TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE
PLANT MATERIALS - 10 SPOKANE, WASHINGTON
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RIPARIAN REVEGETATION – PLANTS

Technical Note #10 is subdivided into the following Sections:

SECTION 10.1 Collecting and Care of Willow, Poplar, and Redosier Dogwood Cuttings for Riparian Plantings.

{Wayne Crowder, 1995}

When a shrub or tree planting is to be made in a riparian site, determining the kind of materials to be used and the method of planting is necessary.

Woody plants can be propagated from seed, softwood cuttings, hardwood cuttings, semi-hardwood cuttings and root cuttings. All of these materials can be used to develop rooted containerized plants. However, with species easily propagated with hardwood cuttings, this option is often more economical than other methods.

Direct field planting on riparian sites of unrooted hardwood cuttings offers advantages over using rooted containerized plants. It minimizes to some extent the physical resources needed - - no greenhouse, lath house, plant media, plant containers, etc. The time frame between obtaining propagation material and the field planting date can be shorter. Dormant cuttings do not have to go through a "hardening off" process as live plants do. Maintaining cuttings during storage requires less personal attention than live leafy plants and dormant cuttings are less susceptible to after-planting frost than live leafy plants.

Willows, poplars, cottonwoods and redosier dogwood are examples of species which may be planted direct into riparian sites as hardwood cuttings. Check with your Plant Materials Specialist for information on a particular species.

Hardwood cuttings are leafless stem cuttings taken during the dormant season, usually after temperatures drop into the 30-40^{O}F range to allow for adequate cold treatment of

buds. In much of eastern Washington, December 1 would be considered late enough to make hardwood cuttings. Many species of willow and poplar will root without application of root promotion hormone applied to the basal cut. Redosier dogwood will also root without hormone application, but may take longer to root than poplar or willow. It appears that the west-side ecotypes of redosier dogwood are easier to root than east-side cuttings so rooting hormone is advised for east-side ecotypes. Cuttings should have at least 2 nodes. All cuts should be made with a sharp tool which leaves a clean, smooth cut. Shattering or smashing of the stem is undesirable. Sometimes hardwood cuttings are made in the field then cut to length off-site. Bandsaws or circular saws are acceptable for this purpose if they can make relatively smooth cuts.

Two potential options exist for planting after cuttings are made. First, cuttings can be collected, trimmed and planted without need for storage if planting is done soon after cutting. Second, cuttings can be collected, trimmed, bagged and stored pending planting at a later date. Consideration should be given to available labor and site conditions for either option chosen.

Whips are flexible hardwood cuttings approximately 4 feet long, usually about 1/2 - 3/4 inch minimum in diameter at the basal end. Potential diameter will vary with the species and site. Hardwood cuttings may be collected as whips on site, transported and later cut to a desired length or planted soon after cutting.

Pole cuttings are rigid and larger in diameter than whips. Potential diameter of pole cuttings is usually limited by practical things such as cutting weight and equipment ability to make the necessary hole size for planting. Length may be greater than whips. More source plants are required to support this option. Also, logistics and planting equipment are more complex. Success rate of pole plantings is greater due to ability to plant deeper into the moisture zone.

Plant Materials Collection

Collection site selection could be affected by numbers of plants needed to provide quality cuttings. If plant numbers are limited, it may be useful to get an "eyeball" estimate of the potential numbers of cuttings available. Approximate number of cuttings needed should be known ahead of time.

The collection site should be accessible, have a reasonable population of desirable source plants and be within an acceptable distance. For whips and small diameter cuttings parent plants should have vigorously growing stems, have young stems with minimal branching and have no apparent disease. Pole cuttings will need to be made from older wood.

Collect several cuttings from the site before you actually plan to harvest. Using sharp shears, cut the whips into 3-5” pieces and examine the condition of the interior woody tissue. It should be almost white. Dark brown tissue is an indication of disease, and this can result in poor rooting. Stands that exhibit a high amount of diseased wood should be avoided. Also examine the stems for galls. Galls are a sign of insect predation. Avoid stands that have a high amount of gall incidence.

Best cuttings are those which are fairly straight and have little branching which necessitates less trimming. There should be healthy buds on the cuttings. Willows,

poplars and cottonwood will root from much older wood, therefore size (diameter) that can be handled becomes more of a factor than age, especially with pole plantings. Generally, basal diameter should be a minimum of 3/8 - 1/2 inch in diameter for cuttings 12 - 18 inches long. Longer cuttings will naturally have a larger basal diameter. Realistically, "ideal" cuttings cannot always be obtained. Emphasis should placed on obtaining quality materials. (Cuttings from native plants may be available in the local area). Water sprouts frequently provide excellent cuttings. Cottonwood cuttings taken from lower branches generally do not root as well as upper branches.

Length of cuttings: Direct planted dormant hardwood cuttings of willows have been more successful in western Washington sites when approximately 4 foot long cuttings or whips were used when compared to 18 - 24 inch cuttings on similar or same sites. (See WA Technical Note 21 for more information). The longer length allows cuttings to be planted deeper and into the mid-summer moisture zone. Cuttings planted into soil which dries out below the cutting and its developing roots have poor survival rates.

The Aberdeen, Idaho Plant Materials Center's direct plantings on riparian sites with willow, poplar and redosier dogwood indicate larger diameter cuttings survive better than the smaller diameters. Cuttings up to three inches in diameter have been used with excellent survival. (Hoag and Short, 1993)

After parent plants are cut back the first time, subsequent growth frequently produces cuttings of better quality and higher numbers. If sufficient lead time is available, parent plants could be cut back, allowed to regrow, then used for hardwood cuttings in the following dormant season. Furthermore, if a local need for cuttings exists over more than one growing season, sites which have had cuttings taken from them should be considered as potential sites again the following year.

Tools: Short handled hand pruners are adequate if stem diameter is not more than approximately 3/8 inch and numbers cut are not large. Long handled lops or pruners provide a longer reach and more leverage, allowing a larger diameter stem to be cut. Power saws may be useful for larger diameter stock.

Time of year to take cuttings: Hardwood cuttings should be cut from source plants during the dormant season, usually December 1 and later in much of eastern Washington. Western Washington cuttings can be harvested in January and February. Dormancy usually occurs after a hard frost. Then buds need an adequate "rest" period. Use of dormant cuttings allows more time for the cuttings to produce roots before energy is diverted to leaf production. Time of year to take cuttings during the dormant season will depend on whether cuttings will be stored after cutting or planted into the field right away. Planting right away will be affected by field conditions where cuttings will be taken and also where they will be planted. Both sites must be accessible by workers and equipment.

Cuttings which will be direct planted into a site may need to be trimmed, culled and counted.

Depending on the time of the year cuttings are taken, consideration should be given to keeping the cuttings cool and moist after they are cut. If cuttings are to be transported a distance away from the collection site, consideration should be given to covering them with a tarp or other suitable cover to prevent drying.

Storage

Cuttings should be trimmed to a single stem. If the base of the cutting is frayed or crushed, a new "clean" cut should be made. Bottom ends of cuttings should all be at one end of the bundle or plastic bag. Keeping cutting counts in each bundle or bag to a consistent number (25's, 50's, 100's, etc.) will help assure easy counting later on, assure enough cuttings are collected and help assure enough cuttings are sent to a particular field site for planting.

It may be desirable to paint the tops of the cuttings to help planting crews get the "right end" up, especially when using inexperienced crews. This can be done with a fast drying spray paint of a color (white, etc.) which is easy to see. Other types of paint which dry slowly may present problems in drying in cooler temperatures during the time of year cuttings are collected. Paint should be dry before cuttings are bagged and stored or before further handling after painting.

Cuttings can be sprayed with water to help keep them moist prior to bagging for storage. Bags should be made of fairly rugged plastic. Addition of moist peat moss to the bag prior to tying the top is desirable. Cuttings should fit comfortably inside the bags. Bags should be heavy enough to prevent punctures which tend to occur when handling bagged cuttings. Bags should be able to retain moisture around the cuttings.

Storage conditions: Cuttings should be stored in the dark, at temperatures approximately 24 - 32^{o}F (ID Technical Note 23, 1993). Longer storage than 60-90 days necessitates storage as close to 24^{o}F as practical. The intent of refrigerated storage is to retard development of leaf buds so that leaves do not appear during storage, retard premature development of roots and keep cuttings moist. Willow and poplar cuttings may develop short roots while in storage, regardless of low temperatures if stored long enough.

Length of storage: Storage time of 30-60 days should be adequate for most needs. Cuttings of willows and poplars have been stored successfully for 6 months at 24^{o}F. (Cram and Lindquist, 1982).

Pre-plant Conditioning of Cuttings

There has been some evidence suggesting that willow, poplar and redosier dogwood cuttings benefit from pre-plant conditioning. Storage with moisture in bags at low temperatures (32^{o}F) for 2 - 4 weeks will provide this pre-plant conditioning if storage temperatures are above 32^{o}F. Also, if planting is done soon after cuttings are collected, some feel that soaking the cuttings upright with bottoms in a bucket or barrel of water prior to planting is beneficial. Soaking should be for a minimum of 24 hours (ID Technical Note 23, 1993).

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SECTION 10.2 Use of Herbaceous Vegetation for Streambank Erosion Control.

{John Schwendiman,1976}

Herbaceous vegetation is an important component of most healthy riparian areas. Grasses, glass-like plants, and forbs provide multiple functions and erosion protection is one of the most important functions. Streambank erosion is highly visual. Not only is the scar highly visible but the sediments carried downstream are just as visual. Controlling streambank erosion is crucial if we are to maintain credibility with the general public.

Effective streambank erosion control using herbaceous vegetation is a matter of judgment and implementation. Facts which will enable correct judgment decisions include on-the-stream soil and climatic information, hydrologic characteristics of the stream, including the volume and extent of flow, its low points and flood stages, its gradient, ice flows, etc.

Our knowledge of herbaceous vegetation streambank erosion protection comes largely from work with grassed waterways and water courses. Stem density, stem stiffness, plant height, root depth and root density, adaptation, and establishment requirements are some factors to consider when designing a streambank erosion control planting.

The first step in erosion control of streambanks is protection of desirable existing vegetation. Retain natural cover as much as possible. Protection alone can often result in revegetation and bank stabilization. Fencing is an effective tool for protecting existing and new vegetation. Haying or grazing needs to be avoided when streambanks are saturated and vulnerable to livestock or mechanical damage. Weeds along adjacent areas such as roadsides and pastures need to be controlled to prevent invasion into the riparian vegetation.

Stretches that require revegetation need to be thoroughly planned. Several practices are generally required and approval authorities vary with these practices. The usual precautions with respect to seedbed preparation, time of seeding or planting, mulching, irrigation (where necessary) and pest management are applicable to streambanks, as well as to other critical areas.

Streambank erosion can be most economically and effectively controlled when both engineering and vegetative practices are employed than when either is used alone. Each stream and stretch of a stream is unique, therefore protection measures must be installed that are applicable to the specific site.

NRCS Engineering Field Handbook Section 7 “Grass Waterways” lists two charts (exhibit 7.1 and 7.2) that are useful for determining which types of vegetation are useful for protecting streambanks. It should come as no surprise that tall, wide-stemmed grasses provide the best flow retardance. Short mowed grasses and burned grass cover provide little flow retardance.

High stream flows generally occur in Washington in early spring when herbaceous vegetation is dormant. Consequently, flow retardance is dependent on biomass from the previous fall. Haying or grazing should be discouraged after August because little regrowth occurs. Post-haying regrowth is mostly leaf tissue with few stems. Leaves provide little retardance. Stems are more important.

The following chart was adapted from "Table 1. Vegetative Species Characteristics and Adaptability for Conservation Buffers, (Oksendahl, 2002)". It lists some characteristics that will help you select vegetation for revegetating a streambank.

GRASSES	SOIL PROTECTION AND COVER					Grassed Waterway	Riparian Forest Buffer	Streambank/Shoreline Protection
	GROWTH[1] CHARACTERISTICS	TOLERANCE TO WATER TABLE[2]	MOISTURE RANGE	STEM[3] DIAMETER	CRITICAL AREAS[4]			
Bentgrass, Redtop**	IMBC	1	18+	A	E		x	
Bluegrass, Big	NMBC	4	9-18	B	G			
Bromegrass, Meadow	IMRC	3	14+	B	G	x	x	
Bromegrass, Smooth*	IMRC	2	14+	B	E	x		x
Bromegrass, Mountain**	NMBC	4	16+	B	E		x	x
Fescue, Hard	ISBC	4	14+	A	G			
Fescue, Sheep	ISBC	4	10+	A	G			
Fescue, Tall*	IMBC	2	18+	C	G	x		
Foxtail, Creeping*	IMRC	1	18+	B	F	x		
Hairgrass, Tufted	NMBC	2	18+	B	G	x	x	x
Needle-and-thread	NMBC	4	6+	B	G			
Orchardgrass	IMBC	2	16+	C	G	x	x	x
Ricegrass, Indian	NMBC	4	6+	B	F			
Ryegrass, Perennial	IMBC	2	15+	C	E	x		
Saltgrass, Inland	NMRW	2	15+	B	G			
Timothy	IMBC	1	18+	C	F	x	x	
Wheatgrass, Bluebunch	NMBC	4	9+	C	F			
Wheatgrass, Crested (Nordan, CD-II, Hycrest)	ISBC	2	9+	A	G			
Wheatgrass, Crested (Douglas, Ephraim)	ISBC	2	14+	A	G			
Wheatgrass, NewHy	IMBC	2	14+		F	x		
Wheatgrass, Intermediate	IMRC	3	12+	C	G	x		
Wheatgrass, Pubescent	IMRC	3	12+	C	G	x		
Wheatgrass, Slender**	NMBC	3	10+		E			
Wheatgrass, Streambank	NSRC	2	8+	B	G	x	x	x
Wheatgrass, Tall	IMBC	2	12+	C	G			
Wheatgrass, Thickspike	NSRC	3	8+	B	G	x	x	x
Wheatgrass, Western	NSRC	2	14+	B	P	x	x	x
Wildrye, Blue**	NTBC	3	16+	C	G		x	x
Wildrye, Canada	NTBC	3	15+	C	G		x	x
Wildrye, Great Basin	NTBC	2	10+	C	F		x	x
Wildrye, Mammoth	IMBC	3	7+	C	F			
Wildrye, Russian	IMBC	3	14+	C	P			x

	SOIL PROTECTION AND COVER							
GRAINS	**GROWTH[1] CHARACTERISTICS**	**TOLERANCE TO WATER TABLE[2]**	**MOISTURE RANGE**	**STEM[3] DIAMETER**	**CRITICAL AREAS[4]**	**Grassed Waterway**	**Riparian Forest Buffer**	**Streambank/Shoreline Protection**
Triticale	IMBC	3	9+	B	G			
Sorghum/Sudangrass	ITBC	2	17+	B	G			
ReGreen Hybrid Wheat	IMBC	3	12+	B	F		x	
LEGUMES/FORBS								
Alfalfa, Crown Type	ITBC	3	9+	B	G			
Alfalfa, Creeping Root	IMRC	3	9+	C	G	x		x
Burnett, Small		4			G		x	
Clover, Alsike	ISBC	2	18+	A	G	x	x	x
Clover, Ladino & White	ISRC	2	18+	C	G	x	x	x
Clover, Strawberry	ISBC	2	13-20	B	G	x		
Flax, Lewis	IMBC	4	15+	B	G		x	
Milkvetch, Cicer	ISRC	3	9+	B	F		x	x
Sanfoin	IMBC	3	18+	C	P		x	
Sweetclover, Yellow blossom	IMBC	4	9+	C	E			
Sunflower, Little	NMBC	4	12+	C	F		x	
Trefoil, Birdsfoot	IMBC	1	18+	C	G			
Yarrow, Western	NSRC	4	6+	A	E			

1/ N = Native, I = Introduced; T = Tall grass, M = Mid grass, S = Short grass; B = Bunchgrass, R = Rhizomatous; C = Cool season, W -= Warm season
2/ 1 = Ponded several weeks, 2 = Ponded only few days on surface, 3 = Water not ponded on surface, 4 = No water table
3/ Stem Density: A= fine stemmed < 1/8 inch diameter, B= 1/8 to 1/4 inch diameter = C = > ¼ inch diameter
4/ E = Excellent, VG = Very Good, G = Good, F = Fair, P = Poor

***These species are prolific spreaders and should not be used in areas where seed could move into riparian areas.**

****Only to be applied for quick growth and temporary cover. Long-term cover plantings should use no more than 15% in mixtures.**

SECTION 10.3 List of Native Woody Species Suitable for Wetland and/or Riparian Plantings in Washington.

		Native Habitat			
COMMON NAME	**Distribution in Washington**	**Wetland (Soils saturated much of growing season)**	**Riparian Zone 1 (Water's Edge**	**Riparian Zone 2 (Upper Banks - Flood Zone**	**Riparian Zone 3 (Uplands - Floods v. rarely)**
ALDER, RED	West-side, prominent in lower elevations	no	yes	yes	yes
ALDER, SITKA	Both sides of state, Mid to high elevations,	no	yes	yes	yes
ASH, OREGON	West-side, generally lower elevations	yes	yes	yes	no
ASPEN, QUAKING	Both sides, widespread	no	yes	yes	yes
BIRCH, WATER	East-side	no	yes	yes	no
CEDAR, WESTERN RED	Both sides, widespread	no	no	yes	yes
CHOKECHERRY	Both sides, widespread	no	no	yes	yes
COTTONWOOD, BLACK	Both sides, widespread	no	yes	yes	yes
DOGWOOD, REDOSIER	Both sides, widespread	yes	yes	yes	yes
ELDERBERRY, BLUE	Both sides, widespread	no	no	yes	yes
ELDERBERRY, RED	West-side, usually within 10-miles of coast	no	no	yes	yes
HAWTHORN, DOUGLAS	East-side, and coastal inlands	no	no	yes	yes
MAPLE, DOUGLAS	East-side	no	no	yes	yes

MAPLE, VINE	Both sides of WA	no	no	yes	yes
MOCKORANGE (SYRINGA)	East-side, and coastal inlands		no	yes	yes
NINEBARK	East-side	no	no	yes	yes
OAK, OREGON WHITE	West-side, and mid-elev of Yakima and Klickitat Counties	no	no	yes	yes
OCEANSPRAY	Both sides, widespread	no	no	yes	yes
ROSE, WILD	Both sides, widespread	no	no	no	yes
SERVICEBERRY	Both sides, widespread	no	no	yes	yes
SNOWBERRY	Both sides, widespread	no	no	yes	yes
SPIREA, DOUGLAS	Both sides, widespread	yes	yes	yes	no
WILLOW, ARROYO	West-side	yes	yes	yes	yes
WILLOW, COLUMBIA RIVER	Banks of Columbia below Deschutes and lower ends of tributaires	yes	yes	yes	no
WILLOW, COYOTE or SANDBAR	E. of Cascades	yes	yes	no	no
WILLOW, DRUMMOND	Palouse region, North-central WA	yes	yes	yes	yes
WILLOW, HOOKER	West-side, within 5 miles of Pacific Coast	yes	yes	yes	no
WILLOW, LEMMON'S	E. of Cascades, W. of Rockies	yes	yes	yes	yes
WILLOW, MACKENZIE	Both sides, generally below 5000 ft elev.	yes	yes	yes	yes

WILLOW, PACIFIC	Both sides, sea-level to mid elev.	yes	yes	no	no
WILLOW, PIPER	Western WA below 500 ft elev.	yes	yes	yes	yes
WILLOW, SITKA	Western WA, Mtns of E. WA	yes	yes	yes	yes