‘The Living Lab’ along the Red River of the North

A demonstration of riparian restorations

Master Plan

Prepared June 4, 2004

River Keepers

325 7th Street South
Fargo, North Dakota 58103-1846
Phone 701-235-2895
www.riverkeepers.org
rkeepers@i29.net

plan prepared by:

Hanson Design Associates
2415 3rd Street North
Fargo, ND 58102
Ph/fax 701-298-8392
hdafargo@aol.com

Index

River Keepers

“Promoting a renewed vision for the Red River of the North.”

River Keepers is a non-profit organization established in 1990 to protect and preserve the integrity and natural environment of the Red River of the North in the Fargo, ND - Moorhead, MN area. In addition, River Keepers is interested in river recreation, safety, and sustainable development of the Red River.

River Keepers promotes a renewed vision for the Red River of the North through workshops, youth service-learning projects and advocacy. The primary goal of River Keepers is to demonstrate to the public that the Red River is an underutilized resource. River Keepers works "hand-in hand" with civic, corporate and political leaders, local watershed groups and the public at-large.

In the 1940's Fargo-Moorhead residents began turning their backs on the Red to the point where in 1989 a volunteer team from the American Institute of Architects was asked to study the river. They described the river as "underutilized, grossly under-appreciated and forgotten." The team, recruited by local architects, spent four days in the area studying the river and meeting with local officials, representative of agencies and interest groups.

View along the Red River located along the proposed Living Lab site.

Their final report pointed to "evidence of a renewed awareness of the river's value" and envisioned a future that would "capitalize on the positive potential of the river." To achieve this they recommended the creation of an organization that could work toward river revitalization. With the support of civic, corporate, and political leaders, as well as numerous citizens at-large, the River Keepers organization was launched in 1990 to speak for the river.

History of the Site

The site called the Jensen property is located at 5508 South University Drive, Fargo. The site was purchased by the City of Fargo as a part of the city buyout of properties that flooded in 1997 along the Red River. Although a large portion of the site was inundated in the flood, the house was not flooded. The deed does not have deed restrictions preventing further building on the site. The Ornberg property which is roughly the southern quarter of the site was purchased by Cass County with Federal Emergency Management Association (FEMA) funds and is deed restricted to prevent building structures on the site.

River Keepers currently leases the site from the City of Fargo. The current lease agreement that River Keepers has is for use in 'as is' condition, although building is not prohibited by deed restriction, the city would be very cautious in approving building on the site. Any building would need to be compatible with the green space usage and designed to support flood control needs of the area.

Prior to the City of Fargo's purchase of the property, Art Jensen owned and occupied the property. Although Art was a mail route carrier, the property was maintained as a hobby farm. Sheep were utilized to keep the grass short across the site. The sheep were stabled in a small building, which we refer to as the shed. Feed was kept on the upper level and fed to the sheep that were kept in the lower level through openings in the floor.

There were numerous specimen trees and shrubs planted across the site. The site most notably had an extensive iris collection and the North Dakota's largest Hop tree. The iris collection is currently being moved to North Dakota State University. Art's interest in horticulture is also noted with the greenhouse attached to the south side of the house.

The site once considered rural has rapidly become surrounded by residential development.

The riparian areas near Fargo in the early days of settlement were important woodlots coveted for their supplies of firewood for heating during the bitterly cold winters. Wood was also used to fire the boilers of steamships. In the late 1800's, wood from the riparian forests along the Red River was also harvested and sold in Canada.

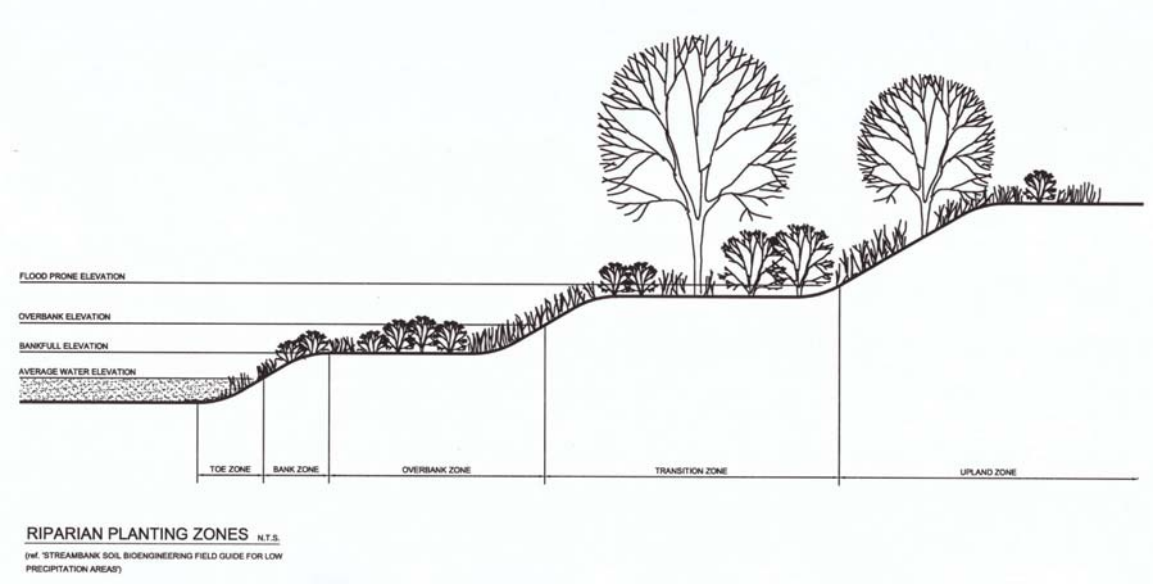
Riparian Buffers

Rationale, Strategies, and Resources for Restoring and Protecting Streamside Corridors

A riparian buffer is the land next to a river or stream. In its natural state, it has native plants growing on it: trees, shrubs, sedges, or tall, coarse grasses; the type of vegetation depends on the climate, soils, proximity to the river etc. As the name suggests, these plants "buffer" the river from anything that flows into it - polluted water, eroding soil or toxic chemicals. The roots of the plants hold the riverbank in place, stabilizing the land and absorbing the water and materials that flow across the land. Also known as "riparian areas," buffers support both land and water based animals, insects and plants, and are essential in the interrelated web of our natural world.

View of riparian woodland adjacent to the Red River located at the proposed Living Lab site.

The width of the buffers is important. Depending on the specific characteristics of a river and its surrounding areas, the size of buffers can and will vary significantly. Though even a small buffer (i.e. 25 feet) is better than none. The larger the protected area, the more likely it will substantially reduce polluted runoff, provide an effective corridor for wildlife, support fish habitat and ensure many of the ecological functions of the stream. On highly permeable soils or very steep slopes, buffers should exceed 100 horizontal feet.



Buffers can take many forms and serve their function in rural, suburban, and urban areas alike. A greenway along a river, which typically includes a recreational path and sometimes includes paving, can provide some of the functions of buffers by trapping materials that otherwise might flow directly into a stream. Urban greenways and buffers fill critical roles in this way by retaining materials from entering watercourses. In developed areas, even narrow bands of vegetation can make significant improvements in water quality, habitat, and the environmental health of a river. Urban buffers are especially effective when coupled with pollution and flooding control technologies, such as catch basin filters, separated storm water/sewer lines and velocity reduction structures. Further, urban greenways and buffers bring a welcome natural character to developed settings, improving the quality of life and scenic nature in an urban area. To be most effective, such buffers should include native vegetation and be as wide as possible.

Unfortunately, too few people understand the importance of riparian buffers. Many people sometimes destroy buffers unnecessarily through lack of knowledge. Real estate developers clear plants for better views; road builders may bury buffers beneath highways; engineers construct culverts, stream channels and retaining walls over buffers; farmers may have cultivated down to the river bank; and homeowners and timber harvesters have been known to clear trees right to the water line.

Destroying buffers causes erosion, siltation of riverbeds, downstream flooding, increase pollution, damage to fisheries and recreation, species and diversity loss and reduction of scenic value. Repairing such damage can be extremely costly - often at public expense. The most simple, efficient and low cost solution to many of these problems is to leave a strip of undisturbed natural area along our rivers and streams. It is far more economical to prevent pollution and destruction of a river than to clean it up after the damage has been done.

<u>Ecological Function and Services of Riparian Buffers</u>

- Reducing Water Pollution:

Non-point source pollution is responsible for most water pollution in the United States today. Oils, salt and sand from our roads; fertilizers used on lawns and farms; manure from livestock and other pollution can damage our rivers' health. The most efficient and cost-effective way to keep these pollutants out of our water is to "trap" them by maintaining a buffer of natural plants along our streams and rivers to absorb and filter pollutants before they enter the water. Buffers even appear to remove some pollutants from water flowing down a stream's main-stem.

- Reducing Flooding and Drought:

During floods, undeveloped land surrounding rivers acts like a sponge, absorbing rising and falling water. Native plants in undisturbed areas help slow flood velocity, store water for future use, and slowly release water over a long period of time. Loss of floodplains and stream buffers increase the chance of floods and can worsen flooding when it occurs. Intact buffers also store subsurface water and slowly release it to the stream channels, maintaining base-flow during dry spells.

- Controlling and Reducing Erosion

Erosion results in serious environmental and economic damage. Loss of topsoil damages farms, homes and businesses, chokes clean streams, destroys fish and animal habitat, and eventually is deposited hundreds of miles away. Much erosion can be controlled by keeping a buffer of natural plants along the banks of our streams and rivers to "trap" eroding silt, strengthen and stabilize stream banks, and help keep the water clean. Additionally, leaves, both living on trees and dead on the ground, protect streamsides from splash erosion (i.e. the scattering of topsoil by raindrops as they hit the ground).

- Fish Habitat:

Fish need clean water, minimal variation in water temperature, food and shelter. Buffers create and maintain fish habitat. Shade from streamside vegetation reduces water temperature variation. Plant detritus falling into the water provides hiding and breeding places. Leaves provide food for aquatic insects, the base of the food chain for fish and other animals.

Fallen trees provide habitat.

- Providing Nutrients:

Buffers supply up to 90 percent of the nutrients, in the form of shed leaves and fallen insects, for in-stream animals.

- Animal Habitat and Migration:

Riparian buffers are essential to feed, shelter, and provide travel paths to more than 95 percent of all terrestrial species in North America. Further, buffers are essential in the breeding and nesting cycles of many species. Loss of natural buffers limit animals' safe access to water, putting more and more species at risk.

Tracks left by animals along riverbank.

- Ecological Services:

The above natural functions can be restated anthropocentrically into three categories of ecological services (i.e. natural processes that sustain human life):

- Economic Services:
  - Reducing downstream flooding
  - Recharging aquifers
  - Supplying surface water in arid regions
  - Supporting the productivity of fishes and other harvestable species
  - Supporting sustainable yields of timber
  - Fueling the recreational and tourism industry

- Social Services
  - Storing heavy metals and toxins
  - Improving air quality
  - Serving as natural fences, visual screens and noise buffers
  - Recycling nutrients
  - Improving the quality of drinking water sources
  - Serving as sinks for excess carbon dioxide
  - Storing excess sediments
  - Fulfilling recreation and aesthetic needs
  - Serving as laboratories for teaching and research
  - Offering places for camping, nature study and hunting

- Biological Services
  - Providing special habitats for rare and upland species
  - Serving as corridors for species movements
  - Supporting predators of rodent and insect pests

The Living Lab

The goal of The Living Lab will be to demonstrate a variety of riparian restoration techniques, explore various restoration techniques, serve as an outdoor lab for students of all ages, exhibit wildlife habitat improvements and more.

Demonstrating Riparian Restoration Techniques:

Too often individuals, particularly those in urban settings, are unaware of the importance of the riparian buffer and it's importance to the Red River and their communities adjacent to the river. The Living Lab will be an opportunity for visitors to observe and learn about the importance of and installation of riparian buffers. There will be numerous test and demonstration plots that will have interpretive signage associated with them.

The visitor will be able to walk through the site on maintained paths to view the various riparian zones. The visitor will be able to come to the site and become more aware of the importance of the Red River and it's riparian buffer through a proposed interpretive building and observation areas. The visitor will be able to observe and monitor various restoration techniques that will be implemented in phases.

Explore Restoration Techniques:

The Living Lab will be an opportunity for academic research and professionals in the restoration field to test methods of implementation first through small scale plots then with large 'restoration strips'. Each of the plot areas will be isolated for ease of installation, maintenance and identification. Facilities will be on-site for storage of equipment and supplies. There is also the proposed re-use and expansion of the greenhouse for the establishment of seedlings for use on-site.

Serve as an Outdoor Lab:

The project will encourage science classes to utilize the site as an outdoor laboratory with the focus of better understanding the biology, ecology and geology of the Red River. Active participation within the site would be greatly encouraged.

Exhibit Wildlife Habitat Improvements:

With the restoration of diverse riparian plant communities, wildlife would be expected to greatly improve. Wildlife that would be expected benefit the most would be songbirds, insects and fish.

The Master Plan

The Living Lab master plan is intended to be a phased approach to the riparian restoration of the site into a 'Living Lab'. The master plan makes re-use of existing structures and proposes minimal disturbance of slopes that are to be restored.

The House

The house is currently used as the grounds-keepers residence and occasional place for meetings. The building is in fairly good condition. It was not flooded during the flood of 1997. It has a new furnace, and 20-year old aluminum siding. There are five levels within the house that will require close scrutiny and careful modifications to comply with ADA for public use. The house currently contains a kitchen, dining area, four bedrooms, two bathrooms, basement and attached greenhouse. With updates, the house has several opportunities for reuse;

View of existing house.

- Continued use as a grounds-keepers quarters
- Meeting area for related professions
- Plant propagation for riparian plantings associated with the green house area
- Use of kitchen as a food prep area for outdoor gatherings

The Garage

The garage is in reasonable condition for re-use. The garage is proposed to be converted into a workshop for constructing and maintaining site improvements such as signs, birdhouses, benches and other necessary site appurtenances. The master plan proposes expanding the east side of the garage into an outdoor, but covered work area for larger projects.

View of existing garage.

The Shed

The shed is in marginal shape, but has character that is worth saving. The shed is built over a cinder block foundation wall that has a walkout access to the east. The shed will require repairs to the existing foundation or be moved. River Keepers currently uses the shed for Wood Duck nesting box construction and for storage. Proposed re-use of the shed include a small, enclosed visitor interpretive area that has a photo history of the uses of the Red River. The interior of the shed is to be remodeled to provide a scenic overview of the site. Windows are to be installed extensively along the East, Northeast and Southeast sides of the shed.

View of existing shed.

Northwest Shelterbelt

The northwest shelterbelt consists of rows of tightly spaced green ash, hackberry and spruce. The intent of the shelterbelt is to maintain it in order to visually buffer the area surrounding the house from South University Drive. The shelterbelt is to be maintained to provide a clean appearance. Brush and dead trees/branches are to be either mechanically chipped in place or removed, the ash and hackberry rows are to be selectively thinned and pruned to provide better growing conditions for the trees. The spruce trees are to be phased out as they die or become unsightly due to disease or injury and replaced with native shrubs.

Vehicle Access and Parking

The driveway access is to be improved to comply with City of Fargo driveway standards for width and materials for commercial use. The driveway access is to tie to a cul-de-sac type turn-around access sized for school buses and emergency vehicle access. The cul-de-sac is to be centered on an existing hop tree. The hop tree is to be preserved. Busses are to park along the outside edges of the cul-de-sac. Along the house-side of the cul-de-sac, there are to be parking stalls for four (4) vehicles, one of which is to be handicap van accessible.

Existing cul de Sac with Hop tree

The conversion of part of the hard surface to a permeable paving surface will be explored.

Gazebo and Associated Lawn Area

The areas located north and west of the existing house are to be general outdoor lawn use areas. The areas are intended to be used for general gathering/staging for large groups and large group picnic areas. There is to be a gazebo for smaller outdoor

covered discussion areas or the stage for large group discussions. The area between the gazebo and the house should be considered the house access point and is to be paved. The house kitchen and restrooms are to be accessible for uses associated with outdoor activities. A backdrop of accent trees is to be planted inside the existing shelterbelt buffer trees to better define the space and provide opportunities to find shade. A chemical toilet may be utilized to provide convenient accessible access.

Bike Access

There is an existing bike trail running along the east side of South University Drive. Bike access to the site visitor center is to be encouraged by providing a bicycle loop from the existing trail to the visitor center and interpretive overlook. Access signage, bike racks and benches should be provided to encourage convenient bike access and rest for the bicyclist and pedestrian. Because of the potential for creating trail ruts and conflicting pedestrian and bicycle access on the same paths, bike use within the site is not encouraged. A bike parking area is to be provided with lockable facilities.

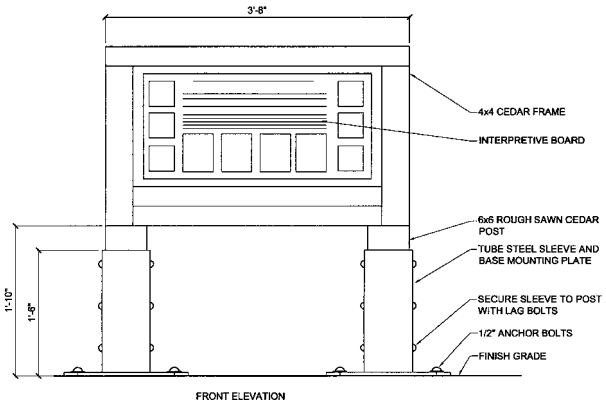
Bike path intersects current driveway

Interpretive Overlook

There are to be two interpretive overlooks. The overlooks are to be hardscape, either concrete or other decorative paving surfaces with interpretive plaques that overlook the site. The interpretive plaques are to be weather resistant signs mounted on durable, vandal resistant posts. The content for each of the interpretive plaques is to depict the following;

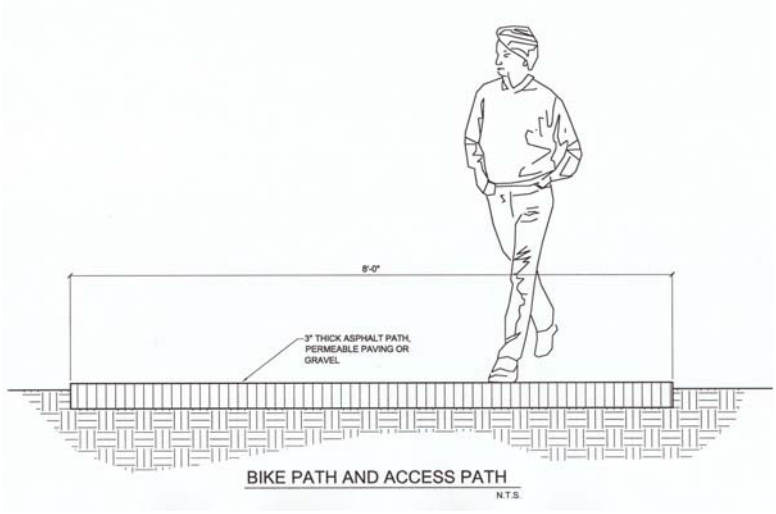
- Purpose of The Living Lab.
- Description of riparian ecosystems.
- Restoration techniques directly viewable from each interpretive location.
- Promotion of the use of native riparian plant materials.

Potential view from over-look area.

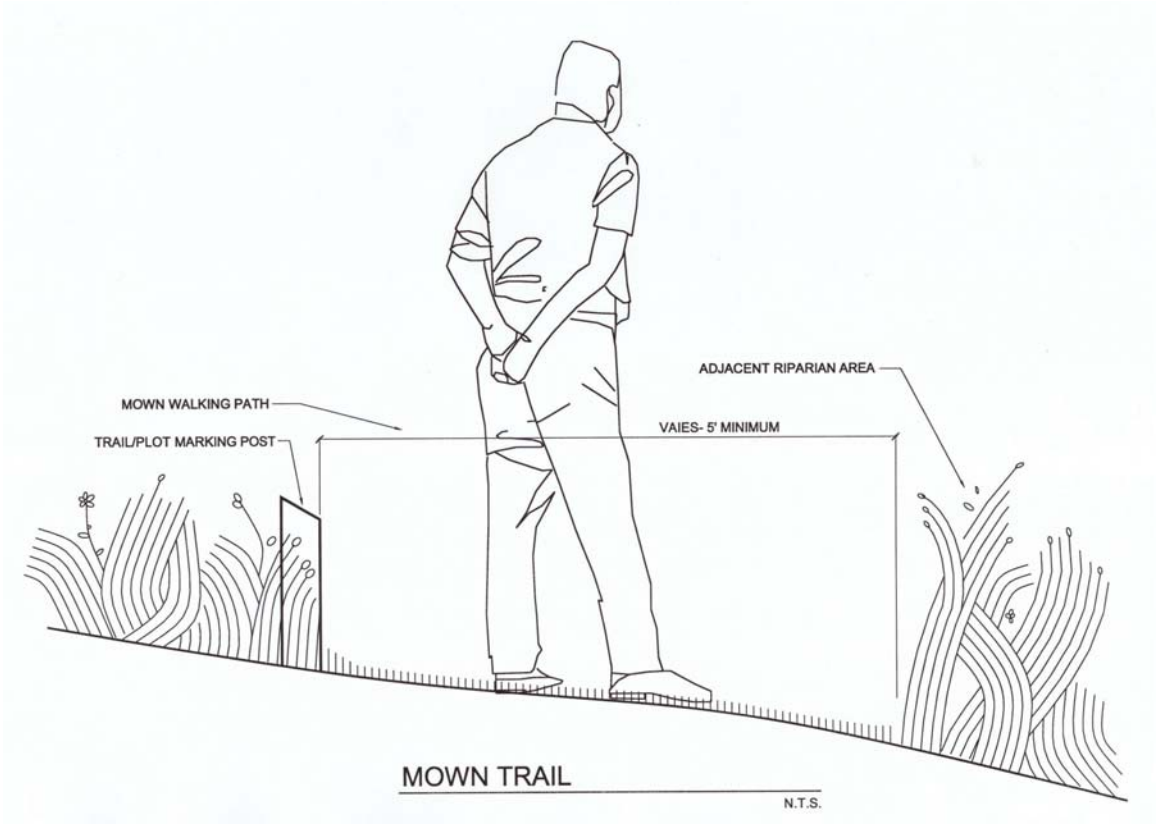


Access Paths

There are to be two types of access paths. Asphalt paths that connect the run from the house and parking areas to the visitor center and interpretive overlook areas. The ‘hard’ paths are intended for the visitor who is curious about the site and who wants to visit the site without actually accessing the riparian demonstration areas. The ‘hard’ path portion is to be eight feet in width and is to be composed of asphalt.

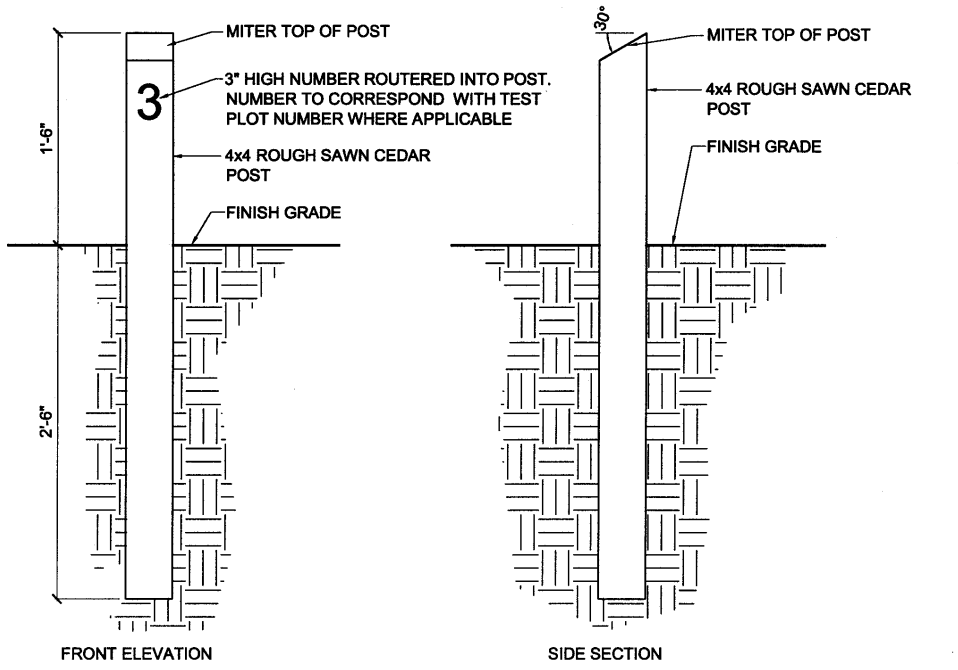


The other path is to be mown lawn and is to provide access to the demonstration riparian restoration areas. Some lawn path areas may need to be re-graded and/or smoothed to provide comfortable and safe access through the site. The lawn path areas are to be mown on a regular basis to maintain a 2” to 3” height. The lawn path areas will also serve to provide a physical separation between each of the riparian demonstration areas. This separation will provide easy visual separation for visitor identification, simplify maintenance of each area by either burning or chemical control and allow for simpler staging for riparian restoration.



Riparian Test Plots

The small test plots are for testing techniques prior to committing to large area implementation. The plots are to be roughly 40'x40' with a 5' minimum width lawn path that separates each of the plots. Each plot will test various concepts for removing unwanted vegetation, re-vegetation and maintenance techniques. Techniques for each plot are not specifically determined in this document. The techniques are intended to be experimental and proposed by regional specialists in native plantings. Test plots that are determined to be successful are then to be implemented in the large riparian restoration strips. Extensive records detailing the process and success will be kept.



TEST PLOT AND TRAIL EDGE MARKER

N.T.S.

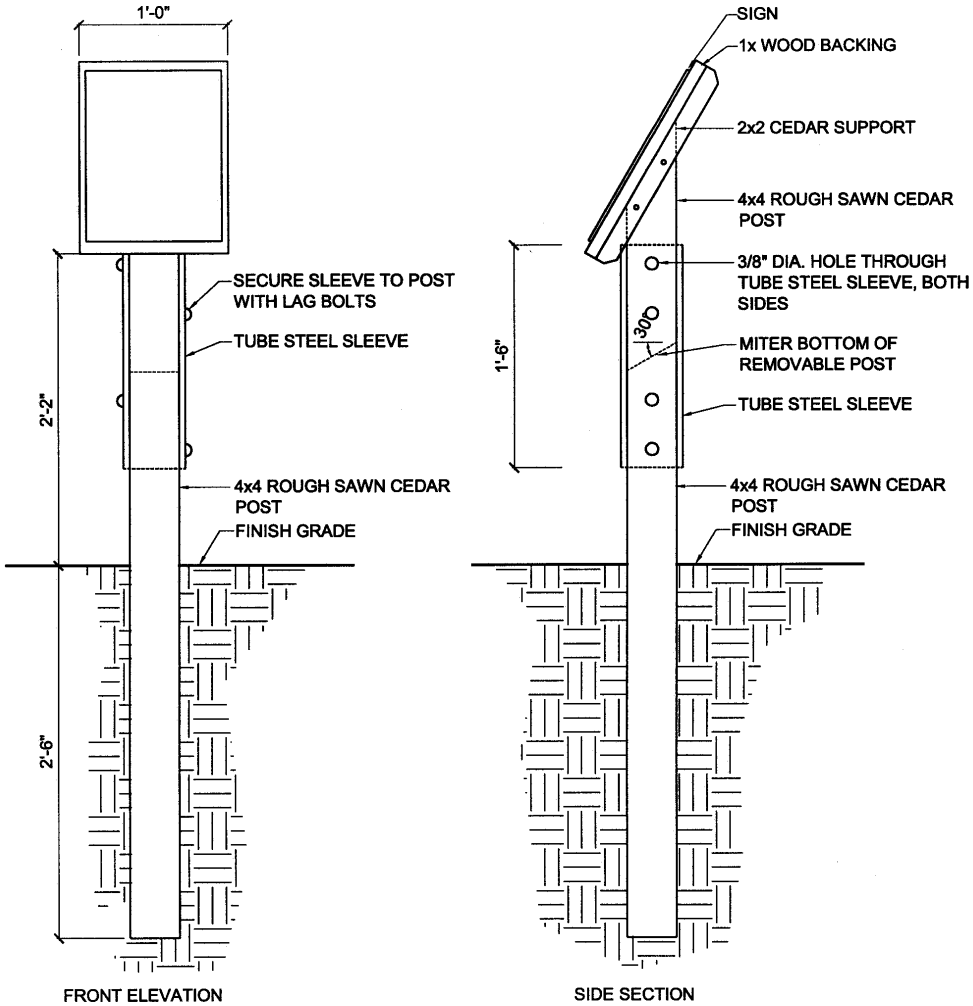
Riparian Restoration Strips

After successfully testing implementation techniques in the riparian test plots, implementation can be done within the riparian restoration strips. The restoration strips are to be approximately 40' wide with the lengths varying. Precise locations and widths will be determined in the field. The strips are to be located in contour type strips running parallel to the river. By running the strips parallel to the river, the potential for erosion is reduced during the restoration process. Each strip is to be separated by mown lawn strips 5' minimum width.

Interpretive Signage

There is to be removable interpretive signage through out the site. The signage is to be made of materials that are inexpensive and easily fabricated on-site in the workshop (garage). The signage is to be removable where it may be at risk of damage due to flooding.

Existing interpretive signage at Hop Tree



REMOVABLE INTERPRETIVE SIGN

N.T.S.

Primary River Access
There is to be access to the river by means of a dock. The dock is to be easily removed each fall and replaced each spring after the floodwaters recede. The dock is to be floating with a ramp that adjusts with the river levels. There is to be a route accessible by a pick-up truck for the removal and installation of the dock.

Rivers Edge

Long-Term Ownership/Lease
The property is owned by the City of Fargo. Currently it is leased by River Keepers. River Keepers is a small non-profit organization that does not currently have long-term control of land as one of its' goals. Various lease and partnership arrangement is to be explored. River Keepers remains open to lease arrangements that insure the continuation of the goals of The Living Lab.

Implementation of Master Plan Tasks

The following is a description of tasks listed in particular steps. Each step is intended to be a logical sequence for implementation. The sequence is intended to be a reasonable and flexible process. Some items that are larger in scope, such as the renovation of the house may take resources that are not available at the anticipated step, so will most like be accomplished only when resources are available.

Step 1

1. Establish locations of small test plots.
2. Establish locations of large test plots.
3. Establish location and begin implementation of mown trail.
4. Remove remainder of diseased trees.
5. Remove remainder of debris across site.
6. Identify the 100-year flood plain and the floodway and mark with interpretive signage.
7. Install flood pole identifying historical flood depths.
8. Remove remainder of existing irises and other non-native specimen plants as desired.
9. Develop interpretive signage to describe development of The Living Lab.
10. Install The Living Lab entry signage near entrance drive.

ENTRANCE SIGN
N.T.S.

11. Install interpretive signage along perimeter of adjacent residential neighbors to discourage dumping onto The Living Lab site.
12. Develop interpretive signage for the various riparian zones.
13. Develop related educational material including printed and web based.

Step 2

1. Renovate garage for use as a wood workshop and storage of equipment.
2. Develop interpretive signage for specific items of interest discovered, i.e. specific plant material, wildlife, example of erosion, etc.
3. Establish location for interpretive over look near house and install interpretive signage material and hardscape material.
4. Establish location for interpretive overlook near shed and install interpretive signage and hardscape material.
5. Install historical interpretive sign at existing swing.
6. Remove chain-link fence running along University Drive.
7. Initiate individual test plot usage.
8. Install storm water interpretive display at storm-drain outfall.
9. Install Wood Duck nesting boxes; explore the installation of nesting/resting poles.
10. Inventory and map on-site utilities.

Step 3

1. Install new entry drive, cul de sac and parking spaces.
2. Install link to bike path to interpretive overlook near shed.
3. Install path connecting parking, house and shed.
4. Expand east side of garage to include outdoors, covered work area.
5. Renovate and expand existing greenhouse attached to house to incorporate an outdoor work area for plant preparation.

Step 4

1. Renovate shed into a visitor center.
2. Install permeable paving at garage.
3. Renovate shelterbelt by removing dead or diseased trees, thinning lower branches and chipping material lying on the ground.

Step 5

1. Install outdoor shelter and associated paving.
2. Install tree plantings surrounding house.
3. Install wet-gardens.
4. Renovate house to accommodate meeting and office space.
5. Initiate riparian restoration strips. Each restoration strip is to have an interpretive sign describing the restoration process utilized.
6. Install floating dock.

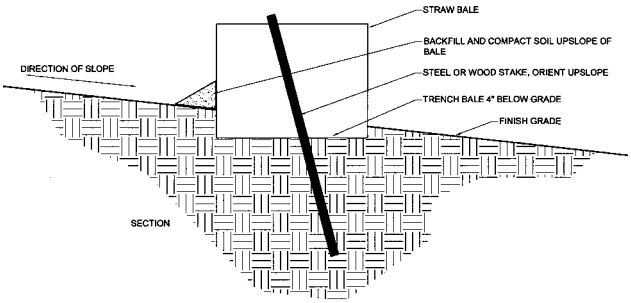
Riparian Implementation Techniques

The techniques that will be used on the site are to be somewhat experimental and are to be designed specifically for this site. The purpose of The Living Lab is to encourage ideas on better ways to restore riparian areas. The following will be general guidelines that are to be considered during the restoration process. Before the restoration of an area is identified on the site, the proposed restoration process is to be tested on one of the various 40'x40' plots.

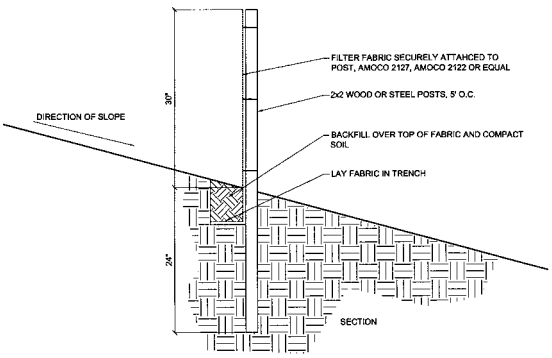
Proposed process:
The process to be implemented must be proposed to River Keepers for approval. River Keepers is to utilize regional experts and an advisory committee to aid in decision-making. The proposal must address removal of existing plant material, erosion control, installation of riparian plants, short-term maintenance and long-term maintenance. The proposed restoration must be committed to the long term.

Test Plots:
The test plots are intended to act as a learning tool for refining the proposed restoration technique prior to committing to a large section of the site. The test plots will also be a very interactive part of the 'Living Lab' for the visitor to view one process directly adjacent to another. The test plots are to be permanently identified with wooden posts driven into each corner of each plot. Each post will have a number identifying the site and will correspond with a master plan to be located at the interpretive overlook nearest the house. A mown path will separate each plot in order to physically and visually separate one from another for ease of maintenance. Extensive and complete planting and maintenance records are to be created and retained.

Initial stripping:
Each site as part of the restoration process must deal with the existing plant material that exists. There are numerous undesirable weeds across the site that must be controlled. Several accepted methods to deal with weeds include chemical herbicide control and burning. Other methods to be explored may be inter-planting more aggressive native species, tilling and biological controls. At no time should the site be allowed to become unreasonably vulnerable to erosion.



STRAW BALE SILT FENCE
N.T.S.



FABRIC SILT FENCE
N.T.S.

Erosion Control:
Erosion control is to be a part of the implementation techniques. In most cases, it is anticipated that the site will be vulnerable to erosion until the intended riparian plant material has taken a hold. Erosion control blankets, silt fences and straw bales are to be utilized where appropriate. Additional control measures may be proposed, but must be approved by River

Keepers. Erosion control is to be maintained until the proposed restoration has established sufficiently to control potential erosion.

Planting Implementation:
There are several potential processes for installing plant material. They include seeding, plugs, seeding blankets, hydro seeding, containerized material and sod. Each site is encouraged to experiment with implementing various process or mix of process to help determine best installation techniques.

Selection of plant species:
Each test plot lies in one of three riparian zones;

- Bank Zone
- Overbank Zone
- Transition Zone

The plan for each plot must take the location into consideration when refining the proposed plant material.

Short Term Maintenance:
During the initial establishment period, maintenance of the plot must be done to ensure a good take on plants. There will be weeds to contend with. Weeds are to be kept under control with approved chemical means, periodic mowing or hand pulling. At no time shall weeds be allowed to overwhelm the plot beyond the expected norm.

Documentation of Implementation:
Proposer must keep detailed written records of processes, methods, materials, maintenance procedures, etc. utilized. Records are to be kept on-site for reference and updating.

View of existing path through area choked with thistle.

Plants Commonly Found in the Riparian Zones

The Living Lab project is committed to promoting the use of native plant material in its demonstration/restoration efforts, but also recognizes the importance of naturalized plants in the restoration of riparian communities as well. Emphasis will be given to the use of native plant material.

The plant palette should relate to elevations, aspect and soil types. Various references including, but not limited to those listed below will be used to determine appropriate plant material. In addition to these publications local experts should be consulted.

Reed, P.B., Jr. Revised List of plant species that occur in wetland: national summary. US Fish and Wildlife Service

Henderson, C.L., et al, Non Game Wildlife Program, MN DNR, Lakescaping for Wildlife and Water Quality

Division of Ecological Services Ecosystem Education Program, MN DNR, Restore your Shore

Sedivec, K.K. and Barker W.T., Selected ND and MN Range Plants, NDSU Extension Service

Long Term Maintenance

Each plot and the entire riparian site will require long term maintenance past successful establishment. Some weeds are very invasive and even with a good riparian establishment some maintenance will be required to keep weeds under control.

River Keepers will be the long-term caretakers and need to adopt straightforward techniques to maintain the site as a riparian area. A combination of limited burning, chemical control and mowing will be the techniques used. A maintenance process including some experimentation will be necessary and should be encouraged.

Burning:
Burning is natures' normal control and regeneration of many plant communities. However, since The Living Lab site is located within the boundaries of the City of Fargo and adjacent to residential areas, burning must be very controlled and with close cooperation with the local fire department.

Burning is to be done in small areas not greater than 500 square feet at a time. The mown lawn paths are intended to be barriers for burning. Additional mown strips are to be done through areas to be burned to keep the burn areas small and manageable.

Before burning, River Keepers must notify local officials and receive their approval. It is anticipated that burning will be required every 3 to 4 years or depending on conditions and persistence of weeds.

Frequency of fire does also provide the additional benefit of removing years of old growth, thus reducing the intensity of any unintended ground fires. The areas surrounding buildings must be kept clear of vegetation so they have a firebreak.

Chemical Control:
There are numerous chemicals currently on the market that provide good control of weeds. Consideration should be given to selection of chemicals based on their residual effects, water contamination and other biological effects. For effective control of weeds, the herbicide should be selected for the most appropriate effective control and should be applied only by hand to specific areas requiring control. Initial control will be extensive across the site.

Successful weed control should be evident year to year by a visibly reduced cover of weeds. It would be unrealistic to believe that complete and permanent weed eradication will be attained. There are many years of weed seeds existing in the soil and new weed seeds that are continuously brought in with winds and yearly floods.

Experimentation with chemicals and application techniques will be required to determine which method(s) work best to control weeds in riparian areas.

Examples of effective chemical that can be utilized are as follows:

- 'Round-Up' has no residual toxicity and will effectively kill an area of most plant material on contact. Should large areas be determined to require a large kill, replanting may need to be considered.

- ‘2-4-D’ is a broad-leaf specific herbicide and should be used only in areas where broadleaf types of weeds persist.

- ‘Plateau’ is an effective herbicide designed to eliminate spurge and leave most native, woody and grassy plants unharmed.

- ‘Assure-2’, ‘Post’, ‘Grass Getter’ are chemicals designed to specifically kill grassy plants.

The use of natural solutions such as vinegar to control thistle is to be explored.

Mowing:
Mowing should be done at certain stages of weed growth to capture weed seed heads before they have the opportunity to mature and ‘go to seed’. A mowing bag should be used to collect the clippings. The seed heads if allowed to fall to the ground may still produce seeds. Mowing height on the mower should be set as high as possible, with the intention of collecting the seed head portion of the weed.

Mowing will most likely be necessary primarily during the period of establishment of the riparian plots when weed growth will be most evident and seem overwhelming. Clippings from the mowing should be disposed off-site at the City of Fargo compost site.

Participants

The following individuals participated in the development of the Living Lab Master Plan.

Mark Bittner	City of Fargo Engineering
Craig Brumbaugh	ND Extension Forestry
Mark Chase	Fish and Wildlife Service
Joe Courney	Red River Basin Institute
Helen Cozzetto	MN DNR
Earl Erickson	Cass County Soil Conservation District
Richard Faught	Cass County Soil Conservation District
Chuck Fritz	Red River Basin Institute
Angela Hansen	NDSU Landscape Architecture
Carole Harbeke-Lewis	SE Cass Water Resource District
Wade Kline	Metropolitan Council of Governments
Kelly Krabbenhoft	Natural Resources Consultant
Doug Leier	ND Game and Fish
Jessie Lisburg	Fish and Wildlife Service
Scott Liudahl	City of Fargo Forestry
Jay Mar	Natural Resources Conservation Service
Carrie Richards	Cass Soil Conservation District
Dave Rush	Red River Riparian Project
Donna Schneider	ND Audubon and Greenway on the Red
Genevieve Thompson	ND Audubon and Greenway on the Red
Darrick Weissenfluh	NDSU Student Natural Resources
John Wesolowski	Fargo Park District Forestry
Joseph Zeleznik	ND Extension Forestry
Bob Backman	River Keepers
Christine Holland	River Keepers
Jim Hanson	Hanson Design Associates

Plans

Appendix