

## 2. River Edge Treatment - Stone Toe Protection

Stone or cobble trenched and embedded into the toe of the riverbank serves as a foundation for the slope above, as well as armor against erosion. The interstitial spaces between stones can be planted with emergent vegetation to soften the appearance and increase water quality and habitat benefits. The height of the stone should be sufficient to address wave energy where this is a significant concern. Once well vegetated and weathered, the stone is not readily visible and has a relatively natural appearance. Once the slope is reestablished, it should be seeded, covered with erosion control blanket, and planted with plugs as necessary.

A variation on the stone toe protection concept are A-jacks, or other similar prefabricated concrete structures. A-jacks are approximately 2 feet square concrete structures with a similar appearance to a toy jack. They are nested together to form a flexible foundation to provide toe protection. Due to their shape and the interlocking of the individual jacks, A-jacks are extremely stable. A-jacks can be seen at Kiwanis Park and Northside College Prep. High School.

This method can offer some cover habitat for macroinvertebrate and small fry fish. This can be important where the majority of the bottom is silty and devoid of macroinvertebrate habitat. Although the emergent zone is narrow, this may provide some foraging habitat opportunity for macroinvertebrate, small fish, and wading birds.

### Advantages:

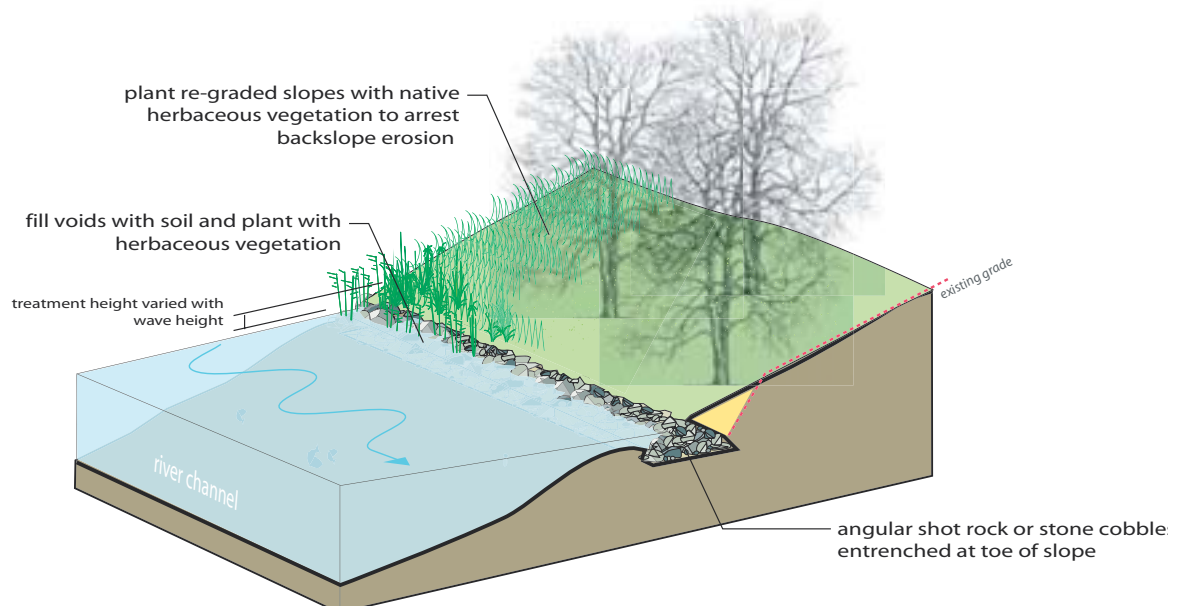
- Very effective method of toe stabilization where wave heights/water do not exceed height of stone. A-jacks are very stable and can resist high stream velocities and continuous wave action.
- Can be placed with minimal disturbance to the upper slope but must be trenched into the bed of the stream to provide slope stability and improve longevity.
- Gaps between larger stone can be interplanted with vegetation.
- Provides a flexible structure that can withstand modest movement without failure.
- A-jacks are quite resistant to vandalism.
- Provides some cover habitat for macroinvertebrate and small fry fish.
- Cost effective method where hard toe stabilization is required.

### Disadvantages:

- A-Jacks are more expensive than stone and their installation is relatively specialized.
- Stone may be subject to vandalism. (Throwing of stones into the river)
- Stone may be considered unaesthetic in some locations, especially if large stone is required or the stone is not interplanted with native vegetation. Aesthetic qualities of A-jacks may be more of a concern than for stone.
- Although stone and A-jacks allows for a modest emergent edge, the emergent zone is quite narrow.

### Maintenance:

- Little maintenance needed other than periodic inspection and repair if rocks have been moved. Repairs are relatively easy.
- A-Jacks are less likely to require periodic repairs but it is difficult to replace individual jacks due to the interlocking nature.



### 3. River Edge Treatment - Gabion Basket or Mattress

Gabions are rectangular baskets or mattresses made from galvanized wire mesh that are filled with small to medium size stones. Gabions are tied together and placed at the bed/bank interface for immediate riverbank stabilization. Soil can be used to fill the void space and planted with vegetation to soften their appearance and improve water quality and habitat. Once the slope is reestablished, it should be seeded, covered with an erosion control blanket, and planted with native plugs as necessary. Gabion baskets can be found in Legion Park north of Bryn Mawr Avenue.

If gabion baskets or mattresses are planted with native herbaceous vegetation, this treatment will provide similar habitats as the stone toe protection treatment. There would be potential cover habitat for smaller organisms, and some foraging opportunities for macroinvertebrate and small fish. The wire baskets may deter usage of this area by shore birds.

#### Advantages:

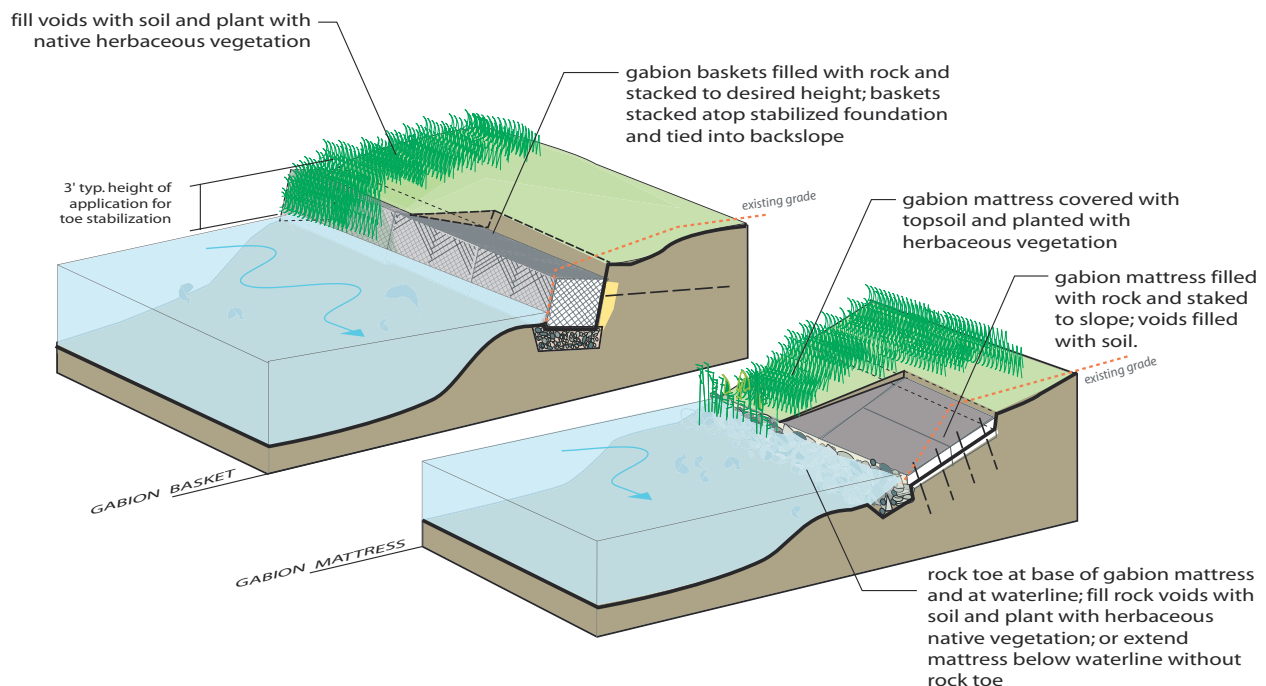
- Allows use of smaller stone than stone toe protection method for a given level of erosive pressure. Cost effective structural solution if required rock size is greater than what is locally available.
- Can provide a significant foundation for the upper slope.
- Because the baskets form a vertical wall, gabions can be used to fill a larger vertical cut.
- Gabions are conducive to vegetative growth if they are filled with soil.
- Gabion mattresses can be tailored to irregular shapes, e.g. transitions from one type of treatment to another, around drains, and other structural features.
- Provides some cover habitat for macroinvertebrate and small fry fish, especially when combined with native vegetation.
- Provides a semi-flexible structure that can withstand modest movement without failure.

#### Disadvantages:

- Tends to transmit flow and reflect wave energy (although not as severely as smoother walls such as sheetpile).
- Expensive to install and replace.
- Subject to vandalism.
- Wire mesh subject to sediment, ice abrasion and extremes in water pH that may lead to corrosion.
- Slope stability protection can be lost when damaged.
- Aesthetically unpleasing when not vegetated.
- Requires a stable foundation.
- Care must be taken during filling and complete lacing of the mattress components, which can be costly.
- Less flexible than stone toe.
- There may be significant wetland and floodway permitting issues related to use of gabion mattress treatment.

#### Maintenance:

- Wire mesh may need to be replaced.
- Periodic inspection to see if gabions have subsided.



#### 4. River Edge Treatment - Sheetpile (low wall)

Often made from steel, sheetpile is an effective toe protection method, especially in deep-water situations. When used for river edge protection, only a low sheetpile wall is necessary to provide a foundation for the upper slope and protect against scouring. It can also be placed below water level so that it is not visually intrusive, but the protection from scour may be lost. When capped, it offers a seating and walking surface at the water's edge that accommodates walkers, anglers, and others. Once the slope is stabilized, it should be seeded, covered with an erosion control blanket, and planted with native plugs as necessary. Sheetpile can be seen at Ping Tom Park.

##### Advantages:

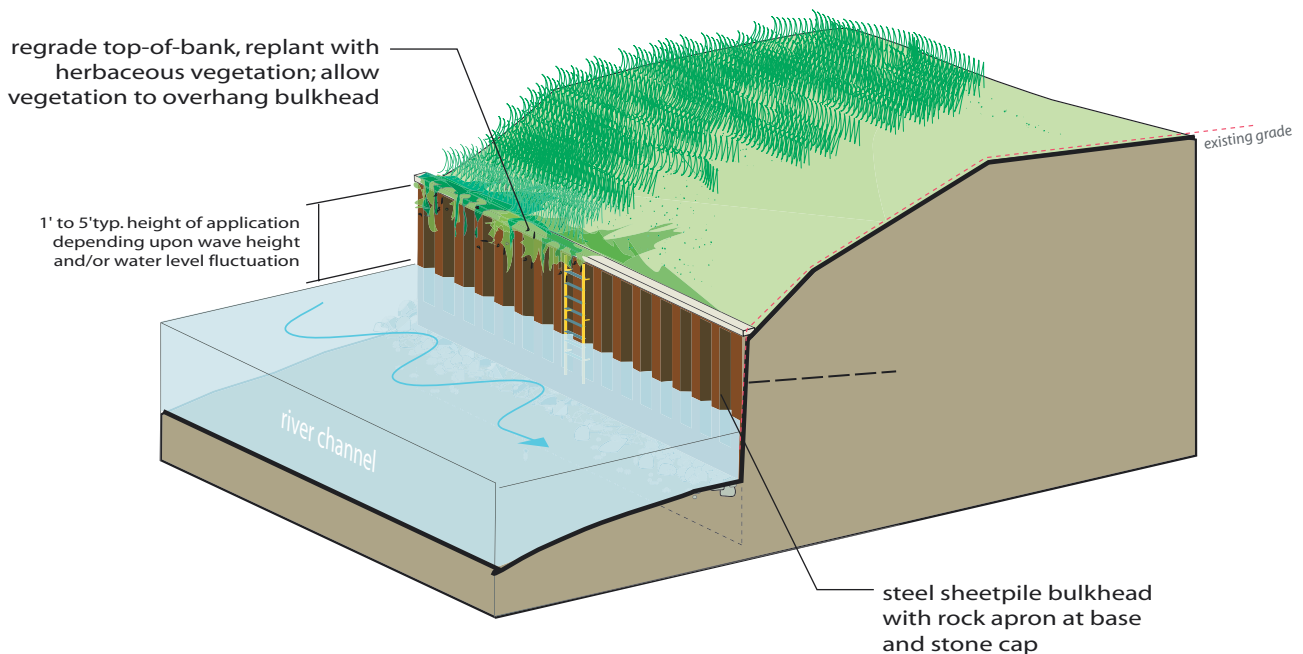
- Properly installed sheetpile is one of the most effective and long-term stabilization treatments.
- Opportunity to provide public access to the water's edge (fishing, walking, etc) when capped at an adequate width for pedestrians.
- Can be used for deep water application.
- Can be used above or below normal water level.
- When height is limited and there is a vegetated slope above, sheetpile can be nearly invisible from the land side of the wall.

##### Disadvantages:

- Most expensive river edge treatment method.
- Difficult and expensive to repair.
- Visually sterile.
- Provides virtually no aquatic habitat for fish and other wildlife.
- Stone apron is needed to prevent scour and undermining, particularly where there is significant wave energy.
- Transmits or reflects flow and wave energy downstream.
- There may be significant wetland and floodway permitting issues related to the use of sheetpile.

##### Maintenance:

- Very little maintenance is required.
- Periodic inspection to evaluate and address scouring.



## 5. River Edge Treatment - Fiber Roll

A fiber roll is a cylinder of nonwoven fibers made from compacted coconut husk fiber, and wrapped within a coir woven mesh rope or coconut fiber mesh. Fiber rolls are available in varying diameters and lengths. Installation of the fiber rolls occurs in a linear fashion along the toe of eroding streambanks to prevent erosive flows or wave energy from directly contacting the toe of the bank. The rolls are staked into place and planted with appropriate native wetland plants. The long-term stabilization is dependent upon extensive establishment of the vegetation as the fiber roll slowly biodegrades. Site conditions that need to be considered include: hydrologic regime – one that provides adequate flow to sustain the vegetation, but without excessive velocities or flood durations that exceed the plant's flood tolerance; expected sediment load – excessive loads may limit ability to establish vegetation at the water's edge; shade conditions; and substrate stability – noncohesive material such as sand or silt may require longer or more frequent staking to provide secure anchoring. Once the slope is reestablished, it should be seeded, covered with an erosion blanket, and planted with plugs as necessary.

In several past applications, the planting embedded in the fiber roll that occurred at the time of installation did not survive due to the relatively sterile and dry conditions within the fiber roll. In those same applications, a second planting that occurred after the roll had become silted was quite successful as the accumulated silt provided a better growing medium and helped retain moisture within the roll. The narrow bank of emergent habitat provides cover, resting, and foraging opportunities for macroinvertebrate, small fish species, and wading birds.

### Advantages:

- Provides short-term stabilization (~5-year) and a medium to establish desirable emergent and riparian vegetation that provides long-term stabilization.
- Flexibility for molding to the existing curvature of riverbank.
- Provides toe protection where scour is not severe and vegetation is sufficient to provide long-term stabilization.
- The established vegetation provides some water quality and aquatic habitat benefits and a natural looking river edge.

### Disadvantages:

- Limited effective life – biodegrades in 3-5 years. If vegetation is not sufficiently established by this time, the treatment may fail.
- Requires maintenance to ensure establishment of vegetation, including replanting, etc. during the establishment period.
- Not appropriate for sites with severe scouring, high velocity flows, or large ice build-up. On the Chicago River, applications may be limited to use within created backwater areas (see treatment 6).
- There must be sufficient sunlight available for colonizing plant growth.
- Should only be installed in areas with low flow velocities, relatively stable substrates, and where erosion pressure is low and vegetation can be established.

### Maintenance:

- Periodic inspections of the coir roll will need to be undertaken to ensure stability as well as assess the establishment of native vegetation, which is critical as the fiber roll degrades.
- Plant maintenance will consist of invasive species removal, and other natural area management techniques as necessary to maintain appropriate emergent plantings.

