
EXHIBIT F2

CHANNEL BANK VEGETATION

STONE TOE PROTECTION WITH VEGETATION

Description: Stone toe protection with vegetation essentially combined the use of several boulders constructed with filter layers and vegetation plantings. The combination provides protection from erosive stream forces while providing a location for vegetation establishment. Depending upon the design, the constructed bank can be fairly vertical, thus providing overhanging vegetation opportunities, or it can be sloped back more thus providing more of a pool at the toe.



Stone toe protection with willow stakes and coir (immediately following construction).



Stone toe protection with well established planting bench

Applicability: The stone toe protection with vegetation can be used on streams where banks are being undermined by toe scour and where vegetation alone may not provide enough scour protection. The stone toe prevents the removal of failed streambank material that collects at the toe and allows revegetation higher on the bank, which provides additional stability to the bank. The application can be used to decrease channel width, protect eroding banks and increase bank vegetation which provides cover and shade.

Pros and Cons:

1. Pros of the stone toe protection with vegetation:
 - a. provides a stable channel bank and allows for the establishment of vegetation
 - b. decreases the width of unnaturally wide channels
 - c. provides for a disruption of flow lines which reduces velocities and increases aeration
2. Cons of the stone toe protection with vegetation are:
 - a. construction can be more expensive than revegetation alone
 - b. large size boulder may be necessary to protect at higher velocities

LUNKERS

Description: Lunkers are crib-like structures, typically constructed with wood, and installed along the stream bank. These are essentially areas of open flow under overhanging channel banks. The lunkers provide a location that is completely covered in shade, has lower velocities, yet maintains adequate depth for the aquatic population (as opposed to the typical shallow depths found along the channel shore / bank). Additionally, the lunker is serves as protection from erosive channel forces on the bank thus stabilizing the bank vegetation as well.

Lunkers were originally developed as habitat enhancement structures. As such, they have a significant potential to improve stream habitat in the form of undercut banks and overhead cover.



Photo 1. Fabricated Lunker Ready for Installation



Photo 2. Installed lunker

Applicability: Lunkers work well at improving habitat in areas with degraded channel banks that are void or lacking in vegetation and therefore have decreased cover and increased water temperatures. Lunkers can also provide help to create a deeper and narrower cross section where the channel width has become unnaturally wide and shallow. Lunkers are not recommended for streams subject to extreme flooding.

Pros and Cons:

1. Pros of lunkers:
 - a. Aquatic habitat that is protected by an overhanging bank
 - b. Reduced water temperatures due to lack of sunlight
 - c. Increased bank protection
 - d. Increased vegetation on bank
2. Cons of lunkers:
 - a. Construction is labor intensive and can be expensive