has been done.

How Can Riparian Zones be Restored?

Restoring all natural riparian zones may not be economically or socially acceptable. Methods of restoration include utilizing plant materials (bioengineering), using material such as rocks (hard engineering), or a combination of the two. Determining what method to utilize is based upon frequency of flooding, availability of plant materials or rocks, access to qualified contractors, staff or volunteers, available financial resources, etc.

There are many types of streambank soil bioengineering treatments that are used to create a living barrier of protection. Most bioengineering treatments involve material that is collected from plants that will easily root from a cutting. Most species should be harvested when the plants are dormant. It is best to use plants from similar areas as the river.

In addition to stabilizing the riverbank, bioengineering offers other benefits that hard engineering does not. Trees, shrubs, and grasses create wildlife habitat for birds, fish, insects, amphibians, and mammals. Bioengineering is useful for areas that are difficult to access with heavy equipment. Living plants are self-repairing. The living shoreline continues to grow and become stronger with age. Trees, shrubs, and grasses are natural and have an aesthetic quality.

Hard engineering can be completed with a high level of confidence and is implemented with standard construction machinery. However, it is usually expensive, has lower aesthetic quality, and can fail dramatically.

At the Living Lab, bioengineering using native materials will be the primary restoration technique utilized.

How Wide is a Riparian Zone?

The width of riparian zones is important. Depending on the characteristics of a river and its surrounding areas, the size of a riparian zone can and will vary significantly. Though even a small riparian zone is better than none. The larger the protected area, the more likely it will ensure many of the ecological functions of the river.



Rocks used to stabilize an outside bend.



Removal of vegetation often results in riverbank erosion and slumping.

Wildlife in the Riparian Zone

Many land owners rate viewing wildlife from their homes as important to them. Yet, the landscape design and maintenance traditionally used for lawns destroy or degrade an area's value as wildlife habitat. Conversion of native riparian zones is especially detrimental. A blue grass lawn does not provide the basic habitat needs of food and shelter for most woodland and aquatic wildlife species. High maintenance lawns require pesticides which degrade the surrounding habitat and eliminate invertebrates that are needed by many creatures as food.

Wildlife species, such as Canadian geese and mallard ducks, may become nuisances when they utilize manicured riverfront lawns as Canadian geese and mallard ducks. These lawns are ideal food sources for ducks and geese.

Riparian zones are more than living plant material. For example, standing dead and dying trees provide food, nesting cavities, and perching sites. Woodpeckers eat bugs found in dead trees. Ospreys, owls and hawks prefer sturdy dead trees near water for nesting sites. Bald eagles are occasionally seen on these same dead trees. Many birds, such as the green heron, perch on dead limbs near rivers and lakes to forage and rest. Snags and fallen trees along a shoreline are often used by turtles for basking. Amphibians often take cover under woody objects.



Dead trees provide nesting cavities, food and perches for mammals and birds.



Snags slow down water flow and provide habitat for fish and aquatic bugs.

Missing elements of the riparian zone may also be replaced by a variety of methods. For example, wood duck nesting boxes are frequently used to replace the cavities used for nesting in dead and dying trees that have been lost in a riparian zone. Dead or dying trees are removed by home owners and local governments, especially in urban areas. In Fargo-

Moorhead, over 400 wood duck nesting boxes have been placed in the riparian zone, replacing those lost cavities.

In other cases, used power line poles maybe installed to replace large dead trees that are used by ospreys and eagles.