Revegetation Best Management Practices

Primary Goals of Revegetation

- To protect the stream bank against erosion, over both the short and long term
- To reduce the need for drainage maintenance in the future
- To prevent the invasion of noxious and invasive weeds
- To provide shade to reduce regrowth of weeds and reed canary grass in the channel
- To reduce heating of the waterway
- To filter sediment, dissipate overland flow, and increase infiltration away from the waterway
- To replace cover and food sources for fish

Additional Goals

- To develop the riparian area into an integral part of the farm ecosystem.
- To maximize limited resources by prioritizing revegetation requirements according to the waterway classification system.
- To minimize on-site impacts by using established best management practices (BMPs) during construction.
- To encourage farmers, whether voluntarily or through grant funding, to plant more functional native tree and shrub buffers than required through the streamlined ADAP on waterways that are high watershed priority for salmon habitat and water quality improvements.

Objectives for Revegetation

The following objectives would be used to meet the goals stated above.

- Eighty percent of the plantings survive after three years (as required under state law)
- The over-hanging canopy covers 80 percent of the waterway after three to five years.[1]

General Best Management Practices (BMPs)

Banks are generally revegetated after waterway maintenance activities, particularly if the bank vegetation has been removed. If there is no streamside vegetation, planting the bank is often the most cost-effective stabilization technique and will also help create better fish habitat. Plant roots help to hold the bank material together. Grass does not typically root deep enough to provide much stabilization, while native trees and shrubs typically will.

However, trees and shrubs take time to produce enough root growth to stabilize and protect the bank. Until the woody material becomes established, seeding grass (as described in the post-construction erosion control BMPs) will provide faster cover. Note that grass can be very competitive with the woody species, so it needs to be controlled in the area around the planted shrubs or trees since woody vegetation provides stronger bank protection against slumping. To improve establishment of plantings and reduce maintenance costs, the use of weed fabrics is recommended prior to planting. In some cases, it may be necessary to use interim non-plant protection measures, such as biodegradable or synthetic geotextiles.

[1] Landowners are not expected to measure the overhanging canopy; rather, government agencies would measure when assessing the ag drainage maintenance program.

To obtain cost shares from King County for revegetation, a planting plan is required that shows where and what type of plants will be planted along the waterway after construction has been completed. Examples of planting plans are available from King County. The King Conservation District may be able to provide advice on what to plant. Information on native plants is also available at http://green.kingcounty.gov/gonative and http://www.kingcounty.gov/sites/environment/stewardship/nw-yard-and-garden/native-plant-resources-nw.aspx.

Two possible methods of revegetation are live staking and container or bare root planting.

BMPs for Live Staking

Cuttings from several woody plants are often readily available and easy to install. This is referred to as 'live staking.' Live staking is used in many bio-engineering practices to stabilize soil and the banks of the waterway. The best time for harvesting and stake installation is the late fall or early spring. Get professional advice when considering planting at other times.

Practices

- Generally, willow species, red osier dogwood, and cottonwood are all capable of re-growing from stakes
- Install between October 15th and March 15th (the earlier the better within this timeframe)
- The lowest row of stakes should be placed as close as practical to the ordinary high water mark—not at the top of the bank
- Plantings in each row should be generally 3 feet apart
- Live stakes also work well when combined with other erosion control BMPs (described in the post-construction BMPs) such as jute fabric
- The stake should be no smaller than the diameter of a thumb or index finger, 0.5-1.5 inches, and at least 4 feet long
- If planting in reed canary grass, choose longer stakes, 5 to 6 feet long, in order for them to be able to outgrow the grass
- Be sure to protect the plant material from drying out between the harvesting and planting by placing bundles of stakes in the waterway and assuring they are secured so that they don't float away
- Try to plant the stakes within 24 hours of taking cutting and keep moist until installed
- Soaking cuttings 24 to 72 hours before planting has been shown to increase plant survival rates
- Spacing will depend on the plant type and eventual size of the plant
- Cut the bottom of the cutting at a 45° angle and always plant the angled end down
- Push the stake in by hand or tap it in gently with a soft mallet until about 2 feet or at least 1/3 of the stake (preferably ½) is below the ground
- To prevent damage to the cutting, a probe should be used to create a pilot hole, and is essential if the soil is very hard.
    - The pilot hole should be slightly smaller than the diameter of the cutting to ensure good soil-plant contact
    - If the hole is larger than the cutting, pour a slurry of water and native soil into the hole with the cutting

- In all cases, tap the soil around the base of the planted cutting with your boot to collapse any air pockets near the cutting
- Irrigate after planting and throughout the first 1-3 dry seasons if possible
- It may be helpful to install grow tubes on the stakes for more rapid growth and to protect from wildlife.

BMPs for Planting of Container or Rooted Stock

Container-grown and bare root stock can be purchased from nurseries or transplanted from areas away from the slope. Pre-rooted plant material can offer a faster but more expensive solution to some slope stabilization projects than live staking. It is often used when rapid root establishment is required or where cuttings of desired species do not easily root.

Practices

- Planting is best October 15-March 15, with the optimal period in October 15-November 30.
- For a diagram of how to plant, see http://www.soundnativeplants.com/PDF/Planting%20diagram.PDF
- The row of plants closest to the waterway should be placed as close as practical to the ordinary high water mark—not at the top of the bank
- Plantings in each row should be generally 3 feet apart
- Containers should be at least 9 cubic inches in volume and 8 inches in depth (1 gallon pot).
    1. Take the plant out of its pot or burlap to view its root size. Keep the roots wet.
    2. Dig a saucer-shaped hole 2-3 times the width of the root mass, and about as deep. Fill hole with water and let drain.
    3. Build a mound of soil at the bottom of the hole.
    4. Loosen bound roots and shake off excess potting soil (not into the planting hole).
    5. Gently spread the roots evenly over the soil mound. The roots should not circle in the hole.
    6. Place the plant so the root flare (where the roots join the stem) is at the soil surface.
    7. Replace soil into the hole so it fills the space between the roots.
    8. Water generously and add more soil to fill the hole up to the root flare.
    9. Create a soil berm around the planting hole to retain moisture.
- The plants should be monitored and irrigated until the root system is well-established, up to three years depending on how dry the summers are that follow the project.

Specific BMPs by Waterway Classification

Revegetation requirements are prioritized according to the waterway classification system. Waterways that are expected to have higher numbers of salmon during the fish window have higher requirements for revegetation to maximize limited resources to benefit fish habitat and water quality. Conversely, waterways that are expected to have no or low numbers of salmon during the fish window have lower or no requirements for revegetation. When the drainage project is conducted, if actual incidence of fish are found to differ from the designated waterway class, revegetation requirements will be adjusted accordingly, and the waterway will be reclassified for future reference.

Natural waterways will not be covered under the streamlined ADAP; farmers should work directly with WDFW on drainage projects in these waterways.

Below is a standardized practice to address the objectives for revegetation. In all cases, the first row should be planted as close as practical to the ordinary high water mark to create over-hanging canopy that will shade the waterway as quickly as possible. In addition, fast-growing native trees and shrubs are necessary to achieve the objective of 80 percent canopy cover within three to five years. Over-planting may help ensure survivability. Examples of the three plant groups referred to in the matrix below can be found in a table that follows.

Farmers may choose to request an alternate planting proposal from the matrix below; however, if the King County templates are not used, it may take more time to obtain the HPA permit and approval of the cost-share agreement. For example, if more slower growing plants are chosen, then additional interim maintenance will be necessary to keep the reed canary grass and other invasive species from returning before the plantings provide sufficient shade to inhibit their return.

Planting additional rows of native trees and shrubs is encouraged (but not required) to achieve the revegetation goals stated earlier in this proposal.

Standardized Plantings by Waterway Class to Address Revegetation Goals and Objectives			
Waterway Class	***High***	***Moderate***	***Low***
Natural	N/A	N/A	N/A
Modified	3 rows of native trees/shrubs on each side of the waterway: • At least 60% from Group 1 in row close to ordinary high water mark, of which at least half (30% of total) are the fastest growing (such as willow), remainder from Group 1 or 2; • 2nd row from any of the groups as long as no more than 5% comes from Group 3	2 rows of native trees/shrubs on each side of the waterway: • At least 60% from Group 1 in row close to ordinary high water mark, of which at least half (30% of total) are the fastest growing (such as willow), remainder from Group 1 or 2; • 2nd row from any of the groups as long as no more than 5% comes from Group 3	2 row of native trees/shrubs on each side of the waterway: • At least 60% from Group 1, of which at least half (30% of total) are the fastest growing (such as willow), remainder from Group 1 or 2
Artificial	2 rows of native trees/shrubs on each side of the waterway: • At least 60% from Group 1 in row close to ordinary high water line, of which at least half (30% of total) are the fastest growing (such as willow), remainder from	1 row of native trees/shrubs on each side of the waterway: • At least 60% from Group 1, of which at least half (30% of total) are the fastest growing (such as willow), remainder from Group 1 or 2	No plantings required

	Group 1 or 2; • 2nd row from any of the groups as long as no more than 5% comes from Group 3		

Specific trees and shrubs may be added to or deleted from the lists below over time as more is learned about their success rates on King County waterways in achieving the goals of revegetation. At least 60 percent of the row closest to the ordinary high water line should be from Group 1, the fastest growing and tallest plants, in order to quickly provide shade to limit regrowth of reed canary grass and replace lost habitat. Plants from the third group should be limited to 5 percent of what is planted because they are the shortest and slowest growing. Ornamental or hybrid species should not be used.

Examples of Trees/Shrubs for Waterway Revegetation	
Common Name	***Scientific Name***
Group 1 *(At least 60% of total plants in row close to ordinary high water line; at least half [30% of total] of these should be willow, the fastest growing choice)*	
Red osier dogwood	*Cornus stolonifera*
Sitka willow	*Salix sitchensis*
Pacific willow	*Salix lasiandra*
Scouler willow	*Salix scouleriana*
Black cottonwood	*Populus trichocarpa*
Red alder	*Alnus rubra*
Group 2	
Black twinberry	*Lonicera involucrata*
Pacific ninebark	*Physocarpus capitatus*
Red elderberry	*Sambucus racemosa*
Beaked hazelnut	*Corylus cornata var. californica*
Vine maple	*Acer circinatum*
Oregon ash	*Fraxinus latifolia*
Sitka spruce	*Picea sitchensis*
Bitter cherry	*Prunus emarginata*
Pacific crabapple	*Malus fusca*
Group 3 *(Limited to 5% of total plants)*	
Salmonberry	*Rubus spectabilis*
Nootka rose	*Rosa nutkana*
Snowberry	*Symphoricarpos albus*

Voluntary Plantings and Links to Larger Landscape-scale Habitat Improvements
Farmers are encouraged to work with non-profit stewardship groups, the King Conservation District, and others to conduct voluntary waterway plantings that will improve fish habitat and water quality, particularly on land that may be too wet to be productive for farming. Some of

these efforts can be linked to watershed- and basin-scale priorities of salmon habitat plans and federal and state grant programs for possible funding assistance. We look forward to linking these programs to ADAP as a means of achieving increased benefits beyond the minimum required plantings and to obtain assistance for more drainage projects to keep King County farm lands productive.