



# RIPARIAN RESTORATION GUIDE

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THE MEADOWS CENTER  
FOR WATER AND THE ENVIRONMENT  
TEXAS STATE UNIVERSITY

TEXAS STREAM TEAM

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## Preface

The improper management of urban growth and development has catalyzed threats to our Texas waterways, including point and nonpoint source pollutants, stormwater runoff, habitat disruption, and more. In an effort to mitigate these growing threats, Texas Stream Team worked diligently to implement a green stormwater infrastructure (GSI) project, exemplified through the restoration of a highly vulnerable riparian area at Spring Lake, located at The Meadows Center for Water and the Environment (The Meadows Center). Further, Texas Stream Team constructed this *Riparian Restoration Guide* for concerned citizens looking to take action, through the guidance of this restoration project. This document provides information on what riparian areas are, why they are important, and how they help mitigate threats on our water resources.

Texas Stream Team acknowledges that the efforts to implement this restoration project would not have been possible without our dedicated partners:

- United States Environmental Protection Agency
- Texas Commission on Environmental Quality
- Texas State University, Grounds and Waste Management Operations
- The City of San Marcos
- San Marcos Aquatic Resources Center
- San Marcos River Foundation

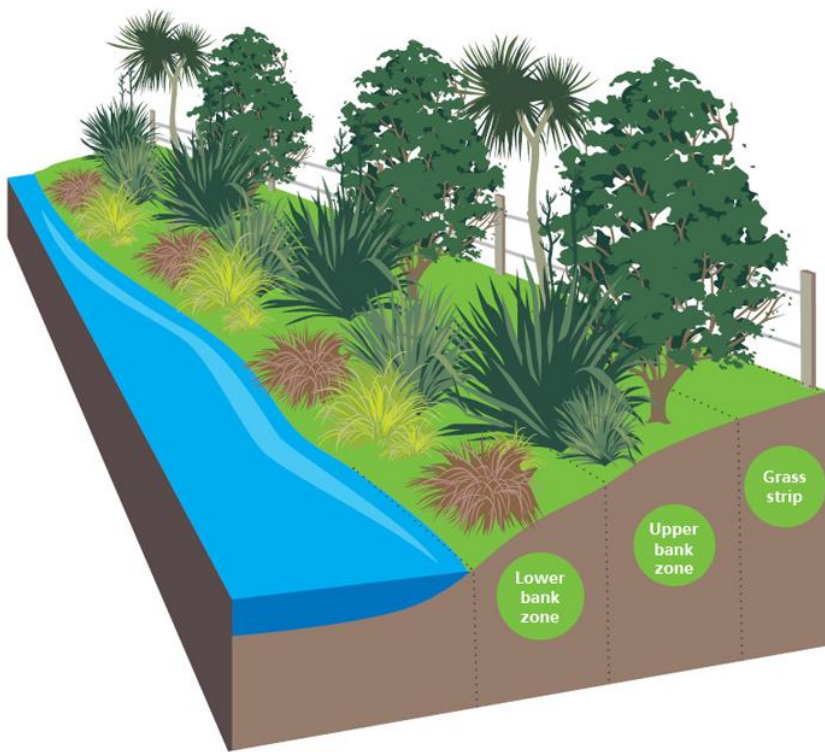


## Background on Riparian Areas

In order to improve riparian areas, their value must first be understood. Riparian areas are the part of the landscape that borders water features, including the margins of streams, rivers, lakes, and wetlands. This guide will focus on the management of a lake-side riparian area. A healthy riparian area contains packed native, water-tolerant vegetation and, when functioning properly, provide the following benefits:

- Improves water quality through pollutant filtration
- Reduces flood impacts and increases groundwater infiltration by slowing down water
- Maintains healthy biodiversity

There are two main zones within a riparian area:



**1. Lower bank zone** is located right along the perimeter of the waterbody, and is the area that includes water-tolerant plants that can endure a flood prone area

**2. Upper bank zone** sits right above the lower bank zone, and is the area that includes trees and shrubs at a slightly higher elevation that function as an additional buffer during high flood events

The quality of water in our rivers and streams can be influenced either positively by healthy riparian function or negatively by the presence of one or more

hindrances. As urban growth increases, so does stormwater runoff due to increased amounts of impervious cover and the reduced potential for infiltration. Unfortunately, stormwater runoff picks up point and nonpoint source pollutants as it makes its way to the nearest receiving water body.

Functioning riparian areas are the last buffers against stormwater pollutants and destruction. Therefore, functioning riparian areas are crucial for keeping our waterways healthy. Continue reading to learn how you can improve riparian areas in your town to protect our water resources.

## Preparing for Restoration

### Choosing the Right Location

Riparian areas can become impaired through the introduction of invasive species, excessive foot and animal traffic, and over trimming of native vegetation. Due to these threats, maintaining and restoring riparian areas is essential to communities. Texas Stream Team assessed for the following indicators to determine the most impaired location within the riparian area along Spring Lake:

- High stormwater runoff and sediment deposition potential
- Sparse, or absence of vegetation
- High threat of foot traffic
- Bank or channel erosion

Based on the above criteria, the following project location was selected:



Figure A: Riparian restoration location at The Meadows Center for Water and the Environment

To restore this highly impaired riparian area, Texas Stream Team's course of action included prepping the surface and soil, selecting and replanting native vegetation, restricting access to the site with a fence until the site is further established, and installing a raised berm strip on the east side of the trail leading to the boat dock.

Installing a berm is an optional, additional barrier consisting of a mounded hill of soil that helps to mitigate stormwater runoff by slowing down, filtering, and redirecting the flow. At this



particular site location, the contour of the land directed higher runoff volumes to the project location. As a result, a berm allowed the lower drainage area to be raised, reducing the water that collected on the trail parallel to the lake.

## Materials Needed

After the site location is selected, the following materials are needed before restoration work can begin:

- Soil
- Gardening tools – gardening gloves, shovels, pruning shears, and a watering can
- Native Riparian/Water-tolerant plants:
  - [Brazos Penstemon, \*Penstemon tenuis\*](#)
  - [Mountain Pea, \*Orbexilum pedunculatum\*](#)
  - [Heartleaf Skullcap, \*Scutellaria ovata\*](#)
  - [Tropical Sage, \*Salvia coccinea\*](#)
  - [Purple Leaf Sage, \*Salvia blepharophylla\*](#)
  - [White Mistflower, \*Ageratina havanensis\*](#)
  - [Dwarf Katie Ruellia, \*Ruellia brittoniana\*](#)
  - [Dwarf Palmetto, \*Sabal minor\*](#)
  - [Wedelia, \*Sphagneticola trilobata\*](#)
  - [Yellow Columbine, \*Aquilegia chrysantha\*](#)
  - [Gregg’s Mistflower, \*Conoclinium greggii\*](#)
  - [White Avens, \*Geum canadense\*](#)
  - [Lyreleaf Sage, \*Salvia lyrata\*](#)
  - [Northern Sea Oats, \*Chasmanthium latifolium\*](#)
- Fencing (optional)

## Riparian Restoration in Action

With the proper location and materials selected, it is time to put on your gloves and begin the restoration process!

### Planting

- 1. Prepping** - Remove grass, weeds, and any objects that may inhibit plant growth. Once the area is clear, disperse the plants throughout the site location to determine the best location for each. Provide about six to twelve inches in between each plant so there is enough room to grow (see photo to the right).



Figure B: Preliminary plant placement at restoration site

2. **Digging** – Using a shovel, dig holes for each plant deep enough to cover the roots and one to two centimeters of the plant stem. Pruning shears may be needed to cut away thicker roots from nearby plants and trees.
3. **Watering** – Cover the roots with the same dirt you dug up, or feel free to add mulch for extra nutrients. Once covered, use your watering can to moisten the soil.
4. **Fencing** – We suggest that you utilize temporary fencing to keep animals and people from disturbing the plants until the riparian area is established.
5. **Maintenance** – Weeds, invasive species, and pests need to be maintained, especially within the first year as the riparian area is reestablished. Watering is necessary the first three to six months, depending on the weather, to help the plant roots get established. Some plants may not survive and need to be replaced as needed.



*Figure C: Before the riparian restoration process*



*Figure D: After the riparian restoration process*



## Building a Berm

- 1. Shape and Size** – Berms can be created in varying sizes and are usually 18-24 inches high. Berms are generally four to five times as long as they are high, and their shape should follow the natural contour of the landscape. Following these guidelines reduces issues with erosion, runoff, and upkeep over time.
- 2. Establish the Base** – Dig into the surface to loosen the soil, then fill the loosened areas with soil up to your desired height and length (see photo to the right).
- 3. Compacting** – To ensure the berm maintains stability and structure, compact the soil as much as possible. Once the berm has reached the desired shape and structure, water and compact again, being sure to add more soil in areas that may have sunk in.
- 4. Planting** – Grass seed was added to the berm to help it blend into the surrounding landscape. Vegetation is optional and can be added to help the berm blend in or stand out. Be sure to use native shrubs, grasses, or flowers if vegetation is used. Once your vegetation is planted, water lightly.
- 5. Maintenance** – Over time, more soil may be needed as erosion wears down the berm. New vegetation will be vulnerable the first few months and will also need occasional watering to help it get established.



*Figure F: Laying out berm soil height adjacent to riparian planting site*



*Figure E: Settled berm with beginning stages of seed growth*

## Glossary

- **Filtration:** The removal of sediment and other pollutants from stormwater runoff by the movement of runoff across a vegetated area and through media.
- **Green Stormwater Infrastructure:** Sets infrastructure in place to direct the flow of stormwater away from built environments in a controlled manner to increase infiltration.
- **Impervious Cover:** Any type of man-made or stone surface that doesn't absorb rainfall. Surfaces such as stone, rooftops, patios, driveways, sidewalks, roadways, parking lots, and some decks are considered impervious cover.
- **Infiltration:** The vertical movement of stormwater through plants and soil. In systems without an under drain or liner, infiltration re-charges groundwater.
- **Nonpoint Source Pollution:** Nonpoint source pollution is water pollution that is caused by widely dispersed sources of pollutants. While most nonpoint source-caused pollution problems are associated with pollutants carried by runoff from rain, other pollutant sources include spills and leaks, atmospheric deposition, and hydrologic modifications. Nonpoint source pollutants affect groundwater and surface water.
- **Point Source Pollution:** Any single identifiable, regulated source of pollution from which pollutants are discharged, such as a pipe, ditch, ship, or factory smokestack.
- **Stormwater Runoff:** Stormwater runoff is generated from rain and snowmelt events that flow over land or impervious surfaces, such as paved streets, parking lots, and building rooftops, and does not soak into the ground. The runoff picks up pollutants like trash, chemicals, oils, and dirt/sediment that can harm our rivers, streams, and lakes.

## References

DairyNZ. 2019. *Planting waterways*.

<https://www.dairynz.co.nz/environment/waterways/planting-waterways/>. (Last accessed 6 June 2019).

Gardening Know How. *What Are Berms For: Tips For Using Berms In The Landscape*.

<https://www.gardeningknowhow.com/special/spaces/creating-and-using-berms-in-the-landscape.htm>. (Last accessed 6 June 2019).

## Additional Guidance Resources

### *Trainings:*

[Texas Stream Team Riparian Evaluation Training](#)

[Statewide Urban Riparian and Stream Restoration Training and Demonstration](#)

### *Book Sets:*

[Your Remarkable Riparian Field Guide and Owner's Manual](#)

### *Guides:*

[Streamside Management in the Hill Country, An Edwards Plateau Landowner's Guide](#)

### *Quick Species Information:*

[Lady Bird Johnson Wildflower Center](#)

[National Gardening Association](#)

### *Informative Websites:*

[Why You Should Consider Green Stormwater Infrastructure for Your Community](#)