

Bioengineered Bank Stabilization

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What is Bioengineered Bank Stabilization?

- ▶ Restoring areas along a river or stream suffering from erosion through the use of natural and sustainable materials.
- ▶ Plants can be transported and planted along river banks to help stabilize the banks along with rock or log revetments.



http://reedycreekrestoration.com/wp-content/uploads/2018/08/Buckleigh-Branch_before-after.jpg

Why Bioengineering?



Effective



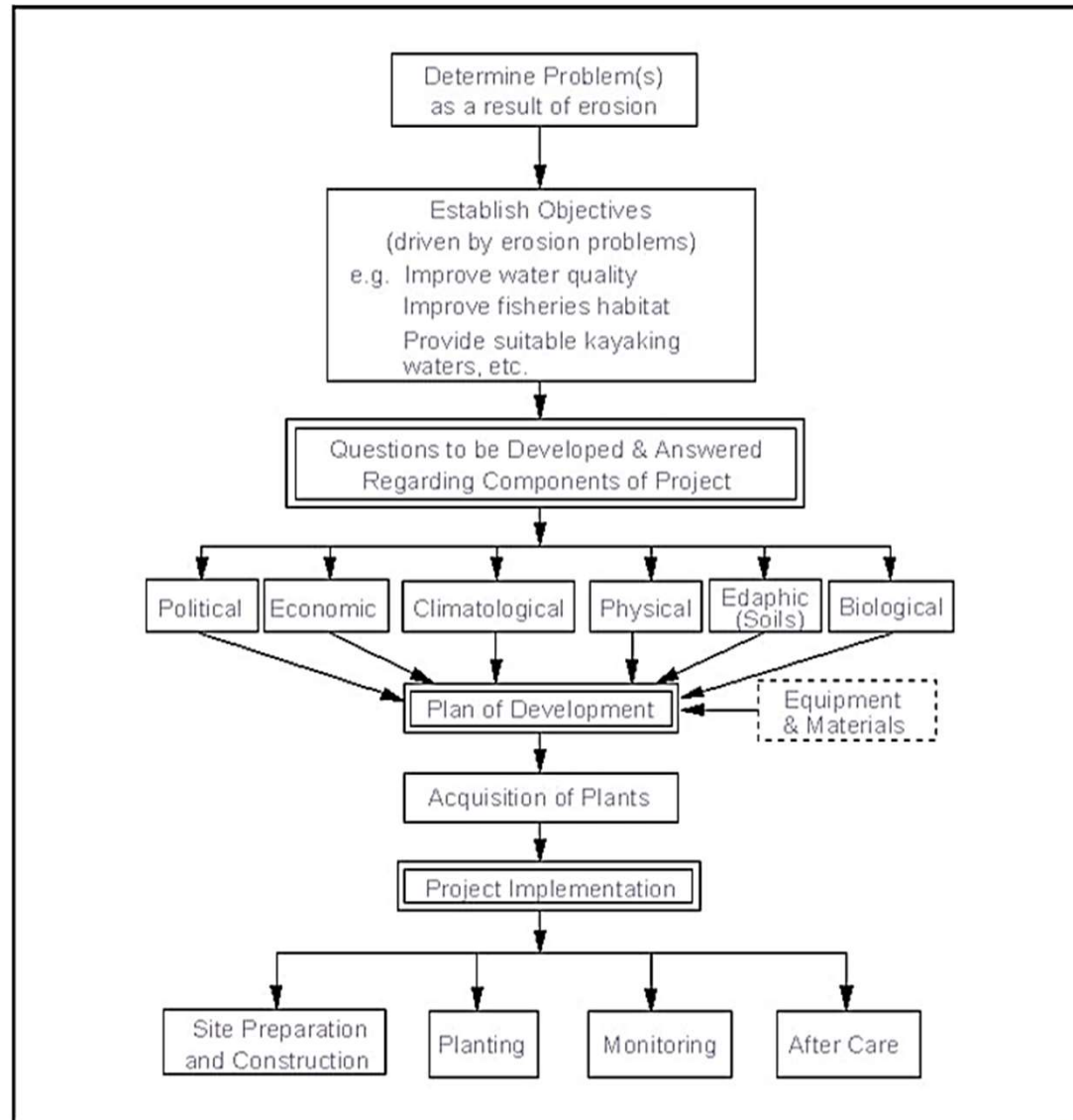
Lower cost



Sustainable

There are times when restoration projects are restricted from using hard structures due to the high cost and environmental concerns. By incorporating vegetation in as a way to stabilize the banks, the area can remain better suitable for aquatic species and more aesthetically appealing.

The Planning Process



Fabric Encapsulated Soils (FES)

- ▶ FES are fabric-wrapped soils that contain rooted plants that can be easily transported to river banks.
- ▶ The fabric is made from a bio-degradable material, which allows for temporary protection of the banks from erosion as the roots of the plants grow.
- ▶ Over time, the fabric degrades and the root zone has developed enough to protect the plants in times of flooding.
- ▶ The new vegetation slows down erosion, yet allows the river banks to remain flexible.



Considerations When Planning the Type of Vegetation to be Used

What plants are native to the area?

- Local plants are more likely to thrive and may reduce the cost

What is the plant's tolerance to water?

- This will help determine how far up the bank a plant should be placed.

What is the plant's ability to withstand hydraulic forces during flooding?

- Velocity resistance
- Shear resistance

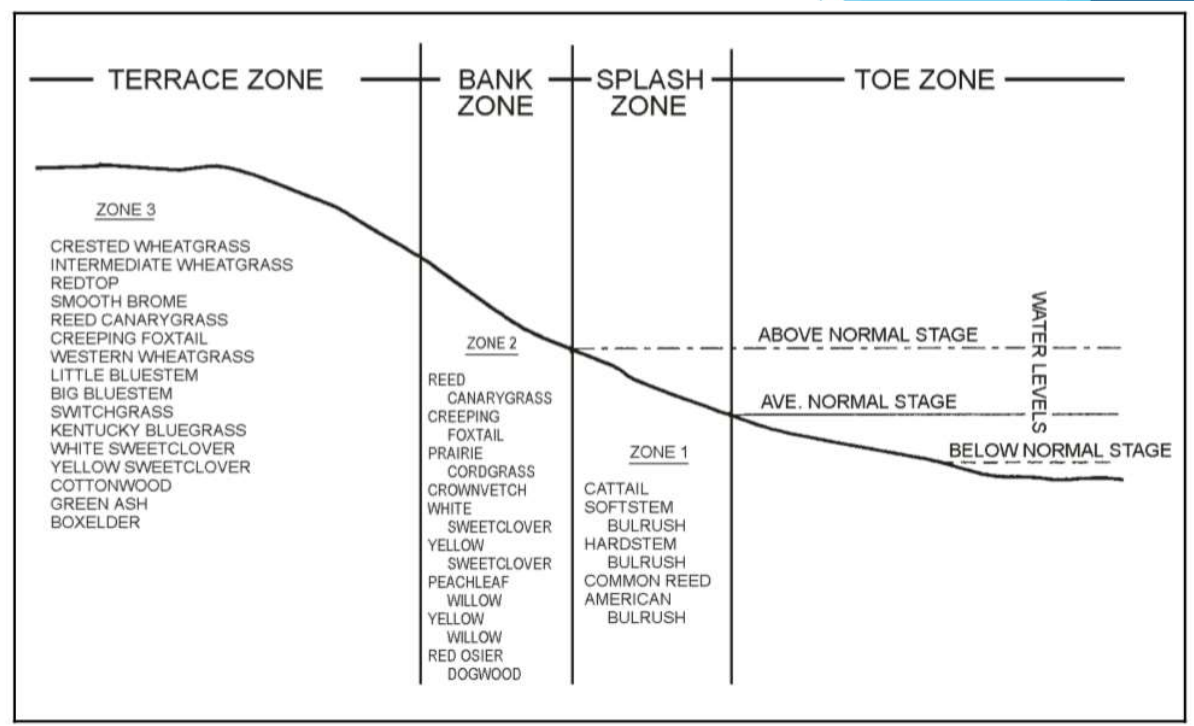
What is plant's tolerance to freezing temperatures?

- In places such as Colorado, the plants need to be able to survive through the winter, and the constant freezing and thawing that occurs in the Fall and Spring.

Elevational Zones

Elevational zones can be developed for a river based on the water stage.

- ▶ **Toe Zone:** The elevation below the “average normal stage” of the river.
 - ▶ Needs protection from undercutting- other materials are used in addition to vegetation, such as rock revetments.
- ▶ **Splash Zone:** Between “average normal stage” and “above normal stage.”
 - ▶ Rolled material can be used (or other FES) that contains wetland plant seedlings that will begin to grow to help stabilize the bank.

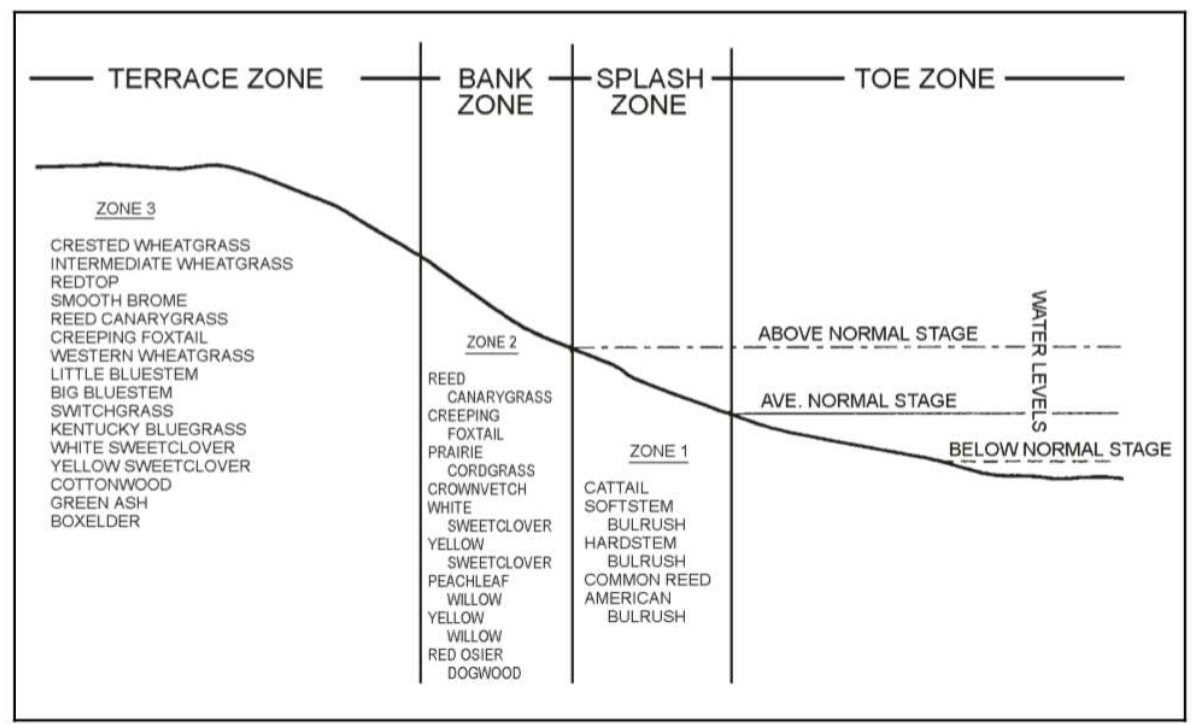


https://www.engr.colostate.edu/~bbledsoe/CIVE413/Bioengineering_for_Streambank_Erosion_Control_report1.pdf

Example of elevational zones on the Missouri river and types of vegetation for each zone.

Elevational Zones

- ▶ **Bank Zone:** The elevation when the bank exceeds “above normal stage.”
 - ▶ May be exposed to flooding and wave splashing- pick vegetation that can withstand constant wave action, such as grasses.
- ▶ **Terrace Zone:** The highest elevation section. Contains top of bank point and possible surrounding floodplains.
 - ▶ Rarely flooded.
 - ▶ Needs vegetation with deeply penetrating roots, such as flood-resistant trees.



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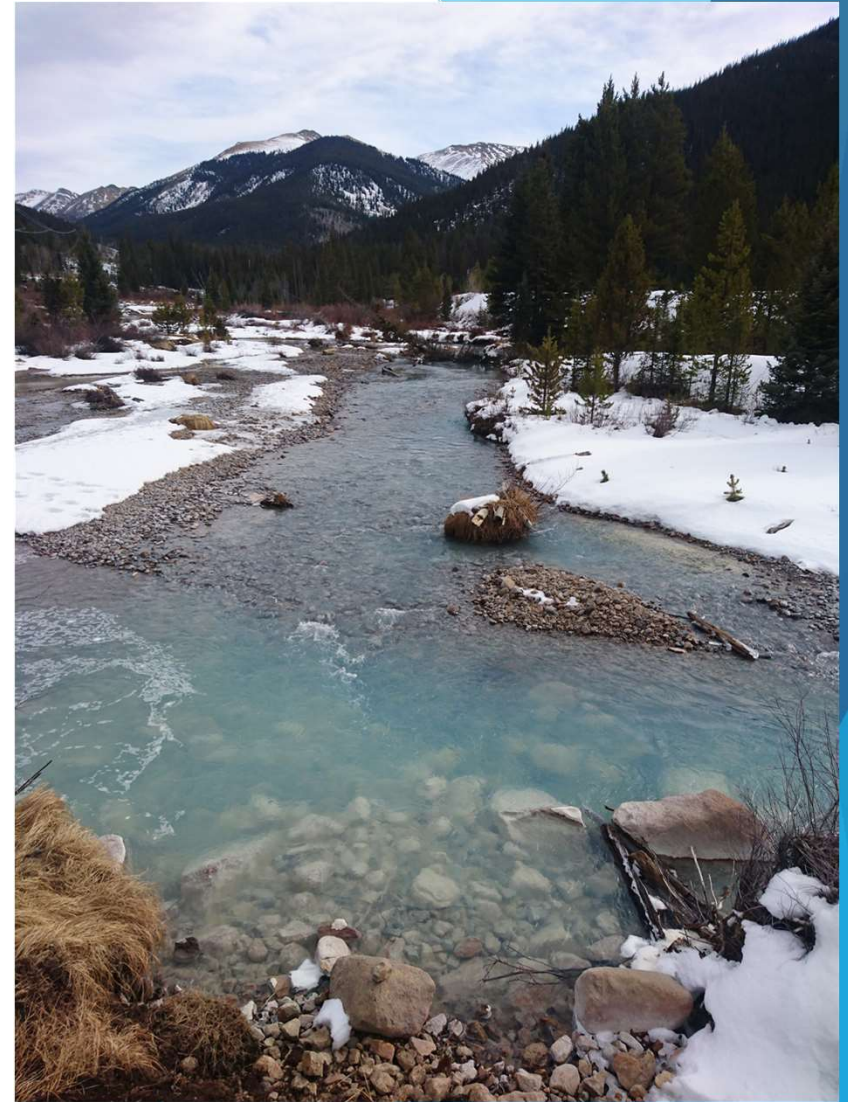
Common Types of Plants Used in Bioengineering Projects

- ▶ Short/long native grasses
- ▶ Reeds
- ▶ Willow posts
- ▶ Woody plants
 - ▶ Poplars
 - ▶ Cottonwoods
 - ▶ Cypress
 - ▶ Cedars
 - ▶ Junipers
 - ▶ Douglas Fir



Limitations of Bioengineering

- ▶ Plants may fail to grow. There is a chance the plants do not respond well to replanting or a bad water year inhibits the plant growth.
- ▶ Plants can be uprooted by wind or heavy storms.
- ▶ In cooler climates, the plants may die due to constant freezing and thawing, or if they are planted too soon, a deep freeze could kill them.
- ▶ Wildlife may eat or destroy the vegetation used.



References

Allen, Hollis H., and James R. Leech. "Bioengineering for Streambank Erosion Control. Report 1 - Guidelines." 1997, doi:10.21236/ada326294.

Dorsey, Don. "Celebrating the Restoration of Donnybrook Stream." *My Green Montgomery*, 27 May 2015, mygreenmontgomery.org/2015/celebrating-the-restoration-of-donnybrook-stream/.

Julien, Pierre Y. *River Mechanics*. Cambridge University Press, 2018.