



# King County River and Floodplain Management Program

## BEST MANAGEMENT PRACTICES FOR PROCUREMENT AND USE OF WILLOWS AND OTHER NATIVE SHRUB CUTTINGS

### INTRODUCTION

King County's River and Floodplain Management Program (RFMP) manages a system of over 115 miles of levees and revetments along the major rivers in King County, including a quarter-mile-long constructed high flow channel on the Sammamish River in Marymoor Park in Redmond known as the Sammamish River Transition Zone (SRTZ). The condition of the vegetation on these facilities varies greatly from complete coverage with invasive species to diverse communities of native riparian vegetation. Management of the vegetation on these flood protection facilities is guided in part by policies in the 2006 King County Flood Hazard Management Plan, which include a mandate to "protect or enhance aquatic, riparian and other critical habitats" (Policy Proj-6). In order to meet the intent of this policy, King County strives to protect, and, wherever possible, improve native plant communities on levees and revetments.

The RFMP staff have made extensive use of native riparian vegetation plantings—most notably installation of willow cuttings—in levee and revetment repair projects since the early 1990s. The most intensive way in which vegetation communities are improved is through the rehabilitation of damaged levees and the complete replacement of invasive species with willows and other native trees and shrubs. In order to do these retrofit projects, it is necessary to take cuttings from other flood protection facilities. In addition, it is sometimes necessary to thin stands of willows to allow flood protection facilities to be inspected for public safety purposes. At present it is necessary to periodically remove most of the willows from the SRTZ high flow channel to preserve the designed flood conveyance of the facility. By coordinating willow harvesting activities with revegetation of flood facility repairs and other habitat restoration projects, both flood hazard reduction and riverbank restoration can be conducted in a manner that minimizes adverse impacts on riparian habitat and maximizes long-term improvement of riparian habitat.

This document describes the best management practices (BMPs) that RFMP staff use to harvest willows and other native plant cuttings from flood protection facilities and properties. In addition, it contains recommendations concerning the installation of vegetative cuttings and other plantings during levee and revetment repair and rehabilitation projects.

## **CONSERVATION RATIONALE**

Sometimes it is necessary to remove native riparian vegetation from flood protection facilities in order to meet flood hazard reduction needs. At the same time, the revegetation of river facility repair and retrofit projects and other kinds of smaller-scale habitat restoration projects is a standard practice. It is important to recognize that excessive removal of native vegetation can damage fish and wildlife habitat by reducing shade and cover, and diminishing habitat for terrestrial insects that are an important source of food for fish. Therefore, it is important to harvest native vegetation for these purposes in a way that maintains healthy riparian habitat. Removing or harvesting only what is needed to create the desired outcome is foremost to the conservation approach.

Experience has shown that it takes three or more years for willow cuttings installed at a typical river facility repair project site to grow to harvestable size, namely an average diameter at breast height (dbh) of at least one inch. Harvesting approximately one third of a mature stand of willows no more often than once every three years will ensure that the cut stems will regenerate fully after harvesting, and the riparian habitat functions will not be unduly compromised. The goal, therefore, is to protect existing stands of natural riparian habitat, and maintain a reliable, sustainable supply of harvestable riparian vegetation at previously revegetated flood protection facilities.

## **VEGETATION MANAGEMENT BEST MANAGEMENT PRACTICES**

These BMPs can be grouped into five broad categories: coordination and record keeping, harvesting activities, harvest crew safety and training, plant installation, and the use of planting soils and soil amendments.

### **COORDINATION AND RECORD KEEPING**

1. The River and Floodplain Management Program's Maintenance Engineer will keep a record of the condition and status of potential harvest sites along with the vegetation management objectives for each site. The purpose of this record-keeping is to ensure that cutting sites are not over-harvested and that river facility maintenance objectives are being met.
2. All vegetation management activities, including vegetation removal for maintenance purposes and harvesting to obtain cuttings for installation at habitat restoration sites, will be coordinated in advance with RFMP's Maintenance Engineer.
3. Whenever possible, the Maintenance Engineer will arrange for vegetation removal to be conducted concurrently with revegetation projects in order to maximize the freshness of the cuttings and minimize labor and transport distances.

4. In addition to King County flood protection facilities, cuttings may be available from King County-owned retention/detention (R/D) ponds and swales where King County maintenance crews routinely remove woody vegetation. Individuals who need cuttings from these facilities are encouraged to contact staff of the King County Road Services Section.

## **HARVESTING ACTIVITIES**

1. Unless otherwise directed, no more than one third of a stand of native riparian vegetation will be removed within any given three-year period. Cuttings will be taken evenly throughout the stand to avoid the creation of bare areas or unnecessary gaps in the canopy. The primary exception to this BMP will be when harvesting from the SRTZ during years when all willows need to be removed from the high flow channel landward of the low flow channel in order to maintain flood conveyance.
2. Willows will be cut at least six inches above the ground to promote full stand regeneration.
3. A 10-foot minimum width of intact vegetation will be left as a buffer adjacent to the ordinary high water mark (OHWM) of all natural waterbodies. This restriction does not apply to willows harvested from constructed R/D ponds.
4. Whenever practicable, hand tools will be used to harvest and process willows.
5. Chain saw chains will be lubricated with vegetable-based oil. All power tools will be fueled well away from surface water using oil absorbing pads to capture spills.

## **HARVEST CREW SAFETY AND TRAINING**

1. Harvest crew members will be trained in personal safety, cutting techniques, and conservation guidelines. This training will include appropriate methods for taking, handling, and storing native plant cuttings to ensure that they remain viable under all weather conditions.
2. Harvest crew members will wear appropriate protective clothing (boots, hardhats, chaps, gloves, eye and ear protection) and be trained in the safe use of cutting equipment, including loppers and chain saws.
3. When working in publicly accessible areas, signage will be posted to ensure that passers-by are aware of the harvesting activity. This is especially important when working on public trails.

## PLANT INSTALLATION ON LOWER STREAM BANKS

1. Stem Diameter and Length: Cuttings should be at least one inch in diameter at the butt end and long enough to overhang the outer edge of the geogrid soil layers by up to one foot. On most project sites this means that cuttings will average approximately eight feet in length, the longer the better. Where the horizontal width of the geogrid soil layers is narrower—for example, where the bank is unusually steep (i.e., where the facility slope angle exceeds 2V:1H) OR at the uppermost geogrid layer—cuttings may be somewhat shorter (e.g., 4-6 feet in length) as long as they are at least one inch in diameter at the butt end.
2. Transport and Storage: Whenever possible, cuttings should be cut and used the same day. If immediate use is not possible, cuttings ideally should be kept in the water to stimulate root and shoot formation following planting. At a minimum they should be kept out of the sun and wind.
3. Installation Elevations: On most rivers, the lowermost cuttings layer should be placed at or slightly above the ordinary high water mark (OHWM). An exception to this is along the Green River, where prolonged spring water release from Howard Hanson Dam necessitates placement of the lowermost cuttings layer approximately one foot above the OHWM. The OHWM can be determined by sighting the lowest elevation on the river bank at which woody vegetation (shrubs and trees) grows in an unaltered bank segment either on the opposite side of the river, or a short distance upstream or downstream on the same side of the river as the project site. Roads crews have a laser level that can help determine this elevation.
4. Species: The three most common willow species in the valleys of the large rivers of King County are Pacific willow (*Salix lasiandra*), Scouler willow (*S. scouleriana*), and Hooker willow (*S. hookeriana*). Although these species have different growth characteristics, they frequently hybridize, making exact identification difficult in some cases. The project ecologist is free to specify which species to use at a particular project site, as long as he or she is willing to identify suitable cutting sites from which adequate quantities of cuttings can be obtained for that project. In such situations, the project ecologist is also responsible for bringing the need for special cuttings to the attention of the RFMP Maintenance Engineer well in advance of the project start date.
5. Spacing: The standard spacing is four cuttings per lineal foot. If rationing has been activated, this spacing may be increased with notification of the project ecologist.
6. Orientation: Cuttings should be placed on the geogrid soil layer with the butt ends pointing toward the cut slope and the tips pointing toward the river, with up to one foot of the tips protruding from the face of the finished slope. Criss-crossing or interlacing the cuttings is acceptable as long as the butt ends are oriented toward the cut bank and the tips are oriented toward the river.
7. Trimming: The tips of the cuttings overhanging the geogrid soil layers do not need to

be trimmed.

8. Inclusion of Potted Plants with Cuttings: Potted plants can be included along with cuttings in geogrid soil layers. Species that typically grow well in the lowermost geogrid layers include red-osier dogwood (*Cornus stolonifera*), Pacific ninebark (*Physocarpus capitatus*), and Oregon Ash (*Fraxinus latifolia*). Other species such as wild roses (*Rosa* spp.), thimbleberry (*Rubus parviflorus*), and Douglas hawthorn (*Crataegus douglasii*) can be incorporated in middle and upper geogrid layers. The ideal spacing for these plantings is a single one-gallon rooted plant every three to four lineal feet. If the project occurs toward the end of the growing season or during the plant dormancy season (i.e., October through March), bare root plants can also be installed in this manner at a somewhat closer spacing of one plant every two to three feet. Larger specimens should be installed at greater intervals, as specified by the project ecologist.
9. Watering: Each geogrid soil layer should be well watered before placement of the cuttings within a layer of topsoil. Ideally, the soil beneath and covering the cuttings will be watered during installation so the cuttings lie in a “sandwich” of wet soil. The project ecologist and/or the project engineer should arrange for watering at least once a week following completion of the project either until the onset of cool weather in late September/early October, or a prolonged period of rain in the early fall. During subsequent growing seasons water may be supplied by installing a drip irrigation system, spraying water from a water truck, or pumping water from the adjacent river if a Washington Department of Ecology watering permit has been issued.

## **PLANT INSTALLATION ON UPPER STREAM BANKS**

1. Potted native riparian plants should be planted on the upper slopes above the geogrid layers and on the top of the bank wherever possible, including on public rights-of-way and privately owned lands wherever King County has suitable easement rights or the landowner permits the installation of plantings.
2. The project manager is responsible for asking the landowner for permission to install plantings during discussions about design, easement, access, and scheduling issues. If necessary, the project ecologist can assist in these discussions.
3. The project ecologist is responsible for including appropriate upper bank plant specifications in the project design drawings. The project ecologist will also order, take delivery, and manage the initial installation of plantings during the construction phase of the project. After construction is complete, the RFMP Maintenance Engineer will manage installation of the upper bank, top of bank, and landward area plantings. During this second revegetation phase of the project, the RFMP Maintenance Engineer will order and take delivery of the plants, and schedule work crews to install the plants. The RFMP Maintenance Engineer will also arrange for any needed watering and replacement of plants that fail to survive or are lost due to

scouring flood flows or vandalism.

## **USE OF PLANTING SOILS**

1. The growth rate of native plant seedlings established in one gallon plastic pots containing pure biosolids compost has been shown to be approximately three times greater than seedlings grown in commercially available topsoil. Therefore, wherever possible, the soils used in vegetated geogrid soil layers in RFMP bank stabilization projects should contain 10% to 15% of this or an equivalent type of organic compost such as steer manure or other approved organic materials. Such materials increase nutrient concentrations and improve the moisture retention properties of the geogrid planting soils.
2. High quality topsoil is present at many project sites, and sometimes it can be conserved and reused either by stockpiling it on site, or transporting it to King County soils recycling facilities for screening and incorporation of any necessary soil amendments for use in future projects. Alternatively, topsoils and amendments can be supplied by vendors in the King County Bid Book. In some cases, such materials can be pre-mixed prior to delivery. Otherwise, the desired soil materials can be mixed on-site using a backhoe.
3. The soil layers in which cuttings are placed should vary in thickness from at least eight inches at the riverward edge (four inches of soil under the willows and four inches of soil covering the willows) and up to one foot at the landward edge of the layer.