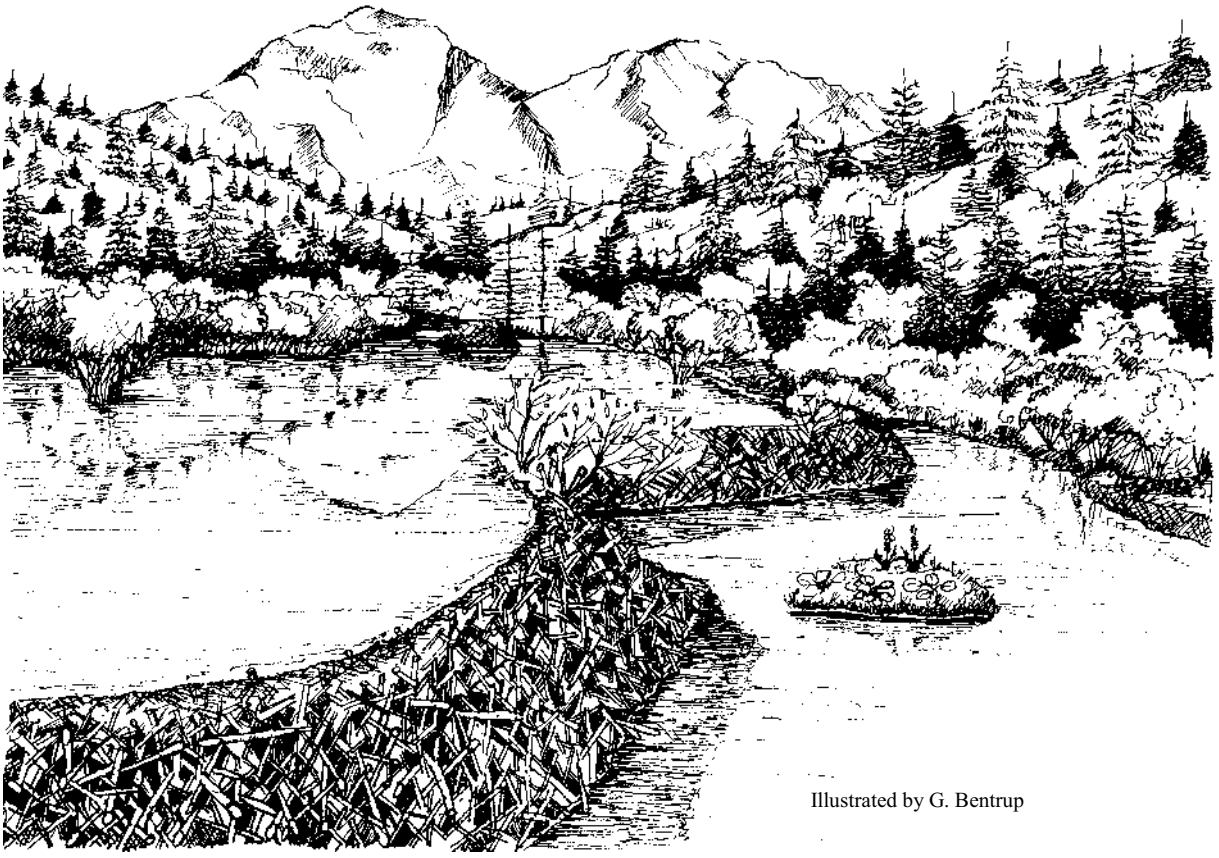
CITY OF COEUR D'ALENE
PLANT MATERIALS GUIDELINES FOR
STORMWATER BEST MANAGEMENT PRACTICES



Illustrated by G. Bentrup

CITY OF COEUR d'ALENE PLANT MATERIALS GUIDELINES FOR STORMWATER BEST MANAGEMENT PRACTICES

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OVERVIEW

This document is intended to serve as a guide for planting applicable plant materials in stormwater Best Management Practices (BMPs) in the City of Coeur d'Alene Stormwater BMP Manual. It should also be applicable as a guide for stormwater BMPs in most Northern Idaho counties. It provides information on general planning guidelines for selecting and planting plant materials for the stormwater BMPs. Discussion on subjects such as the role and function of plant materials in stormwater BMPs, native and introduced species, hydrologic zones, understanding your site, site preparation procedures, selecting plant materials, plant material handling methods, planting guidelines, and vegetation maintenance are included. In the back of this guide are: Appendix A - Climate information for Northern Idaho Counties; Appendix B - Vegetal Retardance-Cover Types for Biofiltration Systems; Appendix C - Plant Information Tables; and Appendix D - Vendors List.

This document includes operation and maintenance guidelines. The information is split into two phases, initial establishment and long term management. Often, initial establishment will take more effort than long term management. Typically this would include supplemental irrigation, extensive weed control, replanting, and erosion control. Long term management, which includes operation and maintenance, requirements would include mowing, irrigation, weed control, fertilization, sediment inundation situations, replanting, and residue management.

This document does not address designs or specifications for building or installing Best Management Practices. Contact the City of Coeur d'Alene for those specifics.

CLIMATIC INFORMATION

Climate information in Appendix A includes a visual PRISM precipitation map and information from selected weather stations in Northern Idaho Counties. This weather information includes precipitation data, average snowfall, high and low temperatures, temperature extremes, and growing season data.

ROLE AND FUNCTION OF PLANT MATERIALS IN WATER QUALITY

Plants can be extremely helpful in cleaning polluted water. Plants provide a natural purification function that can remove suspended solids (sediment) and a wide variety of nutrients and minerals such as nitrate, phosphorous, heavy metals, petrochemicals, and fecal coliform bacteria. They also provide roughness in areas that receive floodwaters, which slows the water, reduces its erosive force, and causes suspended solids to drop out of suspension. The above ground plant biomass provides sites for periphyton to live and multiply. The root systems provide colony sites for microbial populations that breakdown nutrients into useable proteins and amino acids in addition to basic elements and nitrogen gas.

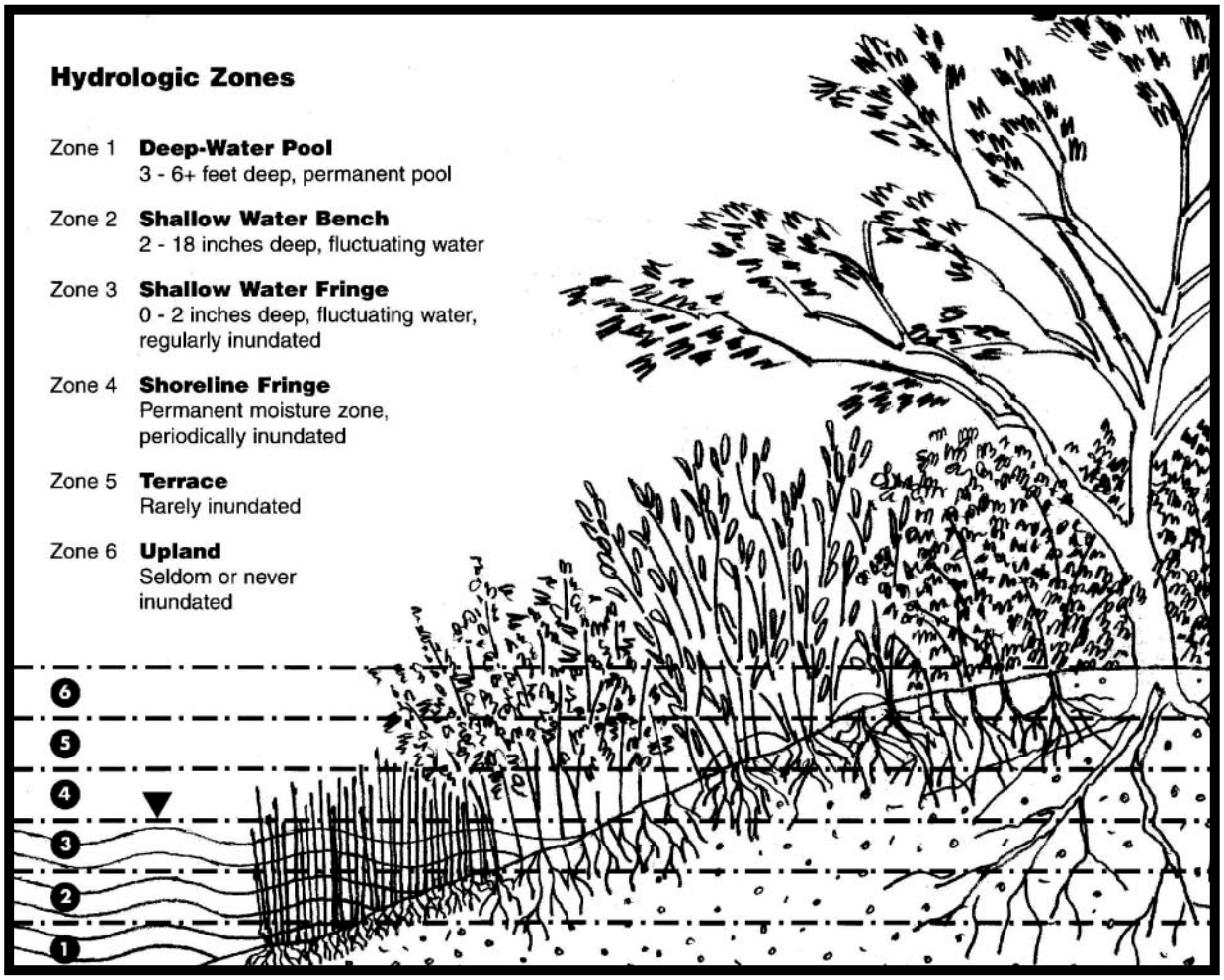
NATIVE PLANT SPECIES

Native plants including grasses, grass-like, forbs, shrubs and trees are normally recommended for wetland and riparian areas. Native plants are defined as plants that have evolved naturally in specific ecosystems. Many introduced species have been brought into the area by well meaning people or they have escaped from previous plantings. Introduced plants can escape from cultivation and spread into wild native plant populations. In many instances, these introduced plants out-compete the native plants and replace them in the wild. Examples of invading introduced plants include: Purple loosestrife which is even now offered in nursery catalogs as an ornamental flower; Reed canarygrass which is often planted in wet areas for forage; False Indigo, Russian olive, and salt cedar are shrubs that are crowding out many willows and cottonwoods in riparian zones, and others. These plants have few predators and can take over natural habitats very rapidly. By planting native species, we can protect the natural plant populations. Overall, native plants have evolved naturally and they are best suited to our climate. They need less maintenance and less replacement because of that adaptation. This will translate into lower costs.

Always purchase plants from reputable plant dealers that understand the species you want and have obtained the seed or plants from local ecotype sources. Plants should be propagated in soils and hydrologic zones similar to those at the project site. The seed should come from approximately the same elevation or higher, not from an elevation that is significantly lower. The general rule of thumb is that the plants should come from no more than 100 miles in latitude from the project site. Local seed sources should be preferred because the plants are adapted to the area and many of the diseases and insects that are found here. Do not use plants that are propagated from seed that comes from the Northeast, Southeast, Midwest, Southwest, coastal Pacific Northwest, or California. Make sure that the correct species have been planned and purchased because there is a significant difference in the ability of different plant species to survive in a particular hydrologic zone. The success of the planting is directly related to the source of the plant materials and the conditions they were propagated under.

HYDROLOGIC ZONES

The stormwater BMPs can be separated into hydrologic zones that will assist the user in determining where various plants can be successfully planted based on the water levels that are expected with each BMP. The hydrologic zones describe the depth of the water and the period of standing water. The hydrologic zones would include:



Zone 1: Deep Water Pool (3 – 6+ feet)

Ponds and wetlands generally have deep pools that are 3 to 6+ feet deep. Generally, these are open water areas that are designed for waterfowl use. Emergent wetland vegetation generally will not grow in permanent water depths that are deeper than 3 feet. Many species can withstand deeper water for short periods of time. However, over time they will tend to die out in these water depths. Most plants that are found at these depths are called submergent species. They root in the pool bottom and extend their stems up toward the water surface. Rarely will they emerge out of the water. These plant species can provide excellent fish and aquatic invertebrate habitat. They can also provide water cleaning functions to water in the pool, such as removal of nitrates and orthophosphorous. Submergent plant materials are not readily available on the retail market at the present time. Plant parts and seeds are mobile and they will come in from other wetland areas so planting generally will not be necessary.

Zone 2: Shallow Water Bench (2 - 18 inches), fluctuating water

Zone 2 is a bench that is added to the design of wetlands and ponds specifically to allow plants to become established and grow. Emergent wetland plants grow in this zone and are generally limited to long term permanent water depths of less than 3 feet and more often 18 inches and less. Species such as Hardstem bulrush can withstand water depths of 8 feet for short periods of time. However, they typically prefer water depths of 8 - 12 inches. Fluctuating water levels are important for maintaining wetland plant populations, keeping plant vigor high, and allowing for the rapid spread of the plants after planting.

Additional benefits that can be realized from establishing wetland plants in this zone. The plants contribute extensive wildlife and fish habitat to the wetland areas. The plants provide resident sites for periphyton, which provide major nutrient reduction to water that surrounds the plant stems. The plants also provide bank protection by reducing the wave energy before it hits the bank. By reducing the wave velocity, the plants will allow the water to drop sediment around the base of the plants thereby cleaning the water by removing suspended solids. Emergent plants can soften the engineered contours of wetlands or ponds and they also conceal lower water levels caused by water drawdown.

Zone 3: Shallow Water Fringe (0 - 2 inches), fluctuating water, regularly inundated

Zone 3 is the fringe around the edge of the water in the wetland or pond area. This area is regularly inundated, but will dry out on a frequent basis as the water level fluctuates. It is important that good plant cover be established in this area to reduce erosion and to assist with wave attenuation.

Establishment of plants in this zone is difficult because of the fluctuating water. This area is not accessible for maintenance when water levels are high. Problems with the public can occur in this zone so plants should be established to reduce access.

This zone will support wetland plants and water tolerant shrubs such as willows, birch, dogwood, and other shrubs. The shrubs provide wildlife habitat and water quality improvement through shade, nutrient uptake and breakdown, and sediment deposition.

Zone 4: Shoreline Fringe, permanent moisture zone, periodically inundated

This zone extends about 1 to 4 feet horizontally (1 –2 feet vertically) above the normal pool level. It is subject to periodic inundation after storms or high water events. Water will typically move off of this zone fairly rapidly (see design specifications for frequency). Plants in this zone typically like “wet feet” and do well under fluctuating water conditions. This zone is saturated for a majority of the growing season except when droughty conditions cause the water level in the wetland or pond to drop below normal levels for an extended period of time. Herbaceous plants should be planted to protect the ground from overland flow moving into the wetland or pond.

Zone 5: Terrace, infrequently inundated

Zone 5 is normally dry but can be inundated by floodwaters that normally drop in a few days. Operationally, zone 5 extends from the maximum 2-year water surface elevation to the 10 or 100 year maximum water surface elevation.

Plants in this zone should be capable of withstanding occasional inundation and common droughty conditions. Supplemental irrigation may be needed to maintain this zone during the hot summer months. Herbaceous plants should be low maintenance since they may be difficult to mow due to steep slopes. If problems with geese occur, more woody plants can be established.

Zone 6: Upland, seldom or never inundated

This zone is usually above the 100-year water surface elevation and generally does not extend down into the design area. A wide variety of plants can be established in this zone. Plant selections should be based on the soil conditions, water schedule potential, and function within the landscape. Placement of the plants should be used to create a visual focal point, frame a desirable view, screen undesirable views, serve as a buffer, or provide shade to allow for a greater diversity of plants.

UNDERSTANDING YOUR SITE

Soil Characteristics

The physical and chemical make-up of the soil materials available for revegetation often determines the procedures used, as well as the eventual success of reclamation. Many generalizations can be made regarding each kind of disturbance (Table I). Consolidated cut slopes will generally provide a shallower, more variable-rooting medium.

TABLE 1 Generalized Soil Characteristics of Disturbed Areas

Type Disturbance	Texture	Reaction	Slope	Depth
Roadside	variable	neutral-alk.	20-60%	shallow-deep
Sand/gravel	very coarse	alkaline	1% or 3%	shallow
Limestone	gravelly	alkaline	30-60%	shallow
Bentonite	very heavy	v. alkaline	20%	deep

The water holding capacity of the soil affects the composition of natural vegetation and the selection of species. Species must be tolerant to restrictions imposed by the soil. Major soil limitations for vegetation are doughtiness, fine or course textures, presence of restrictive pans, wetness, salinity or alkalinity, acidity, shallow depth and toxicity or severe nutrient imbalance. Slope, stoniness and the amount and quality of surface materials are also important within the climatic range of adaptation of each species

Soil Fertility

Many disturbed areas are extremely deficient in available nitrogen and phosphorus. Spoil material is nearly devoid of organic matter, so fertilizer nitrogen or nitrogen-fixation are the only viable sources of this nutrient, unless topsoil is applied. Annual additions of nitrogen fertilizer may be needed on some disturbed lands to sustain a plant community until a nutrient cycle can become established.

Disturbed lands can also be phosphorus deficient often because the pH is at or above 8.3 and abundant calcium carbonate keeps the phosphorus largely unavailable. Phosphate fertilizer increases the plant-available supply for only a few years. Application of topsoil greatly increases the available phosphorus levels on disturbed lands.

Most excavated and fill areas will require fertilizer to establish good cover. Apply a minimum of 30 pounds of nitrogen and 40 pounds of phosphate ($P^2O^{5)}$ to these areas. Deviations from these rates should be based on soil tests.

Topsoil

All topsoil and soil-like material should be saved and redistributed on the reclaimed area. Research has shown that up to 30 inches of applied topsoil increases the potential production of the reclaimed soil. Direct placement of topsoil (moved and replaced) provides a source of viable native seeds and vegetative structures, which volunteer into the reclaimed plant community. If top soils are not available, sub-soils should be amended with compost and other organic amendments that will ensure better soil tilth, improved infiltration characteristics, and to ensure improved soil biologic activity. Guidelines for selection of the best quality topsoil material for use in reclamation of disturbed land is shown in Table 2.

TABLE 2 Guidelines for Rating the Suitability of Topsoil for Use as Cover-Soil Material

Factors Affecting Suitability of Soil Material	Good	Fair[1/]	Poor[2/]
Textural class[3/]	vfsl, fsl, sl, l, sil	lfs, ls, cl, scl, sicl	s, c, sc, sic
Moist consistence[4/]	vfr, fr	lo, fi	vfi, exfi
EC (mmhos/cm)[5/]	<4	4-8	>8
ESP[6/]	0-5	5-15	>15
pH	5.6-7.8	4.5-5.6; 7.8-8.4	<4.5, >8.4
Stoniness class[7/]	0	1	2-5
Available water (inches)	>10	5-10	<5
Rock fragments (%)	<15	15-35	>35
Saturation water (%)		25-80	<25, >80

1/ Mitigation of adverse properties will increase reclamation potential.
2/ Materials rated as poor may be suitable as topsoil only if adverse factor can be treated.
3/ Textural classes: vfsl = very fine sandy loam; fsl = fine sandy loam; sl = sandy loam; l = loam; sil = silty; lfs = loamy fine sand; ls = loamy sand; cl = clay loam; s = sand; c = clay; sc = sandy clay; sic = silty clay.
4/ vfr = very friable; fr = friable; lo = loose; fi = firm; vfi = very firm; exfi = extremely firm.
5/ EC (mmhos/cm) = electrical conductivity in millimhos/centimeter.
6/ ESP = exchangeable sodium percent.
7/ Stoniness Class = percent of surface covered with stones, where: 0 = non-stony; 1 = .01% to .1%; 2-5= >.1% to >75%.

Weed Management Practices

A weed management program cannot be administered without understanding the growth habits of the weed. A weed is identified as a plant that is useless, undesirable, detrimental to the economy, or simply a "plant out of place." Weeds are hardy and capable of enduring severe conditions. Their seed matures under the most adverse circumstances. They are able to adapt quickly to a new environment, and frequently are more troublesome pests in the new locality than the area they came from.

Weeds, according to management practices, can be classified on the basis of (1) their general structure - grass type weeds (monocotyledons) or broad-leaf weeds (dicotyledons); (2) environment - field, row-crop, pasture, lawn, aquatic (water), roadways, and waste areas; and (3) growth habit --annual, biennial, and perennial.

Annual weeds are plants that live one season. They begin growth in the spring, summer, or fall and they produce seed and then die. Annuals are prolific seed producers.

Summer Annuals - germinate in the spring, summer, or early fall to produce seed and die. Because they cannot survive the winter, they must produce seed before a killing frost. Examples are lambsquarter, pigweed, Russian thistle, sunflower, redroot, etc.

Winter Annuals - germinate in the late summer or early fall and live over winter. These plants resume growth in the spring to develop blossoms, produce seed, and then die in early summer. Examples are shepherd's purse, fanweed (pennycress), cheatgrass (downy bromegrass), medusahead rye, and prickly lettuce.

Biennial weeds require two seasons to complete growth. They establish from seeds in the spring or fall and spend the first season storing food in a tap-type root (fleshy, single root) and developing a clump of leaves or rosettes. During the second season the plant draws heavily on the stored food, make vigorous growth, develops flowers to mature seeds in the summer and fall, and then die. They are troublesome in irrigated pastures and rangeland. Examples are mullein, burdock, houndstongue, bull thistle, musk thistle, wild parsnip, poison hemlock, spotted and defuse knapweed, etc.

Perennial weeds live more than two years. They reproduce primarily by seed and some also spread by means of underground rootstocks or aboveground runners. Our most troublesome weeds are found in this group because of their ability to live from year to year and their different methods of spreading.

Simple Perennials - Depend on seeds entirely to reproduce and spread. A fleshy taproot or masses of fibrous roots generally support them. Examples: dandelion, curly dock, foxtail barley, plantain, etc.

Bulbous Perennials - Reproduce by means of bulbs or bulbets, developed either above or below the ground, and also by seeds. Examples include wild onion, death camas, and bulbous bluegrass.

Creeping Perennials - Reproduce both by seed and underground rootstocks or aboveground runners. Buds form on the roots to produce new plants. Roots can extend 25 feet or more from the original location. Small fragments or pieces may develop into new plants under favorable conditions. Examples include quackgrass, leafy spurge, Canada thistle, field bindweed, Russian knapweed, white top (hoary cress), perennial sow thistle, etc.

SELECTING PLANT MATERIALS

Species Selection

The species to seed is dependent on the expected precipitation, irrigation supply, site exposure, elevation, temperatures, soil type and properties, purpose of the seeding and availability of seed. Limiting factors are accentuated in dry climates where moisture and its seasonal availability are most critical. Other factors of major importance when choosing a species for a particular site and purpose include competitive ability, longevity, and distinctive growth habits.

Under normal conditions only perennial species should be considered on non-irrigated sites. Annual species are not as dependable, because production fluctuates greatly with seasonal moisture and germination of the seed crop. On irrigated sites, annual species may be a viable alternative for short-term stabilization prior to establishing permanent perennial plantings.

Species should be selected on the basis of what they can contribute to your objectives such as filtering abilities, inundation tolerance, and soil protection qualities.

Select plants that are adapted to local climatic and soil conditions. Factors to consider when selecting plant materials are drought tolerance, cold hardiness, tolerance to potential soil salinity, soil texture adaptability, tolerance to high water tables, and ease of establishment and aggressive growth. In certain situations the desired vegetative community may already be designated. For example, areas such as roadside rest stops, sod-forming grasses may be most desirable.

The pros and cons of introduced versus native species can be debated forever. Choosing native species in

reclamation plantings is relatively simple. Reconnaissance in the surrounding terrain will provide a list of species that are adapted with respect to climate, slope, topography, general soil characteristics, and aspect.

If a short-term soil stabilizing plant cover is desired, it is feasible to plant species, such as slender wheatgrass or mountain brome, which are aggressive for three or four years and then die out. Within that time period, other perennial plants may become established if they were included in the planting mix or an adequate seed source is available in or adjacent to the site.

Introduced species are generally more aggressive than native species. They usually green up sooner in the spring than most native species do. This early recovery from effects of winter is one reason introduced species commonly out-compete natives.

Ecologically speaking, a diverse community is a more stable community. Therefore, it is advised to include shrubs and forbs in the revegetation plan where appropriate. Research has found that increasing the number of species in the mixture consistently resulted in greater community diversity without a detriment to overall productivity. Therefore, mixtures containing grasses, forbs, legumes, and shrubs are recommended. It is prudent to adjust ratios of grasses to forbs to legumes to shrubs. Aggressively growing grass species can dominate a site before other species have a chance to become established. Therefore, the mixture may be constructed with a high ratio of legumes and shrubs to grasses with the knowledge that grasses will eventually make up the majority of the cover.

A mixture of grasses and legumes should be developed to cover the following: 1) Sod formers and bunchgrasses, 2) Moist to dry adaptations, 3) Long- to short-lived grasses, 4) Erosion control, wildlife benefits, and 5) Germination time.

Determine the purpose and need of vegetation in the future and design the seed mix accordingly. Legumes can provide ground cover and food for wildlife. In addition, they fix nitrogen, if properly inoculated. Four grasses and one to two legumes should cover the micro-sites on difficult areas. Seed mixes should include about 25 to 50 pure live seeds per square foot when drilled and 50 to 100 pure live seeds per square foot when broadcast. Dry areas need less and critical areas need more seed. An exception to this recommendation would be biofiltration systems where grasses are primarily recommended to enhance the filtering ability of the system.

If immediate sod cover is desired or if it is difficult to establish adequate sod cover from seed, it may be necessary to use pre-established sod.

The Plant Information Tables (Appendix C) provide expanded descriptions for herbaceous grass and wetland plants (grass-like) that could be used in riparian and upland areas associated with biofiltration systems. Information includes elevation adaptation, root type, hydrologic suitability, availability, mature height, rate of spread, tolerances to acidity, salinity, and flooding, wildlife value, and wetland indicator status. Refer to the footnotes for guidance on criteria for each column.

The Plant Information Tables (Appendix C) provide expanded descriptions for native trees and shrubs including willows that could be planted in riparian areas and wetlands. The willows are included on a separate page because it allows better comparison between species. These species can typically tolerate excess water that is associated with stormwater BMPs. It includes the mature size and form for each species, deposition tolerance, and the hydrologic zone where they are best suited (see pages 3, 4, and 5 for descriptions of each zone).

The Plant Information Tables (Appendix C) provide expanded descriptions for trees and shrubs typically found on upland sites which is defined as hydrologic zone six in these guidelines. These plants typically will need supplemental irrigation. Most of these species will not tolerate areas with excess water. Use this table for aesthetic qualities when considering upland trees and shrubs for areas outside of biofiltration systems.

Species Selection for Wetlands

Many wetland plants can survive in anaerobic soils (soil without oxygen) because they have aerenchymous material that acts like a straw to bring oxygen from the atmosphere to the root system. This creates an aerobic zone (oxygen

saturated) around the roots. The establishment year is the most critical for young wetland plants because they need to grow and develop the aerenchymous material. A mature wetland plant can withstand months of total inundation, but young plants will die under the same conditions. Fluctuating water levels for at least the first year are extremely important to the successful establishment of a wetland plant community. Fluctuating water levels allow the plants to spread more and faster than if the water level is kept at a constant level. In nature, rarely will wetlands or ponds maintain a constant level. Evaporation, reduction in the base flow, and other factors cause the water levels to drop, while rain storms, watering lawns, and snow melt cause the water levels to rise.

When purchasing plants, always obtain plant plugs that are a minimum of 12 in^3 to 21 in^3. These plants have a much larger root system and the aerenchymous material is better developed. This allows the young plants to withstand wider variations in water depth than smaller plugs. Overall, the survival rate will be higher and the cost will be lower because of the higher survival rate.

Management during the establishment year is very important. Water levels must be maintained at no more than 1 – 2 inches for the first two months and then 1 – 2 inches can be added over the next few months. Fluctuating the water level from 2 inches of standing water down to saturated soils will allow more spreading of the root system and better survival.

Pay particular attention to the wetland plant species when designing the planting plan (see Appendix C). Some species such as sedges and rushes can not survive in extended periods of deep water (more than 1 - 2 inches). Hardstem bulrush can withstand water depths of up to 8 feet for short periods of time, but normal water levels are about 8 –12 inches.

Species Selection for Biofiltration Systems

Biofiltration systems are a natural or constructed channel that is shaped or graded to specified dimensions and established in suitable vegetation for the stable conveyance of runoff. This practice may be applied as a part of a system to support the conveyance of runoff or water concentrations without causing erosion or flooding. Biofiltration systems rely on vegetation to slow runoff velocities, filter sediment and other pollutants, and to improve or maintain water quality. To be most effective, there must be sheet flow across the entire strip. Once flow concentrates to form a channel, the filtering effectiveness is significantly reduced. The vegetation is generally grass or grass mixtures that may or may not be mowed resulting in stiff upright stems that promote filtering of sheet flows. Woody plantings may be desirable on channel back slopes and top of bank to improve screening, erosion control, wildlife habitat, space definition, and climate control. Woody plantings should not occur in main channel.

Species should be selected on the basis of what they can contribute to your objectives such as filtering abilities, inundation tolerance, and soil protection qualities.

In addition to climate and soil, which determine the type of vegetation that will grow and survive in any particular area, there are local factors that influence the selection of vegetal lining for a channel. From a stability standpoint these, in approximate order of importance, are:

(a) Discharge to be handled

In general, the greater the discharge the more root mass, ground cover, and stiffness of above ground vegetal lining required.

(b) Gradient

As gradient increases, channeling of the flow is more likely to occur. For this reason, bunchgrasses should not be used on slopes steeper than 5 percent. For slopes above 5 percent, only sod-forming covers should be used on the portion of channel where the main flow occurs.

(c) Establishment

Ease of establishment and time required to develop a protective cover are extremely important

considerations in selecting species. Generally any type of temporary cover during establishment of permanent cover is better than no cover at all. Use of mulch, temporary cover plantings, and jute netting products should be considered.

(d) Suitability to user

If a sod cover is required, as determined by discharge and slope, but is objectionable to the user because of likely spreading, a combination of species may be selected. This type of planting may have, for example, Kentucky bluegrass on the bottom and partially up the sides of biofiltration system and a mix of sod grass, bunch grass, and alfalfa or forbs on the upper sides and top of bank.

(e) Deposition

Deposition may be controlled to some extent by the selection of vegetation. Low, shallow flows encounter very high retardance when flowing through dense sod covers. Dense sod covers keep the flows from channeling and result in low velocities conducive to deposition. Only when the vegetation bends and submerges will high, non-depositional velocities develop. Low growing sod species, bunchgrasses and open covers like alfalfa offer less resistance to shallow flows than dense sod-forming covers. Velocities are higher, owing primarily to development of channeled flow with less deposition. These covers, however, offer less erosion protection than dense sod covers and are limited to flatter slopes.

The Vegetal Retardance – Cover Type table in Appendix B provides engineering vegetation guidelines for planning. It includes information on Vegetation Condition, Height, and Slope tolerances. Refer to this Appendix for specific information on species used for biofiltration systems.

The Plant Information Tables (Appendix C) expand the information on commonly used species on biofiltration systems. It includes information on root form, mature plant height, adapted precipitation ranges, flooding and drought tolerance, and recommended seeding rates.

Woody plantings may be desirable on channel back slopes and top of bank to improve screening, erosion control, wildlife habitat, and space definition. Woody plantings should not occur in main channel.

Plant and Seed Vendors

Appendix D, Plant and Seed Vendors, provides information on potential nurseries and seed dealers who would have plant materials available near the North Idaho area. This does not include all potential sources nor does it constitute an endorsement of the included vendors. In addition it does not guarantee the reliability or quality of products. Additional vendors and updated information can be added as obtained.

GENERAL PLANTING GUIDELINES

General Rules of Thumb

- Plant buffers with tree, shrubs, grasses, and herbaceous materials to stabilize banks, provide shade, and create an aesthetically pleasing landscape.
- Native species should be specified over exotic or introduced species because they are adapted to local soil and climate conditions.
- Always check water tolerances of species that are used in the various BMP's.
- Plant trees and shrubs at least 15 feet away from the toe of the slope.
- Trees and shrubs that have a long taproot should not be planted in the vicinity of dams or subsurface drainage facilities.
- Plant trees and shrubs at least 15 feet away from perforated pipes.
- Plant trees and shrubs at least 25 feet away from a riser structure.
- Divert flows away from seeded areas until stabilized.

- Do not block maintenance roads with trees or shrubs.
- Use plants to block public access to pools or slopes that may be unsafe.
- Always consider long term vegetation strategy for the BMP. Keep in mind the maintenance requirements of the future owners.
- Keep maintenance areas and access free of woody vegetation to allow vehicle clearance. Use grass species like creeping fescue, hard fescue, or sheep fescue on the access roads to allow vehicular traffic even when wet.
- Provide a planting surface that can withstand the compaction of vehicles using the maintenance access roads
- Consider using salt tolerant plants in areas that will receive excessive amounts of deicing salt from roadways.
- Prevent over-compaction when installing BMP's to allow sufficient root penetration.

Direct Seeding of Wetland Plants

Many wetland plants are very difficult to seed in the wild. Wetland plant seeds usually need three things to germinate: 1) heat, 2) water, and 3) light. The need for light means that wetland plant seeds need to be seeded on the surface and they can not be covered with soil (Grelsson and Nilsson 1991, Leck 1989, Salisbury 1970). Planting the seed with a drill will cover the seed especially if packer wheels or drag chains are used.

Many species have a very hard seed coat that takes up to one year or longer to break down enough for the embryo to germinate. Many species require special stratification treatments to prepare the seed for planting. These treatments include everything from acid wash to mechanical scarification, from pre-chilling to extremely high temperature soil conditions. Occasionally, dormant seeding (seeding during the late fall or winter after the plants have gone dormant) can be successful, but it depends on the species.

Not having absolute control of the water going into the wetland or riparian area is the most common mistake that occurs when seeding wetland plants. Without good water control, when water enters the system the newly planted seeds will float to the water surface and move to the water's edge where wave action will deposit the seed in a very narrow zone. The seed will germinate here and the stand will generally be quite successful as long as the hydrologic conditions are maintained for the various species deposited there (Hoag and Sellers 1995). With good water control, the seeds, for the most part, will stay in place and the stand will cover the wetland bottom instead of just around the fringe.

Some species when seeded in a greenhouse setting need a cold-hot stratification environment for successful germination. This means that the seeds are placed in cold storage at 32-36º F for 30-60 days and then they are planted in moist soil containers at about 100º F. Heat is one of the essential requirements for germination and growth. (Hoag et al. 1995)

Based on these difficulties, using direct seeding of herbaceous plants as the primary means of revegetating a site will require more attention to planning and control of site hydrology during the establishment period to be successful. It also means that you will need to know what specific germination/stratification requirements (if any) that the targeted species require. Typically, direct seeding of herbaceous species is not used as the primary means of active revegetation, but it is a method to increase the overall species diversity in a wetland, especially around the perimeter, and to establish populations of specific target species. **The use of wetland herbaceous plugs are recommended over use of wetland seed.**

Wetland Transplanting with Plugs

Natural wetland systems normally have high species diversity. When selecting plant species for the project wetland, try to copy a nearby natural wetland. Identify the particular hydrology in areas where the individual plant species are growing. Make note of how deep the water is. Try and imagine how long the plants will be inundated. Determine if the plants are in flowing or relatively stagnant water. Rarely will a natural wetland be totally stagnant through time. Generally, there is water flowing into the wetland from somewhere either above ground or from groundwater. Spring and fall overturn, as well as wind mixing, helps to circulate the water.

Next, prepare the planting area. The easiest way to plant wetland species plugs is by flooding your planting site. Standing water is much easier to plant in than dry soil (this also ensures that your watering system, what ever it may be, works before you plant). Make sure the soil is super saturated so that you can dig a hole with your hand. This is more successful with fine soils than with coarse soils. Take the plug trays and place them in a Styrofoam cooler (you will not need the lid). Try to cover most of the roots with water while in transit. At the planting site, drain off most of the water so the cooler will float. Use the cooler to move the plugs around the wetland as you plant. Select a spot in your wetland to put a plug, reach into the water with your hand and dig out a hole deep enough for the plug to fit all the way into. Push the plug into the hole and pack around it with your hand. Make sure all of the roots are covered with soil. Be careful to not dislodge the plug and expose the roots when moving around. Start at one end of the planting site and work toward the opposite end.

Spacing of the plugs is a common question. Research has indicated that many wetland plants will typically spread about 9 to 12 in (23 to 30 cm) in a full growing season. Typically, wetland species are planted on 18-in (46-cm) centers. Even though it takes fewer plants to plant an area at a wider spacing, plantings at wider spacing has less overall success than planting at a closer spacing. The exact reason for this is unknown, but it could be a sympathetic response to plants of the same species. If the project budget does not allow for the purchase of enough plants to cover the wetland bottom, plant the plugs on 18-in (46-cm) centers but plant them in copses or patches that are about 10-ft (3-m) square or diameter. Space the copses about 10-ft (3-m) apart. The copses can be planted to different species according to the hydrology. Over time, the plants will spread out into the unplanted areas.

The planting window for wetland plants is quite long, from April through late October. Planting plugs in the fall and winter has resulted in frost heaving of the plugs so that only about 1/3 of the plug remained in the ground. The availability of water is critical. Remember wetland plants like it hot and wet. They tend to spread faster with warmer temperatures. If you plant in the spring, it will take the plants a while to get going, but they will have a longer establishment period. Fall planting will generally result in lower establishment success because of the shorter growing season and frost heaving damage.

The plants can be successfully established in a wide variety of soil textures. Successful wetland plantings have occurred in areas that are clay with no organic matter to gravelly textures. The biggest problem is digging the holes. The soil texture will often limit the equipment available to dig the holes. In clay bottoms, a small bulldozer or tractor with a ripper tooth can be used to dig lines across the bottom about 8-in (20-cm) deep.

In general, fertilizer is not necessary. However, it really depends on the site and the soils. If during construction, the bottoms have been cut down to the subsoil and all of the naturally present nutrients have been removed, fertilization will probably be necessary unless the water coming into the wetland has a high nutrient load.

After planting, release the water into the site slowly. The young plants have not fully developed the aerenchymous material necessary for them to survive in anaerobic soils and standing water. After the initial planting, be careful not to raise the water level to more than about 1-in (2 to 3-cm) above the substrate. Too much water at this time may stress the new plants. Maintain the water at about 1-in (2 to 3-cm) for about one week, this will inhibit the germination and growth of any terrestrial species that may be present in the restored wetland. The water level can then be lowered to the substrate surface for 15 to 20 days. This will expose the mud surface, stimulating any wetland seeds that were brought in with your transplants to germinate as well as increase the rate of spread of the transplants. You can then raise the water level 1 to 2-in (3 to 5-cm) for another week. Then lower the water to the substrate surface for another 15 to 20 days. After this period, slowly raise the water level to 4 to 6-in (10 to 15-cm) for 3 to 5 days. Continue to gradually increase the water depth to 6 to 8-in (15 to 20-cm). Remember that the aerenchymous tissues in the plant shoots are what supply the roots with oxygen so be careful not to raise the water over the tops of the emergent vegetation. If the plants are not showing any stress, continue to carefully raise the water level to 12 to 20-in (30 to 50-cm) if possible. These suggested water level depths must be modified based on the species used. Some species will not tolerate inundation at these suggested depths or durations. When in doubt, defer to the hydrology conditions on natural reference sites where the species occurs. The goal here is to inundate the transition zone between wetland and upland as much as possible to control any invading terrestrial species. After about 20 days lower the water level to about 2 to 3-in (5 to 7-cm)(Hammer 1992). For the rest of the growing season, adjust the water level to maximize the desired community type. The key to determining the appropriate water level is to monitor the emergent wetland plant community. Raise the water level if weed problems surface. Lower the water level to encourage emergent wetland plant growth and spread. The key is to fluctuate the water level. Natural

wetlands rarely have a constant water level. Many species cannot tolerate a constant water level and will begin to die out. Species more tolerant to standing water will increase. The plant diversity that was so carefully planned for will be lost

Management during the establishment year is important to ensure that the plants do not get too much water or too little. Weed control is important especially during the establishment year because of the low water levels and exposed, unvegetated areas. A good weed control plan needs to be in place before planting. Monitoring the planting for 3-5 years after the establishment year will help maintain the planting and it will provide useful information for future plantings.

Recommendations:

- Always match the plant species to the hydrology associated with that species.
- In general, purchase the largest plugs you can. Planting technique will often determine the size of the plugs and the ease of planting.
- Plant the plugs on 18 to 24-in (46 to 61-cm) centers.
- Plant in patches rather than wider spacing.
- Fertilizer is generally not necessary unless the water coming into the site is relatively clean or the construction has cut into the subsoil.
- The plants will spread faster under saturated soil conditions rather than standing water. However, terrestrial weeds will move in to saturated soils much faster than flooded soils. Fluctuating the water level helps the plants spread and decrease terrestrial weed establishment.
- Water control is extremely important during the establishment year.
- Weed control needs to be planned and budgeted at the beginning of the project.
- Monitoring is essential for the success of the project. Monitoring needs to have time and money allocated in the budget and it needs to have a specific person identified to carry it out.
- Successful wetland plantings take significant planning and a good understanding of the hydrology at each site.

Upland Seeding

There are three main factors to consider when planning the seeding phase of the revegetation operation on drastically disturbed lands. These include season of seeding, seeding rates, and method of application. Season of seeding is important because some seeds may require stratification before germination. Other seed such as legume species should probably not be seeded until spring. Seeding rate concerns both economics and plant competition. Too much seed on a site puts unnecessary cost into the total process and, at the same time, a thinner stand will emerge because of plant competition for nutrients traditionally in short supply on disturbed soils. Ideally, the site should have been prepared the previous fall if a spring seeding is desired. Usually spring seedings are planted between periods of wet and dry weather (commonly in March to the first of May in Northern Idaho). If spring seedings are to be effective, they should be made prior to spring rains. There may be a problem getting heavy equipment onto the site to prepare a seedbed in the spring following a wet winter that has saturated the soil profile.

Seeding rates should provide adequate seed for a good stand and limit the reduction of future stands because of too much competition among seedlings. Seeding rates on disturbed lands may range from 10 to 35 pounds PLS (pure live seed) per acre. Increased seeding rates may increase initial plant densities, but there is usually an inverse relationship between initial high density and survivability the first year after establishment of the stand. Poorly prepared seedbeds require higher than normal seeding rates; however, increased seeding rates will not compensate for poor seedbed preparation. Seeding rate computations are based on pure live seed (PLS) per square foot. A range from 30 to 40 seeds per square foot is generally adequate.

The two methods of direct seeding, which are recommended, for disturbed land reclamation are broadcast and drill planting. A primary consideration when either broadcasting or drilling seed is seeding depth. Generally, small seed are planted at 1/4-in and medium to larger seed at 1/2-in on light to medium soils. Medium and large seed should be planted from 1/2 inch to 1-in deep on sandy to gravelly soils.

If the seedbed is relatively uniform and rough, broadcasting is recommended. This type of seedbed can be prepared on most highly disturbed sites and road-cuts. Dry method - hand cyclone seeders, air guns, or blowers are good

inexpensive means for broadcast applying grass and legume seeds. Care should be taken to insure an even distribution of light and heavy seeds over the areas to be seeded. One advantage of broadcast seeding is that all types of seed can be contained in the seeding mixture. Mixtures are recommended to plant highly disturbed lands because they increase the chance of success and improve diversity of vegetation. Many species have heavy, awned or fuzzy seed. These seed types can clog a drill, making seeding a tedious process. A primary requirement for successfully establishing stands of vegetation using the broadcast planting method is that the seed can be adequately covered following sowing by harrowing or packing. Using a heavy sheepsfoot roller is an acceptable method to cover seed on disturbed lands. It compresses some seed to approximately an inch depth while others are only slightly covered. Double the seeding rates normally used for drilled planting, when using the broadcast method.

Drilling seed into a prepared seedbed also has advantages. Drills are most effective when only a few species are included in the mixture. Large and small seeded species can be placed in separate boxes and depth bands can be set to plant the seed at a specific depth. Spacing of seed is also more controlled with a drill. Good stand establishment can be accomplished with row widths of 6 to 14-inches. A sound practice, not commonly used, is alternate row seeding. Seeding grass, legumes, and shrubs into alternate rows increases the survivability of the slower developing legumes and shrubs by reducing competition during the establishment year(s).

Most shrubs are difficult to establish using direct seeding methods. Transplanting bare rootstock or tubed plants improves establishment success. Bare rootstock or tubed plants are planted into previously dug holes. Plant bareroot stock and tubed plants about 1 inch lower than the soil surface, cover with soil and compact the soil firmly around the roots. Plants should be thoroughly watered following planting. Tree spades can be used to transplant larger dormant shrubs and small trees onto disturbed sites or roadcuts.

If a sod-forming plant species is desired for quick vegetative cover, a sprig digger or modified potato harvester can be used to gather vegetative sprigs. Plant sprigs using a manure spreader or a specially designed sprig planter. If a manure spreader is used, sprigs must be lightly disked into the soil so that the sprigs are in contact with moist soil at all times. Another alternative would be to place sod.

Date of Upland Seeding

Most legumes and grasses are seeded in the spring when irrigated to allow the seedling to become well established before being subjected to freezing temperatures. Make spring plantings as early in the spring as possible to provide for optimum germination temperatures and to allow seedling to get a jump on the weeds. There are a few species such as cicer milkvetch, which require warmer soil temperatures and should not be planted until mid spring.

Late fall and early spring are the two times of the year when reseeding disturbed soils can be most effective. There are advantages to each season. Spring seedings, which are made as soon as the ground thaws, allows for planting into a moist seedbed. This allows for rapid germination of seedlings and avoids damage by rodents. Spring seeding may work best when a legume is included in the mix, since seedlings of legume species can be damaged by late fall or early spring frost. A fall seeding followed by seed germination could result in poor stands of legume species. Cool season grasses are generally easier to establish than shrubs, legumes, or other forbs.

A late fall or dormant seeding just prior to winter is the most common seeding period in the Intermountain West. Timing of seeding is important on disturbed lands. Plant late enough in the fall (after November 1st in Northern Idaho) so seed does not germinate or emerge before winter weather sets in. The closer to winter the planting can be made, the more successful the seeding will usually be. Over-wintering helps break seed dormancy in some species and cool season grasses germinate readily under the snow when temperatures are slightly above freezing. Seedlings are protected from rodents by the snowpack and emerge quickly with early spring moisture.

Upland Seeding Depth

Drill seeds at a uniform depth of ¼ to ½ inch. Depth bands on disks will help control seeding depth. Equip the drill with packer wheels to firm the soil over the seed after seeding.

Hydroseeding - Hydromulching

Sometimes a slope is too steep to use tillage equipment to prepare a seedbed. On some sites, ripping can be completed across the contour and then seeding with equipment is completed on the contour. When this is not possible and the slopes are accessible from a level area, hydroseeding and hydromulching may be acceptable planting techniques. This is a common practice for planting roadcuts and embankments.

It is most desirable to first apply the seed and fertilizer and then mulch the site with hydromulch. A small amount of green dye and hydromulch (100-200 lbs/acre) is included in the seed and fertilizer slurry to provide a tracer for judging seed distribution. The wood fiber, straw, or paper mix is then placed into the water vat and is applied as a cover for seed in a second operation.

This method is recommended over the more common method of applying seed, fertilizer, and mulch in one operation because when seed is suspended in the mulch, good soil to seed contact does not occur, resulting in poor stand establishment. The seed may dry out and die after germination unless the relative humidity is constantly high enough to maintain high moisture levels when the seed is suspended in the mulch.

Disadvantages of this practice include: damage to some of the seed as it goes through the pump, legume inoculant may be washed from seed, and operations require large crews, water tankers, supply trucks, adequate water supplies and relatively smooth, flat areas from which to operate the equipment.

Mulching for Soil Protection

Mulching is the most common and widely used method of rapidly stabilizing soils on moderate to steep slopes when reestablishing vegetation.

Wood fiber, erosion control blankets, hay and straw are the most commonly used commercial mulches. Net or blanket type mulches include straw or other fibers secured with jute or polypropylene netting and wire staples. Netting type mulches can be utilized on either slopes or flat surfaces, provided the net is attached securely to the ground. Straw or native grass hay is perhaps the most commonly used mulch because it is available, inexpensive, and easy to apply, and gives reasonably good results.

Mulches increase infiltration of water and provided a microclimate for establishment of vegetative cover. Straw is generally more weed-free than grass hay, but good native grass hay can also provide a source of adapted seed. These mulches can be spread by hand or with mechanical blowers. Mulches can be used to help establish a temporary cover planting on droughty sites and to minimize erosion and sediment on critical and sensitive sites such as stream crossings. Straw mulch can be used on high, steep slopes along roads to help hold the seed and fertilizer in place. Organic tackifiers and netting can be used to hold the straw in place. Wind, water and gravity should be evaluated to determine the amount and method used to hold the mulch in place. Straw or hay must be crimped by disking into the soil surface from 2 to 3 inches deep to prevent the mulch from being blown from the site by high winds. Because of this incorporation requirement, it is not a viable technique on steep slopes unless a tackifier or polypropylene netting anchors the mulch.

Mulching materials such as straw, hay, jute and other appropriate materials should be used to protect the new seeding (especially late summer and fall seedings).

Mulching with straw, a minimum of 4,000 pounds per acre to a maximum of 6,000 pounds per acre of clean small grain straw is recommended. Additional nitrogen needs to be applied when mulching with organic materials because nitrogen will be tied up in the process of breaking down the mulch. The following amounts should be applied for straw:

Mulch	Nitrogen
4,000 pounds/acre	15 pounds/acre
5,000 pounds/acre	20 pounds/acre
6,000 pounds/acre	25 pounds/acre

Anchor mulch 2 - 4 inches deep with no more than two passes of the anchoring equipment.

Temporary Vegetative Cover Plantings

Biennials such as barley and winter wheat can be used as an inexpensive method to provide a temporary cover planting for erosion control. These plants provide at least two years of temporary cover. Permanent vegetation seed can be planted the second year following the planting of the temporary cover planting and will benefit from the cover planting as well as the mulch from the dead straw. These plants have a wide range of adaptation from wet to dry, and cool to warm sites. This method is also a useful tool in the reclamation of borrow areas and gravel pits.

This is an ecologically sound approach in that annual species are the first types of plants to colonize a disturbed area. Even with present day technology, annual weeds frequently dominate a site, but usually only for the first year. Annual species will quickly stabilize the soil surface. Vegetated areas resist wind and water erosion much better than bare soil. Barley and wheat are good choices for cover crops. Use seeding rates of 60 to 80 pounds per acre. Plant the cover crop in the spring or in late summer if irrigation is available. One drawback to using small grains is that they may persist by volunteering.

If temporary cover plantings are used for soil protection, plant one of the species listed in the following list:

	Seeding	Planting	
Species	Rate(lb./ac.)	Depth	Method
Spring Wheat	60	2"	Drill
Barley	80	2"	Drill
Oats	60	2"	Drill

Note: Temporary cover plantings should be drilled in two operations - one at angle to the other. Nurse crop plantings (planting temporary cover species with perennial long-term seed mix) are not recommended unless planting is irrigated. Temporary plantings should be mowed when seed-heads appear so no seed production occurs.

Water Conservation

Practices installed for water conservation purpose generally maximize the use of available water. These practices can involve physical manipulations of the surface of the soil or mulching of the seedbed.

Mulching conserves soil moisture by shading the soil surface and minimizing soil temperatures; protects the soil surface from air movement; and reduces water losses through evaporation. In addition, mulching reduces puddling, soil surface sealing, and maintains normal infiltration rates.

Mechanical surface manipulations may be used that accumulate moisture (from either snow or rain) within depressions. Some treatments are primarily designed for use on extensive areas such as regraded mined land soils. Gouging, dozer basins, and chiseling are examples of treatments most applicable to these areas.

Pitting, in addition to chiseling, may be more adapted to site disturbances such as roadsides. The practices pitting and chiseling do not create large depressions. They do however, assist increased infiltration from rainfall. These relatively shallow, narrow depressions are adapted for use on roadcuts and other disturbed land sites.

Irrigation

Irrigation is not available to every disturbed site. Irrigation on disturbed soils significantly affects establishment of planted species. Commonly irrigation is a temporary practice and applications of water are supplemental to natural precipitation events. Seeding during the drier summer months is possible with 2 months of irrigation. Generally only one to two months of supplemental water is necessary if plantings are made in the spring or late summer. On roadside rest areas and biofiltration systems, the seeded species must be watered frequently to ensure establishment of complete stands.

Fertilizer

Fertilizer applied with an air gun or blower should be of uniform prill (individual fertilizer grains) size to provide an even distribution over the area to be fertilized. Non-uniform prill size may result in the spread of the nitrogen in a narrower band than the phosphorus. Once the stand is established, the grass-legume composition can be adjusted or maintained through the use of fertilizer. High phosphorus fertilizer rates will favor legumes, while high nitrogen rates will favor grasses.

Fertilizer Applied with the Seed

When fertilizer and seed are applied with a blower or hydroseeder, seed and fertilizer should not be mixed for more than a few hours, or the germination of the seed may be adversely affected. It is preferred not to mix the two, but to apply the seed and fertilizer from separate bins or in separate operations to reduce the risk of damage to the seed.

Wildfires

Erosion control with vegetation following wildfires requires special assessment and evaluation. Small grains such as barley, oats, winter wheat, and yellow sweetclover germinate quickly and are fast growing plants. Biennials can provide cover for two years and have some mulching effect. Some short-lived perennial grasses such as slender wheatgrass or mountain brome can provide cover until long-lived native grasses and shrubs are restored to the watershed. Sediment traps and straw mulching can be used on special sensitive areas where fisheries or domestic water supplies are of concern.

Recreation Areas

Seed mixtures designed for recreation areas require some of the same considerations used in establishing yards and lawns. Intensive use areas should have a mixture of sod-forming grasses and legumes, while extensive use areas could have a mixture of bunchgrasses and legumes. In some areas, tolerance for shade should be considered. Once the stand is established, the grass-legume composition can be adjusted or maintained through the use of fertilizer. High phosphorus fertilizer rates will favor legumes, while high nitrogen rates will favor grasses.

VEGETATIVE MONITORING

Inspection Criteria during Emergence

Inspect seedings periodically during the establishment period, since failures in stand establishment may still occur after the initial seedling emergence. The main reason for seeding failures is lack of attention to proper practices of seeding and management. Other common causes for seeding failure include inadequate moisture and unfavorable soil conditions. Seed may germinate but fail to emerge due to a soil crust. After emergence, seedlings may die because of adverse climatic conditions. Also, in some cases failure may occur during the second year in unusually dry weather.

Seeding failure represents an expensive risk. In some areas, very high proportions of seedings may fail. When this situation occurs, early recognition of the failure allows reseeding, thus salvaging part of the seedbed preparation expense. Perhaps only a portion of a seeding will have to be replanted; careful evaluation of seeding success will indicate the necessary areas to be reseeded.

In examining seedings there are several things to look for. These include number of seedlings, uniformity of distribution of seedlings over the soil surface, and presence of undesirable weed species. The density of plants comprising a successful seeding will vary considerably from place to place, but if seedling plants are uniformly distributed, with a minimum amount of undesirables, the seeding probably is successfully establishing. Some native species may be particularly slow to establish and full stands may not be present until the second or third year. It is essential to evaluate seedings for a year or two before deciding whether they are successful. Similarly, most rapidly

growing introduced species should form a fairly solid stand the first year. With seeding mixtures it is important to notice the relative abundance of the species seeded.

Plantings should be inspected as soon as possible after emergence. If a failure is recognized, perhaps due to soil crusting, this will allow reseeding in time to capitalize on spring precipitation. Rainfall usually occurs from April to mid June in the Intermountain West. If good spring germination occurred, summer survival should be evaluated the following fall. If failure is noted at that time, reseeding without further seedbed preparation is still possible.

Caution must be used in evaluating dryland seedings because the first year results may be misleading unless closely examined. Often good seedling establishment is masked by heavy weed growth. Many good stands have been plowed up and reseeded, when another year or two would have allowed the seeding to become established and eliminate the weeds through competition.

The criteria for success of plantings should be based on some quantitative measure of stand establishment. This might be seedlings per foot of seeded row or plants per unit area. The absolute values related to various success ratings will vary with site, year, species, and measurement method. Thus, a stand density, which would be considered poor on a well drained, moist upland site might be excellent under droughty conditions. For these reasons the criteria to be applied to any particular seeding should be based on local experience and observation.

A quantitative method of evaluating seedings is given in the following section. This technique is fast, relatively accurate, and is based on research. It is felt that this method, or some modification of it, will meet the evaluator needs.

In addition to quantitative data on stand establishment, the examiner should note the kinds and amounts of weeds and also desirable perennials, which may become established. In some cases weed control may be necessary to allow seeding establishment in a reasonable time.

Technique for Evaluation of Seedings

The relative degree to which a plant community is closed by seeded species should be sufficient to evaluate the success of a seeding. The following procedure is based on the plant frequency concept, whereby species presence in a series of plots is the basis of evaluation.

A 2 x 2-foot square frame is divided into four 1 x 1-foot units. This frame is randomly located through a seeding, being placed 25 times. This gives 100 observations of 1 square foot units. At each placement of the frame the number of frames stocked with one or more individual plants of the seeded species is recorded. Basal portions of plants must be included in frame areas for counts to be recorded. The resultant percentage occupancy (frequency) value is taken as an index of seeding success. The number of 100 observation samples taken in any particular seeding depends upon the stand variation and the desired level of accuracy. A minimum of five samples should be taken. Earlier research has found that 12 samples adequately sampled the most variable stand of crested wheatgrass that could be found. In highly variable stands some sample stratification may be desirable. This could take the form of mapping the seeding into frequency class areas and then keeping data from each area separate.

Once the field data are taken it is necessary to compare them to some kind of standard (success rating scale) to determine the seeding success. This standard should be based upon local conditions, including site potential and species seeded.

A rating scale is proposed as follows:

50% or more stocked	Excellent
40-50% stocked	Good
25-40% stocked	Fair
10-25% stocked	Poor
9% or less stocked	Failure

VEGETATIVE MAINTENANCE OF BIOFILTRATION SYSTEMS

Repair any damage to the biofiltration systems at the end of the runoff period. Fill any rills and/or gullies, and reseed or sod as needed. Remove sediment bar build-up. If sediment buildup occurs in long reaches, the biofiltration systems should be reshaped and seeded. Maintain outlets to prevent erosion or head cutting.

Fertilize according to soil test annually to maintain good vegetative cover. Remove excess vegetative growth on biofiltration systems annually. Mow and remove clippings from site. Cut at height (approximately 4 to 6 inches) that will cause minimal damage to grass seeding. Do not leave a heavy layer of clippings on the biofiltration system that would smother the seeded grass.

Never use grass biofiltration systems for regular vehicular travel.

Weed Management

Allowing weeds to compete with a planting is wasteful and expensive. They use water, fertilizer, and light and affect the quality of the planting. They increase labor and equipment costs, harbor insects and disease organisms, and reduce land values. Infestations usually start on land lying idle or on land not properly managed. Disturbed areas are usually the first lands infested.

Losses can be reduced by three principle means - prevention, eradication, and control. Weed prevention requires good sanitation practices. Every attempt should be made to start out with weed-free planting areas and then prevent weeds from being introduced. Prevention methods include the use of clean (certified) seed, cleaning contaminated equipment, preventing nearby weed areas from producing seed and from spreading, and spot-treating small weed infestations.

Weed control rather than weed eradication is the most reasonable approach. Many weeds are so widespread that eradication, though desirable, is economically impractical. A well-planned and managed control program can reduce the weed infestations to acceptable levels.

Mechanical tillage for seedbed preparation gives good weed control on many early germinating weeds and winter annuals that live over winter. Planting competitive plants will also help keep weed populations to a minimum. Chemical weed control increases ability to reduce weed populations. Every plant suppressed enough to prevent seed maturity reduces future infestations. Many selective herbicides are available for use against specific weeds. No single method is sufficient, however, for an optimum weed control program.

Sources of Weed Infestation

Weeds can spread or infest new areas in many ways. Infestation of new areas is primarily through the disbursement of seed. Seeds of many weeds become attached to the wool, hair, feet, or other parts of animals and can be transported long distances. Both animals and birds eat weed seeds that pass through digestive tracts without injury. Winds carry weed seed over the ground or snow, or carry seeds with special devices such as delicate parachutes, tufts of hairs, or membranous wings. The average distance weed seed can be carried by wind is two to three miles. Some are carried 10 to 15 miles or more. Weed seeds may be transported considerable distances by rain or melting snow. They can be carried by streams and rivers and eventually wash ashore or deposit in the silt of flooded lands many miles away. Not all weed seeds float, but many do. Some have special devices that enable them to stay on top of the water.

Plants with stolons (aboveground creeping stems) and rhizomes (underground creeping stems) can spread over large areas regardless of their seed production. Such spreading varies from a few inches to several feet each year. Studies indicate that a field bindweed patch can double in size in five years under normal conditions. New infestations can be started by pieces of roots or rhizomes broken off and carried by equipment to other areas.

The planting of contaminated grass and legume seed is another cause of weeds spreading. The use of certified seed will prevent the planting of unwanted weeds.

Mulching materials can be a source of noxious weeds.

Machinery can spread weed seeds, especially in wet weather when the seeds become attached to muddy implements and vehicles. Weed seeds can spread when blown or shaken off vehicles.

Weed Control Methods

Weeds can be controlled by one or more methods--mechanical, cropping (competition), biological, or chemical. Studies show no single method is most efficient under all circumstances. A long-term control program, combining all methods, usually provides the best results.

Mechanical Control - includes cultivation, mowing, and burning. Hand pulling or hoeing of weeds can be justifiable in certain situations such as gardens.

Biological Methods - utilize living organisms, mostly insects, to control weeds. Examples of insects being tested are the Chysomelid beetle on goatweed, Celerio larvae on leafy spurge, Rhinocyllus weevil on musk thistle, and the Urophora adult (gallfly) on spotted and diffuse knapweed.

Chemical Control – herbicides or weedicides have been developed to control many weeds.

General Mechanical Practices

Tillage can be used to control weeds under most soil conditions. It reduces or eliminates weed competition for moisture, nutrients, light, and carbon dioxide needed for plant growth. In heavy soils, tillage can provide benefits in addition to weed control. It can close cracks in dry soil and promote conditions that favor absorption of rain. The major function of cultivation is weed control.

Tillage that buries the weed plant is effective primarily on small annual weeds, and the entire plant must be covered. Burial is not as effective on weeds that have underground rootstocks capable of sprouting. Roots of perennial weeds must be cut off by a tillage implement and brought to the surface so they will dry out and die. Root portions that remain in moist soil may continue to grow.

Another tillage method is the disturbed-rooting system. The objective is to loosen or cut the root system so the plant dies from desiccation (drying) before it can reestablish roots. Sweeps, knives, harrows, finger weeders, or rotary hoes usually are used. This type of tillage easily controls small weeds, and is most effective in hot, dry weather and with dry soils. In moist soils, or if it rains soon after tillage, the roots may reestablish. Seedlings of most perennial weeds are easily destroyed by tillage, but are difficult to kill after they develop rhizomes, stolons, tubers, or other reproductive roots.

Mowing

Mowing often is used to control weed species when other control measures are not adaptable. It is not effective on short-statured plants. Tall annual and biennial weeds are mowed primarily to reduce competition and to prevent seed production.

Repeated mowing not only prevents perennial weed seed production, but also may starve massive root systems. The creeping root system of a perennial weed is capable of storing up to a three-year food supply. This food supply must be depleted to control most perennial weed species. Frequent cutting (every 16 to 18 days) for one to three years will force the plants to use up these reserves. At no time should the plant be permitted to replenish its underground stored food supply. The best time to start mowing is when the underground root reserves are at a minimum level. For many species this is between full leaf development and the time when flowers appear (bud stage) during late spring.

Following mowing, buds start to grow on the lower and belowground stems and roots. Although this may appear to thicken the stand, it is desirable if you mow this new growth repeatedly. The new stems grow at the expense of the belowground stored food, so repeated cutting hastens food depletion and death of the plant.

Annual weeds should be mowed before or soon after flowers appear. Some weed seeds can continue to fill and will eventually germinate if the plant is cut during or after pollination. Some annuals can sprout new stems below the cut. It often is possible to control this growth by cutting rather high at first mowing and mowing lower later to cut off the sprouted stems. By the second mowing the stem is often hard and woody, and cannot put out new sprouts below the cut. Mowing cannot control weeds that form rosettes, or a close-growing sod. In fact, mowing favors such weeds by removing competition. Mowing will not control weeds that produce seed close to the ground.

Mowing may be used to good advantage in new grass-legume seedings to reduce weed competition. Clipping the tops of broadleaf weeds reduces weed competition enough to permit survival of seedling grasses and legumes. Mowing may clip the tops of the planted species and set them back to some extent.

Chemical Weed Control

The use of chemicals for weed control has increased rapidly since 1944, when 2,4-D was first used as a herbicide. Many new herbicides and formulations have become available. Herbicides developed to control unwanted plants are referred to as weedicides. Herbicides have different selectivities because they have different molecular forms. The variation in molecular form changes the chemical and physical properties of the molecule, which, in turn, modifies its biological activity.

Classification of Herbicides

Herbicides are grouped on the basis of use into selective and non-selective and classed by mode of action or contact, translocated, and sterilant chemicals.

Selective Herbicides - are used to control specific weeds. They kill some plants with little or no injury to other plants. Some herbicides kill broadleaf weeds but not grasses, or vise versa.

Non-selective Herbicides - are toxic to all plants. They are used to treat areas where no vegetation is wanted, such as around guardrails, fence lines, or in industrial areas. Non-selective herbicides with low solubility are used as soil sterilants.

Foliar and Soil Application

Foliar Herbicides - are applied usually as a liquid spray to the leaves. The plant is affected either by contact or translocation.

Contact Herbicides - kill only the plant parts covered by the chemical. Adequate coverage of the foliage is essential to get optimum control. Effectiveness may depend on the arrangement and angle of the leaves, other plant characteristics, spray placement, and coverage and location of the plants growing points.

Translocated Herbicides - kill the entire plant as the herbicide applied to the leaves is translocated into the roots or from older leaves to young growing points. Translocation is essential to control perennial weeds and the degree of control depends on how deep the herbicide translocates into the root system.

Soil Herbicides - are applied to the surface of the soil and incorporated into the soil by cultivation or leached by rainfall or irrigation. The treated soil is toxic and prohibits plant growth. Selective herbicides are used to control specific weeds in specific crops. The application may be pre-plant, pre-emergence, or post-emergence related to the state of the plant. Pre-plant application is when treatment is made before planting. Pre-emergence treatment is made after planting but before the plant emerges. Post-emergence

treatment is made any time after the planting emerges. Timing of the application in relation to the growth stage of the weed and planting is important. Non-selective herbicides are applied to the soil as soil sterilants.

Growth regulators, defoliants and desiccants are chemicals used to alter the plant. A defoliant causes the leaves of the plant to drop off early. A desiccant draws moisture from the plant, causing it to wither and die. Defoliants and desiccants are often used to make crops easier to harvest. A growth regulator (plant regulator) increases, decreases, or changes the normal growth or reproduction of a plant. Some regulators are used to speed or delay the normal harvest date for the crop. Others are used to improve crop quality or yields.

Herbicide Restrictions and Limitations

Herbicides are chemicals formulated to control broadleaf and grass weeds. All have limitations as to type and degree of control. Many have restrictions on their use. The label for each herbicide should be read thoroughly and mixing and application directions followed carefully.

The applicator must consider, when choosing a herbicide, its effectiveness in controlling specific weeds. Will it injure other plants? What effect will it have on beneficial organisms within the treated area? Will it have any ill effects on non-target areas?

Label information indicates product restrictions and limitations when applied to certain plants and in various habitats. These restrictions and limitations should be understood before a herbicide is selected to control a certain weed(s) in a specific planting. The limitations will help determine which herbicide(s) to purchase.

Herbicides and the Environment

Weed control practices, and protecting the environment, requires time-consuming precautions. The user must select herbicides that will kill the weeds without damaging other plants. He must restrict the drift to nearby, sensitive vegetation. Succeeding plant damage from herbicidal residues in the soil must be avoided. When weeds are treated in or near irrigation ditches or streams, special precautions must be taken to avoid contamination of water and injury to fish or other beneficial forms of life.

Herbicides and Fish

The toxicity of a herbicide in water is affected by several factors in addition to those, which affect its performance in a soil. The pH (acidity), hardness of the water (minerals), and the absorbent qualities of suspended organic matter can affect the toxicity. The oxygen content and water flow or movement affects chemical concentration, persistence, and possible toxic effects on other life forms.

Factors that affect the toxicity of a given chemical formulation to specific weeds under field conditions include the nature of the water body and the immediate environment. For this reason, toxicities to fish and aquatic organisms usually are estimated in terms of median tolerance to a given concentration for a given length of time.

Studies of toxicity hazards to fish have shown that formulation variations result in greater differences in toxicity than differences in toxicity between basic compounds. Ester formulations of 2,4-D for example, often are more toxic than amine or metallic salt formulations. Added caution when applying herbicides near water will reduce the danger of significant amounts of herbicides appearing in ground or surface waters.

DEVELOPING A WEED CONTROL PROGRAM

There are five fundamental methods of controlling weeds: preventive, cultural, mechanical, biological, and chemical measures. To decide which method(s) is needed for their weed control program, the planner must evaluate the cost of each method and the level of management desired. A program, which integrates all five methods into one program, is usually the most cost effective in controlling weeds.

Preventive Measures

- Use intense weed control practices prior to seeding land to perennial species.
- Use Certified weed-free seed and bulk fertilizer.
- Use only clean, weed-free machinery and hauling facilities.
- Where possible control or restrict wind and water movement from weedy to weed-free areas.
- Eliminate seed sources. Cultivate, spray or establish perennial plantings.

Cultural Measures

- Establish a competitive grass and/or legume stand.
- Factors affecting establishment:
  - species selection
  - planting depth/date
  - seed quality
  - drill type
  - site selection
  - weeds and insects
  - soil fertility
  - weather
  - seedbed preparation
- Manage the planting to maintain a dense competitive stand.
- Factors affecting competitive ability of established stands:
  - soil fertility
  - irrigation
  - insects and disease
  - weed management
  - seeding management
- Planting Date spring or fall is influenced by:
  - soil moisture
  - seed dormancy
  - kinds of weeds expected

Fall planting
- winter annual weed management is critical
- planting has head start on summer annual weeds

Spring planting
- breaks winter annual weed cycle
- summer annual weed management is critical

Mechanical Control Measures

- Use thorough preplanting tillage to destroy existing weeds.
- Clipping may be used to control certain weeds:
  - effective against broadleaves; ineffective against most grasses.
  - clip early, as soon as weeds grow above crop plants.
  - clip as low as possible without clipping the desired plants.
  - clip as often as needed.

- do not allow clipped plant material to ball- or pile-up.
- use a mower to evenly spread clipped plant material.

Chemical Control Measures

- Many herbicides are available for use to help establish or on established grasses and legumes. Most herbicides currently recommended, are relatively cost-efficient and are the most widely used means of controlling weeds in the growing crop.
- When used as directed, herbicides control a variety of weeds with minimal injury to the crop. Most though not all performance failures or incidents of crop injury can be explained by the applicator failing to follow label directions. It is the applicator's responsibility to become familiar with the product label and be able to recognize conditions that may result in non-performance or non-target plant injury.
- Chemical treatment is one of the most effective tools used for weed control. Utilizing herbicides generally gives wider latitude in the choice of planting management practices. But in their effectiveness lies the problem. You should not place too heavy emphasis on herbicides and neglect other management measures. Although herbicides are an integral part of any weed control program, they cannot be relied on solely in a long-term, cost-effective, weed control program.
- Keys to effective weed control with herbicides:
  (1) Properly identify your weed problems.
  (2) Base herbicide selection on weed and desired plant species, weed and desired plant growth stage, soil factors, and residual characteristics.
  (3) Follow approved label rates.
  (4) Calibrate sprayer or granular applicator and adjust to meet specifications recommended on label.
  (5) Observe all label directions, restrictions and precautions.
  (6) Evaluate treatment effectiveness to determine what additional follow-up measures might be needed. For example, sequential spot treatments may be necessary to control perennial weds effectively.
  (7) Weeds will be controlled only if the crop is properly managed.

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Appendix A

Climatic Information for the City of Coeur d' Alene and North Idaho Counties

APPENDIX A: Climate information for Northern Idaho Counties including PRISM map and weather station data for selected stations.

The climate data in this section were specifically prepared for the City of Coeur d'Alene Project by the Natural Resources Conservation Service and includes data for selected weather stations in Northern Idaho.

The Northern Idaho PRISM Data map provided includes visual precipitation information on average annual precipitation based on data collected from 1961 through 1990.

The weather station data provided for Benewah County (Saint Maries), Bonner County (Cabinet Gorge, Priest River, and Sandpoint), Boundary County (Bonners Ferry and Porthill), Clearwater County (Dworshak, Elk River, Headquarters and Pierce), Kootenai County (Bayview and Coeur d'Alene), Latah County (Moscow and Potlatch), and Shoshone County (Avery R.S., Kellogg, and Wallace) gives data on temperature, precipitation, and growing season dates based on data collected from 1961 through 1990.

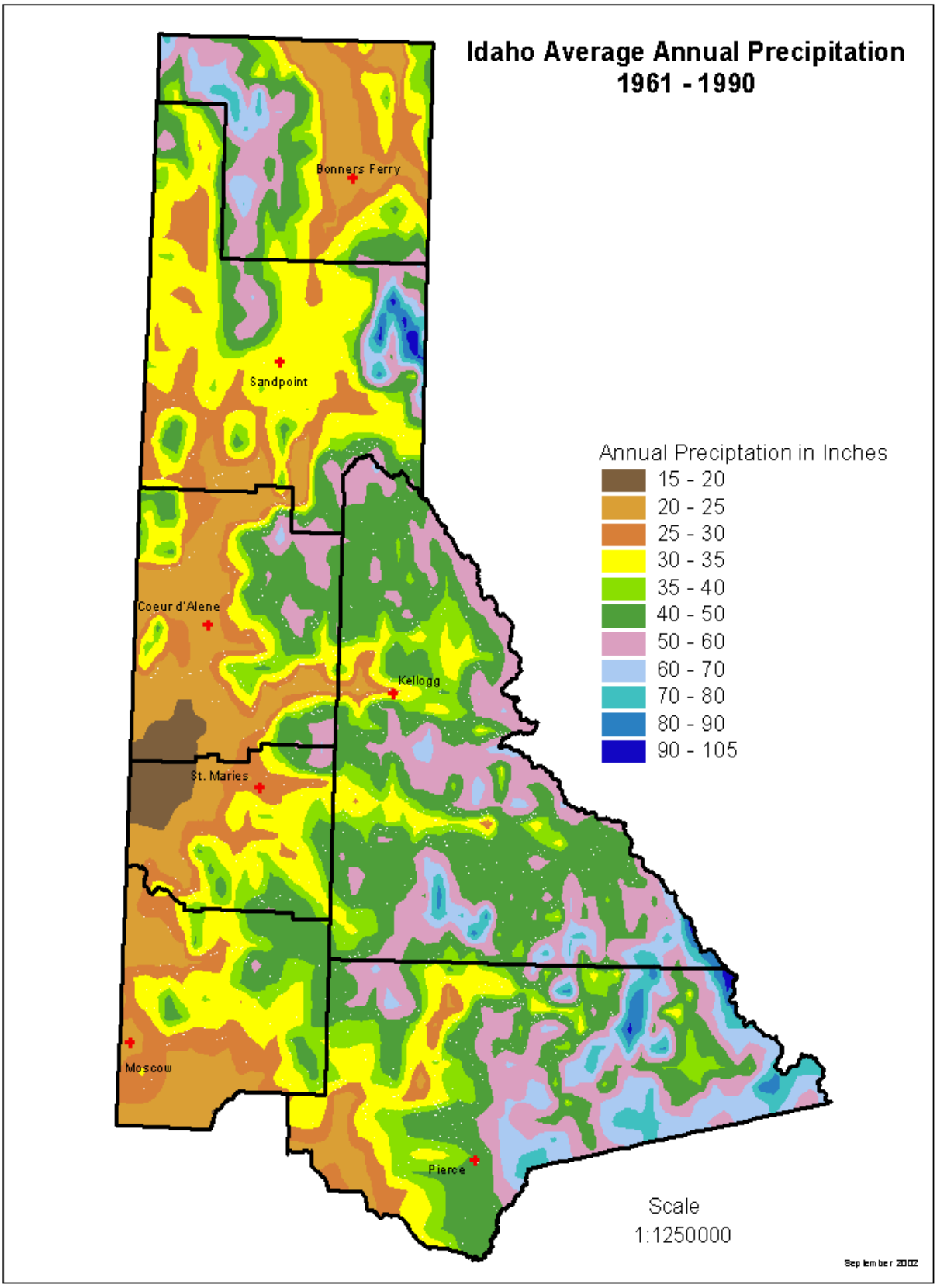
The temperature information includes monthly average daily maximum, average daily minimum, and average data in degrees F. The precipitation information includes monthly average, 30 percent chance of less than and more than, average number of days with .1 or more, and average total snowfall data in inches. The Growing season dates information provides 50 and 70 percent chance probability of temperatures being higher than 24, 28, and 32 degrees F.

Northern Idaho summers are warm to hot in the valleys and much cooler in the mountains. In the mountains, winters are cold, but generally not too severe. Valleys are colder than mountains and lower mountain slopes due to cold air drainage.

Precipitation occurs in the mountains throughout the year and deep snowpack accumulates during winter. Precipitation comes primarily during winter (October through March - 70 to 80 percent). The snowpack at high elevations supplies more water than can be used for agricultural irrigation in the valley.

The average relative humidity in mid afternoon is less than 44 percent in spring, and is about 50 percent during the rest of the year. Humidity is higher at night in all seasons, and the average is about 75 percent at dawn.

The percent of possible sunshine is 75 in summer and 42 in winter.


Idaho Average Annual Precipitation
1961 - 1990
Bonners Ferry
Sandpoint
Coeur d'Alene
Kellogg
St. Maries
Moscow
Pierce
Annual Preciptation in Inches
15 - 20
20 - 25
25 - 30
30 - 35
35 - 40
40 - 50
50 - 60
60 - 70
70 - 80
80 - 90
90 - 105
Scale
1:1250000
September 2002

BENEWAH COUNTY CLIMATE DATA

TAPS Station : SAINT MARIES, ID8062
Start yr. - 1961 End yr. - 1990
Temperature: 30 years available out of 30 requested in this analysis
Precipitation: 30 years available out of 30 requested in this analysis

	Temperature (Degrees F.)						Precipitation (Inches)				
				2 yrs in 10 will have				2 yrs in 10 will have		avg # of	
Month	avg daily max	avg daily min	avg	max temp. >than	min temp. <than	avg # of grow deg days*	avg	less than	more than	days w/.1 or more	avg total snow fall
January	34.3	22.3	28.3	51	-10	4	4.07	2.07	5.82	9	15.8
February	41.9	26.1	34.0	60	-2	14	2.87	1.38	4.16	8	7.1
March	49.8	29.6	39.7	70	10	70	2.72	1.62	3.70	8	3.0
April	58.7	34.0	46.4	83	22	203	2.20	1.24	3.05	6	0.5
May	67.6	40.3	53.9	91	28	431	2.16	1.39	2.86	6	0.0
June	75.9	47.0	61.4	96	34	638	1.99	1.21	2.69	5	0.0
July	85.1	49.9	67.5	101	37	847	1.00	0.35	1.60	2	0.0
August	84.9	49.0	67.0	102	36	835	1.34	0.36	2.21	3	0.0
September	74.4	42.0	58.2	96	26	545	1.24	0.51	1.94	3	0.0
October	59.7	34.6	47.1	83	19	236	1.78	0.52	2.80	6	0.2
November	42.5	29.9	36.2	61	8	36	3.38	1.98	4.62	10	5.8
December	34.4	23.7	29.1	51	-10	4	3.85	2.11	5.39	10	13.3
Yearly :											
Average	59.1	35.7	47.4	---	---	---	----	----	----	---	---
Extreme	109	-29	---	103	-16	---	----	----	----	---	---
Total	---	---	---	---	---	3863	28.61	20.65	32.12	76	45.9

Average # of days per year with at least 1 inch of snow on the ground: 41

*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (Threshold : 40.0 deg. F)

BONNER COUNTY CLIMATE DATA

TAPS Station : CABINET GORGE, ID1363
Start yr. - 1961 End yr. - 1990
Temperature: 30 years available out of 30 requested in this analysis
Precipitation: 30 years available out of 30 requested in this analysis

	Temperature (Degrees F.)						Precipitation (Inches)				
				2 yrs in 10 will have				2 yrs in 10 will have		avg # of	
Month	avg daily max	avg daily min	avg	max temp. >than	min temp. <than	avg # of grow deg days*	avg	less than	more than	days w/.1 or more	avg total snow fall
January	32.5	20.8	26.6	50	-9	1	4.31	2.35	6.04	10	29.3
February	39.2	24.0	31.6	55	-4	4	3.21	1.69	4.54	8	14.5
March	47.1	27.6	37.4	66	7	33	2.61	1.46	3.63	8	5.4
April	57.4	33.2	45.3	80	21	172	2.10	1.30	2.81	6	0.4
May	67.1	39.6	53.3	88	27	413	2.22	1.40	2.96	6	0.0
June	74.8	46.1	60.5	93	34	613	2.34	1.16	3.37	6	0.0
July	83.0	49.3	66.2	98	38	810	1.01	0.29	1.59	3	0.0
August	82.5	49.1	65.8	98	38	799	1.60	0.48	2.62	4	0.0
September	71.3	42.7	57.0	90	29	511	1.65	0.59	2.53	4	0.0
October	57.5	35.7	46.6	77	21	217	2.18	0.79	3.34	6	0.2
November	41.1	29.6	35.3	59	9	25	4.34	2.59	5.90	10	5.4
December	33.1	23.0	28.0	49	-8	2	4.45	2.81	5.94	11	24.1
Yearly :											
Average	57.2	35.1	46.1	---	---	---	----	----	----	---	---
Extreme	105	-28	---	100	-16	---	----	----	----	---	---
Total	---	---	---	---	---	3600	32.03	27.55	36.20	82	79.3

Average # of days per year with at least 1 inch of snow on the ground: 89

*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (Threshold : 40.0 deg. F)

BONNER COUNTY CLIMATE DATA

TAPS Station : PRIEST RIVER EXP STN, ID7386
Start yr. - 1961 End yr. - 1990
Temperature: 30 years available out of 30 requested in this analysis
Precipitation: 30 years available out of 30 requested in this analysis

	Temperature (Degrees F.)						Precipitation (Inches)				
				2 yrs in 10 will have				2 yrs in 10 will have		avg # of	
Month	avg daily max	avg daily min	avg	max temp. >than	min temp. <than	avg # of grow deg days*	avg	less than	more than	days w/.1 or more	avg total snow fall
January	29.8	19.4	24.6	45	-14	0	3.97	1.97	5.71	9	25.3
February	36.7	22.4	29.6	51	-8	1	3.12	1.73	4.34	8	13.8
March	45.1	25.8	35.4	63	3	14	2.77	1.68	3.75	8	5.6
April	56.0	30.9	43.5	78	18	132	2.08	1.23	2.83	5	0.2
May	66.1	38.3	52.2	86	25	378	2.44	1.60	3.20	7	0.0
June	73.9	44.8	59.4	91	32	581	2.06	1.14	2.87	6	0.0
July	81.8	47.2	64.5	96	34	760	1.21	0.50	1.88	3	0.0
August	81.5	46.5	64.0	97	33	745	1.45	0.37	2.40	3	0.0
September	70.9	39.5	55.2	90	24	456	1.53	0.51	2.37	4	0.0
October	55.6	32.7	44.2	76	17	157	2.02	0.72	3.09	5	0.4
November	37.9	27.8	32.8	56	5	13	4.33	2.52	5.96	10	9.8
December	30.3	21.6	25.9	46	-14	0	4.46	2.69	6.05	11	24.2
Yearly :											
Average	55.5	33.1	44.3	---	---	---	----	----	----	---	---
Extreme	103	-36	---	98	-21	---	----	----	----	---	---
Total	---	---	---	---	---	3238	31.43	27.51	35.23	79	79.4

Average # of days per year with at least 1 inch of snow on the ground: 114

*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (Threshold : 40.0 deg. F)

BONNER COUNTY CLIMATE DATA

TAPS Station : SANDPOINT EXPERMNT STN, ID8137
Start yr. - 1961 End yr. - 1990
Temperature: 30 years available out of 30 requested in this analysis
Precipitation: 30 years available out of 30 requested in this analysis

Month	Temperature (Degrees F.)						Precipitation (Inches)				
	avg daily max	avg daily min	avg	2 yrs in 10 will have max temp. >than	2 yrs in 10 will have min temp. <than	avg # of grow deg days*	avg	2 yrs in 10 will have less than	2 yrs in 10 will have more than	avg # of days w/.1 or more	avg total snow fall
January	32.5	21.0	26.7	49	-9	2	4.07	2.01	5.86	9	24.3
February	38.6	24.2	31.4	54	-4	4	3.31	1.71	4.70	8	12.8
March	46.5	28.1	37.3	63	7	33	2.85	1.55	4.00	8	4.6
April	56.8	33.8	45.3	77	21	172	2.12	1.25	2.90	5	0.3
May	66.0	40.0	53.0	85	26	403	2.51	1.63	3.31	7	0.0
June	73.6	46.4	60.0	91	33	599	2.32	1.24	3.27	6	0.0
July	80.9	48.6	64.7	95	36	767	1.24	0.54	1.92	3	0.0
August	80.6	47.8	64.2	96	35	747	1.63	0.58	2.71	4	0.0
September	69.8	41.3	55.6	87	26	466	1.71	0.55	2.67	4	0.0
October	56.3	33.6	45.0	74	18	173	2.35	0.98	3.65	5	0.4
November	41.0	28.8	34.9	58	8	24	4.70	2.71	6.46	10	6.5
December	33.3	22.5	27.9	49	-10	2	4.69	2.80	6.38	10	21.8
Yearly :											
Average	56.3	34.7	45.5	---	---	---	----	----	----	---	---
Extreme	100	-37	---	97	-16	---	----	----	----	---	---
Total	---	---	---	---	---	3394	33.50	29.14	37.08	79	70.7

Average # of days per year with at least 1 inch of snow on the ground: 77

*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (Threshold : 40.0 deg. F)

BOUNDARY COUNTY CLIMATE DATA

TAPS Station : BONNERS FERRY, ID1079
Start yr. - 1961 End yr. - 1990
Temperature: 30 years available out of 30 requested in this analysis
Precipitation: 30 years available out of 30 requested in this analysis

	Temperature (Degrees F.)						Precipitation (Inches)				
				2 yrs in 10 will have				2 yrs in 10 will have		avg # of days w/.1 or more	avg total snow fall
Month	avg daily max	avg daily min	avg	max temp. >than	min temp. <than	avg # of grow deg days*	avg	less than	more than		
January	32.9	19.6	26.3	51	-10	4	3.07	1.44	4.48	8	24.0
February	40.0	24.1	32.0	55	-4	8	1.96	1.06	2.76	6	10.5
March	48.7	27.9	38.3	66	7	46	1.65	0.91	2.31	5	3.8
April	59.5	33.7	46.6	80	20	204	1.47	0.87	2.01	4	0.3
May	68.7	40.4	54.6	88	27	448	1.64	1.02	2.20	5	0.0
June	76.3	47.2	61.8	93	34	642	1.61	0.87	2.26	5	0.0
July	83.4	49.9	66.7	98	38	810	0.93	0.43	1.41	3	0.0
August	83.1	49.2	66.2	98	37	793	1.15	0.39	1.84	3	0.0
September	71.9	41.3	56.6	90	26	491	1.41	0.52	2.16	4	0.0
October	57.4	33.8	45.6	77	19	190	1.68	0.59	2.58	4	0.4
November	41.7	28.0	34.9	60	6	28	3.52	1.87	4.97	9	8.3
December	33.6	21.6	27.6	50	-10	3	3.48	2.01	4.79	9	21.7
Yearly :											
Average	58.1	34.7	46.4	---	---	---	----	----	----	---	---
Extreme	103	-33	---	99	-16	---	----	----	----	---	---
Total	---	---	---	---	---	3668	23.58	19.68	26.21	65	69.1

Average # of days per year with at least 1 inch of snow on the ground: 43

*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (Threshold : 40.0 deg. F)

BOUNDARY COUNTY CLIMATE DATA

TAPS Station : PORTHILL, ID7264
Start yr. - 1961 End yr. - 1990
Temperature: 30 years available out of 30 requested in this analysis
Precipitation: 30 years available out of 30 requested in this analysis

	Temperature (Degrees F.)						Precipitation (Inches)				
				2 yrs in 10 will have				2 yrs in 10 will have		avg # of	
Month	avg daily max	avg daily min	avg	max temp. >than	min temp. <than	avg # of grow deg days*	avg	less than	more than	days w/.1 or more	avg total snow fall
January	32.5	17.6	25.0	50	-12	2	2.25	1.15	3.21	7	15.9
February	38.7	21.6	30.1	53	-5	3	1.58	0.75	2.30	5	5.9
March	47.1	26.7	36.9	64	4	32	1.49	0.86	2.05	5	1.8
April	58.2	33.5	45.9	78	21	186	1.38	0.94	1.78	4	0.1
May	67.6	40.5	54.1	88	27	435	1.72	0.97	2.38	5	0.1
June	74.8	47.3	61.1	92	35	632	1.81	1.02	2.51	5	0.0
July	81.6	50.5	66.0	97	39	805	1.07	0.40	1.62	3	0.0
August	81.4	48.8	65.1	98	36	773	1.27	0.61	1.91	4	0.0
September	70.5	40.6	55.5	90	27	464	1.41	0.50	2.17	4	0.0
October	56.1	32.6	44.3	75	20	155	1.39	0.54	2.09	5	0.1
November	41.5	26.9	34.2	59	5	21	2.76	1.54	3.84	7	5.6
December	33.3	19.9	26.6	51	-12	2	2.53	1.41	3.53	8	11.7
Yearly : Average	56.9	33.9	45.4	---	---	---	----	----	----	---	---
Extreme	100	-37	---	98	-18	---	----	----	----	---	---
Total	---	---	---	---	---	3509	20.65	17.71	23.48	62	41.2

Average # of days per year with at least 1 inch of snow on the ground: 65

*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (Threshold : 40.0 deg. F)

CLEARWATER COUNTY CLIMATE DATA

TAPS Station : DWORSHAK FISH HATCHERY, ID2845
Start yr. - 1967 End yr. - 1990
Temperature: 24 years available out of 24 requested in this analysis
Precipitation: 24 years available out of 24 requested in this analysis

Month	Temperature (Degrees F.)						Precipitation (Inches)				
	avg daily max	avg daily min	avg	2 yrs in 10 will have max temp. >than	2 yrs in 10 will have min temp. <than	avg # of grow deg days*	avg	2 yrs in 10 will have less than	2 yrs in 10 will have more than	avg # of days w/.1 or more	avg total snow fall
January	38.3	25.3	31.8	55	1	6	2.93	1.62	4.08	8	4.7
February	45.9	29.1	37.5	62	6	33	2.21	1.40	2.94	7	2.4
March	54.8	33.6	44.2	72	20	148	2.47	1.64	3.23	8	0.9
April	63.1	38.5	50.8	88	28	320	2.15	1.31	2.91	6	0.0
May	71.8	44.9	58.4	95	32	570	2.44	1.60	3.21	6	0.0
June	80.1	51.6	65.8	100	40	769	1.69	0.96	2.34	4	0.0
July	89.1	56.1	72.6	106	44	1009	1.04	0.33	1.69	3	0.0
August	89.7	55.5	72.6	106	45	1009	0.89	0.26	1.62	2	0.0
September	78.7	47.5	63.1	100	34	691	1.57	0.38	2.50	4	0.0
October	63.9	38.5	51.2	85	25	349	1.62	0.60	2.60	4	0.0
November	47.6	33.0	40.3	65	15	78	2.72	1.50	3.80	9	0.1
December	38.6	27.0	32.8	54	2	8	3.04	1.60	4.30	9	5.9
Yearly :											
Average	63.5	40.0	51.8	---	---	---	----	----	----	---	---
Extreme	111	-15	---	108	-5	---	----	----	----	---	---
Total	---	---	---	---	---	4991	24.78	20.74	27.31	70	14.0

Average # of days per year with at least 1 inch of snow on the ground: 8

*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (Threshold : 40.0 deg. F)

CLEARWATER COUNTY CLIMATE DATA

TAPS Station : ELK RIVER 1 S, ID2892
Start yr. - 1961 End yr. - 1990
Temperature: 30 years available out of 30 requested in this analysis
Precipitation: 30 years available out of 30 requested in this analysis

Month	Temperature (Degrees F.)						Precipitation (Inches)				
	avg daily max	avg daily min	avg	2 yrs in 10 will have max temp. >than	2 yrs in 10 will have min temp. <than	avg # of grow deg days*	avg	2 yrs in 10 will have less than	2 yrs in 10 will have more than	avg # of days w/.1 or more	avg total snow fall
January	34.0	16.5	25.3	48	-18	0	5.40	3.04	7.50	12	34.1
February	39.9	19.9	29.9	57	-10	1	4.13	2.42	5.67	10	18.5
March	45.8	24.1	35.0	65	2	20	3.65	2.46	4.74	10	13.2
April	54.2	30.6	42.4	79	18	118	2.54	1.42	3.53	7	3.4
May	63.3	36.5	49.9	88	24	310	2.71	1.76	3.58	7	0.5
June	71.9	43.1	57.5	93	31	523	2.27	1.32	3.12	6	0.0
July	80.9	45.1	63.0	97	32	703	1.10	0.26	1.84	3	0.0
August	81.4	44.0	62.7	98	31	704	1.21	0.35	1.98	3	0.0
September	70.8	37.1	54.0	93	24	419	1.92	0.54	3.04	5	0.0
October	58.2	29.9	44.0	81	17	156	2.53	0.72	3.99	6	0.5
November	42.4	25.7	34.0	63	2	18	4.31	2.78	5.70	11	14.0
December	34.0	18.2	26.1	48	-16	1	5.04	2.88	6.96	12	30.0
Yearly :											
Average	56.4	30.9	43.6	---	---	---	----	----	----	---	---
Extreme	107	-37	---	100	-24	---	----	----	----	---	---
Total	---	---	---	---	---	2972	36.84	31.64	41.56	92	114.2

Average # of days per year with at least 1 inch of snow on the ground: 130

*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (Threshold : 40.0 deg. F)

CLEARWATER COUNTY CLIMATE DATA

TAPS Station : HEADQUARTERS, ID4150
Start yr. - 1961 End yr. - 1990
Temperature: 30 years available out of 30 requested in this analysis
Precipitation: 30 years available out of 30 requested in this analysis

	Temperature (Degrees F.)						Precipitation (Inches)				
				2 yrs in 10 will have				2 yrs in 10 will have		avg # of	
Month	avg daily max	avg daily min	avg	max temp. >than	min temp. <than	avg # of grow deg days*	avg	less than	more than	days w/.1 or more	avg total snow fall
January	34.6	16.6	25.6	50	-15	0	5.45	2.94	7.66	13	27.4
February	40.3	18.8	29.5	58	-9	1	3.82	2.39	5.12	12	15.8
March	45.3	22.9	34.1	66	1	16	3.76	2.52	4.90	11	11.6
April	53.9	28.3	41.1	79	15	91	3.22	1.90	4.41	10	3.9
May	63.5	34.3	48.9	89	23	259	2.82	1.80	3.74	9	0.3
June	72.2	41.7	57.0	94	29	481	2.55	1.25	3.68	7	0.0
July	81.3	44.4	62.8	97	32	661	1.14	0.33	1.94	2	0.0
August	81.7	43.3	62.5	99	31	639	1.44	0.36	2.47	3	0.0
September	70.6	35.7	53.1	93	23	362	1.81	0.67	2.76	5	0.0
October	58.2	29.2	43.7	82	17	137	2.82	1.32	4.31	7	0.5
November	43.5	25.1	34.3	65	6	19	4.74	2.92	6.38	14	13.4
December	35.0	18.2	26.6	49	-12	0	5.05	2.71	7.11	14	24.8
Yearly :											
Average	56.7	29.9	43.3	---	---	---	----	----	----	---	---
Extreme	108	-28	---	100	-20	---	----	----	----	---	---
Total	---	---	---	---	---	2667	38.63	18.92	44.60	107	97.6

Average # of days per year with at least 1 inch of snow on the ground: 116

*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (Threshold : 40.0 deg. F)

CLEARWATER COUNTY CLIMATE DATA

TAPS Station : PIERCE, ID7046
Start yr. - 1963 End yr. - 1990
Temperature: 28 years available out of 28 requested in this analysis
Precipitation: 28 years available out of 28 requested in this analysis

	Temperature (Degrees F.)						Precipitation (Inches)				
				2 yrs in 10 will have				2 yrs in 10 will have		avg # of	
Month	avg daily max	avg daily min	avg	max temp. >than	min temp. <than	avg # of grow deg days*	avg	less than	more than	days w/.1 or more	avg total snow fall
January	32.1	16.1	24.1	44	-15	0	5.63	3.25	7.76	14	34.4
February	37.3	18.5	27.9	51	-9	0	4.33	2.88	5.65	12	22.2
March	44.2	22.8	33.5	63	1	9	4.22	2.94	5.39	12	16.5
April	52.0	28.3	40.1	77	17	75	3.49	2.54	4.37	10	6.5
May	63.5	34.4	49.0	89	23	282	3.40	2.18	4.50	9	1.0
June	71.1	41.2	56.2	93	29	477	2.96	1.58	4.18	7	0.0
July	80.8	43.3	62.1	97	32	673	1.34	0.53	2.32	3	0.0
August	80.5	41.6	61.1	97	30	648	1.63	0.51	2.76	4	0.0
September	69.5	34.3	51.9	92	21	356	2.28	0.76	3.53	5	0.0
October	56.8	27.9	42.3	80	15	112	2.95	1.38	4.53	7	0.7
November	40.1	24.6	32.4	61	2	9	4.60	2.76	6.24	13	12.4
December	31.5	16.5	24.0	42	-18	0	5.53	2.99	7.77	14	31.2
Yearly :											
Average	54.9	29.1	42.0	---	---	---	----	----	----	---	---
Extreme	101	-33	---	101	-22	---	----	----	----	---	---
Total	---	---	---	---	---	2640	42.35	25.85	44.98	110	124.9

Average # of days per year with at least 1 inch of snow on the ground: 128

*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (Threshold : 40.0 deg. F)

KOOTENAI COUNTY CLIMATE DATA

TAPS Station : BAYVIEW MODEL BASIN, ID0667
Start yr. - 1961 End yr. - 1990
Temperature: 30 years available out of 30 requested in this analysis
Precipitation: 30 years available out of 30 requested in this analysis

	Temperature (Degrees F.)						Precipitation (Inches)				
				2 yrs in 10 will have				2 yrs in 10 will have		avg # of	
Month	avg daily max	avg daily min	avg	max temp. >than	min temp. <than	avg # of grow deg days*	avg	less than	more than	days w/.1 or more	avg total snow fall
January	34.6	20.7	27.6	52	-7	3	3.01	1.35	4.43	8	16.3
February	38.5	23.8	31.2	54	-3	4	2.39	1.26	3.38	7	6.2
March	45.4	27.1	36.3	63	7	20	2.04	1.16	2.82	7	2.0
April	54.1	32.2	43.1	73	20	120	1.72	0.92	2.43	5	0.2
May	63.2	38.2	50.7	84	26	329	2.08	1.23	2.83	6	0.0
June	71.4	45.2	58.3	90	33	547	1.87	1.02	2.62	5	0.0
July	78.6	48.4	63.5	95	35	722	0.97	0.33	1.57	3	0.0
August	78.1	47.9	63.0	95	35	711	1.20	0.33	2.06	3	0.0
September	67.4	40.5	53.9	86	26	409	1.35	0.48	2.24	4	0.0
October	55.1	32.8	44.0	74	19	145	1.78	0.66	2.71	5	0.1
November	42.7	28.8	35.8	60	8	27	3.08	1.73	4.28	9	3.1
December	35.6	22.5	29.0	52	-8	4	3.40	1.99	4.67	9	13.9
Yearly :											
Average	55.4	34.0	44.7	---	---	---	----	----	----	---	---
Extreme	100	-28	---	96	-14	---	----	----	----	---	---
Total	---	---	---	---	---	3040	24.89	21.51	26.96	71	41.7

Average # of days per year with at least 1 inch of snow on the ground: 40

*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (Threshold : 40.0 deg. F)

KOOTENAI COUNTY CLIMATE DATA

TAPS Station : COEUR D ALENE 1 E, ID1956
Start yr. - 1961 End yr. - 1986
Temperature: 25 years available out of 26 requested in this analysis
Precipitation: 25 years available out of 26 requested in this analysis

	Temperature (Degrees F.)						Precipitation (Inches)				
				2 yrs in 10 will have				2 yrs in 10 will have		avg # of	
Month	avg daily max	avg daily min	avg	max temp. >than	min temp. <than	avg # of grow deg days*	avg	less than	more than	days w/.1 or more	avg total snow fall
January	35.0	22.3	28.6	51	-8	5	3.12	1.65	4.41	8	21.5
February	42.6	26.3	34.5	58	1	14	2.60	1.32	3.71	8	6.4
March	48.8	29.0	38.9	67	11	57	2.28	1.21	3.22	7	3.2
April	58.0	34.2	46.1	81	22	188	1.71	0.88	2.44	4	0.6
May	68.0	41.4	54.7	89	28	452	1.97	1.10	2.74	6	0.0
June	75.9	48.5	62.2	95	37	664	2.05	1.10	2.89	5	0.0
July	85.1	52.9	69.0	102	41	889	0.86	0.31	1.44	2	0.0
August	85.3	52.8	69.0	102	41	903	1.28	0.49	2.14	3	0.0
September	74.5	45.0	59.8	94	30	598	1.21	0.71	1.85	4	0.0
October	61.0	37.4	49.2	82	20	286	1.62	0.61	2.47	5	0.1
November	44.5	30.7	37.6	62	11	45	3.20	1.72	4.50	8	6.0
December	36.6	25.3	31.0	52	-5	8	3.80	2.33	5.12	10	16.8
Yearly : Average	59.6	37.2	48.4	---	---	---	----	----	----	---	---
Extreme	109	-26	---	104	-13	---	----	----	----	---	---
Total	---	---	---	---	---	4107	25.70	21.01	28.62	70	54.7

Average # of days per year with at least 1 inch of snow on the ground: 48

*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (Threshold : 40.0 deg. F)

LATAH COUNTY CLIMATE DATA

TAPS Station : MOSCOW UNIV OF IDAHO, ID6152
Start yr. - 1961 End yr. - 1990
Temperature: 30 years available out of 30 requested in this analysis
Precipitation: 30 years available out of 30 requested in this analysis

	Temperature (Degrees F.)						Precipitation (Inches)				
				2 yrs in 10 will have				2 yrs in 10 will have		avg # of	
Month	avg daily max	avg daily min	avg	max temp. >than	min temp. <than	avg # of grow deg days*	avg	less than	more than	days w/.1 or more	avg total snow fall
January	34.8	22.3	28.6	51	-10	5	3.12	1.45	4.55	8	17.3
February	41.0	27.0	34.0	58	-2	20	2.27	1.16	3.25	6	7.8
March	47.7	30.7	39.2	66	12	63	2.40	1.61	3.12	7	4.2
April	56.7	34.8	45.7	79	21	189	2.16	1.19	3.02	6	1.2
May	65.5	40.1	52.8	87	26	398	2.24	1.48	2.92	5	0.0
June	73.7	45.4	59.6	92	32	587	1.78	0.94	2.52	5	0.0
July	83.0	48.1	65.5	98	35	788	0.94	0.25	1.49	2	0.0
August	83.6	48.7	66.2	100	35	811	1.16	0.30	2.06	2	0.0
September	73.6	43.1	58.4	94	26	551	1.28	0.40	2.15	4	0.0
October	60.4	36.3	48.4	82	20	274	1.85	0.74	2.89	5	0.2
November	43.6	30.2	36.9	63	7	48	3.27	1.80	4.56	9	5.5
December	35.2	23.4	29.3	52	-14	9	3.02	1.65	4.24	8	15.2
Yearly :											
Average	58.2	35.8	47.0	---	---	---	----	----	----	---	---
Extreme	109	-42	---	101	-19	---	----	----	----	---	---
Total	---	---	---	---	---	3742	25.47	21.58	29.20	67	51.6

Average # of days per year with at least 1 inch of snow on the ground: 48

*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (Threshold : 40.0 deg. F)

SHOSHONE COUNTY CLIMATE DATA

TAPS Station : AVERY RANGER STN 2, ID0528
Start yr. - 1969 End yr. - 1990
Temperature: 22 years available out of 22 requested in this analysis
Precipitation: 22 years available out of 22 requested in this analysis

Month	Temperature (Degrees F.) avg daily max	avg daily min	avg	2 yrs in 10 will have max temp. >than	2 yrs in 10 will have min temp. <than	avg # of grow deg days*	Precipitation (Inches) avg	2 yrs in 10 will have less than	2 yrs in 10 will have more than	avg # of days w/.1 or more	avg total snow fall
January	30.0	19.2	24.6	45	-9	0	6.01	3.22	8.46	13	38.3
February	35.9	24.4	30.1	49	-4	0	3.57	1.95	5.00	10	15.2
March	44.3	28.0	36.1	62	10	19	3.15	1.70	4.43	9	3.9
April	55.3	32.8	44.0	81	23	142	2.65	1.53	3.65	9	0.4
May	66.7	39.0	52.9	89	26	401	2.88	1.93	3.75	7	0.0
June	75.8	45.9	60.8	95	34	615	2.11	1.03	3.25	6	0.0
July	83.4	48.6	66.0	98	37	801	1.45	0.66	2.40	3	0.0
August	83.3	48.4	65.9	98	37	801	1.49	0.30	2.54	3	0.0
September	70.7	41.7	56.2	91	28	468	2.13	0.68	3.31	5	0.0
October	56.0	34.2	45.1	76	20	167	2.13	0.50	3.41	7	0.4
November	39.0	28.8	33.9	56	8	12	4.03	2.47	5.43	10	7.5
December	31.6	22.9	27.3	44	-4	0	4.86	3.19	6.39	12	23.6
Yearly :											
Average	56.0	34.5	45.2	---	---	---	----	----	----	---	---
Extreme	104	-20	---	101	-13	---	----	----	----	---	---
Total	---	---	---	---	---	3428	36.45	20.01	39.20	94	89.4

Average # of days per year with at least 1 inch of snow on the ground: 44

*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (Threshold : 40.0 deg. F)

SHOSHONE COUNTY CLIMATE DATA

TAPS Station : KELLOGG, ID4831
Start yr. - 1961 End yr. - 1990
Temperature: 29 years available out of 30 requested in this analysis
Precipitation: 29 years available out of 30 requested in this analysis

Month	Temperature (Degrees F.) avg daily max	avg daily min	avg	2 yrs in 10 will have max temp. >than	2 yrs in 10 will have min temp. <than	avg # of grow deg days*	Precipitation (Inches) avg	2 yrs in 10 will have less than	2 yrs in 10 will have more than	avg # of days w/.1 or more	avg total snow fall
January	35.1	20.9	28.0	52	-9	4	3.83	2.18	5.30	10	15.4
February	42.0	24.6	33.3	60	-2	13	2.70	1.52	3.75	8	7.6
March	48.8	28.6	38.7	70	8	57	2.68	1.81	3.47	9	4.3
April	58.4	33.9	46.1	84	23	197	2.27	1.30	3.13	7	1.1
May	67.9	40.4	54.2	92	27	435	2.46	1.38	3.42	6	0.0
June	76.2	47.0	61.6	98	34	647	2.19	1.15	3.10	5	0.0
July	85.0	50.0	67.5	102	37	853	1.09	0.48	1.75	2	0.0
August	84.6	49.0	66.8	102	36	825	1.46	0.40	2.31	3	0.0
September	73.8	42.0	57.9	95	28	537	1.76	0.53	2.76	4	0.0
October	59.9	34.1	47.0	84	20	228	2.10	0.81	3.19	6	0.1
November	44.0	28.8	36.4	63	7	38	3.52	2.08	4.81	9	5.3
December	34.9	21.8	28.3	54	-10	6	3.96	2.44	5.32	11	14.7
Yearly :											
Average	59.2	35.1	47.1	---	---	---	----	----	----	---	---
Extreme	111	-36	---	104	-16	---	----	----	----	---	---
Total	---	---	---	---	---	3837	30.01	21.88	35.14	80	48.5

Average # of days per year with at least 1 inch of snow on the ground: 50

*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (Threshold : 40.0 deg. F)

SHOSHONE COUNTY CLIMATE DATA

TAPS Station : WALLACE WOODLAND PARK, ID9498
Start yr. - 1961 End yr. - 1990
Temperature: 30 years available out of 30 requested in this analysis
Precipitation: 30 years available out of 30 requested in this analysis

	Temperature (Degrees F.)						Precipitation (Inches)				
				2 yrs in 10 will have				2 yrs in 10 will have		avg # of	
Month	avg daily max	avg daily min	avg	max temp. >than	min temp. <than	avg # of grow deg days*	avg	less than	more than	days w/.1 or more	avg total snow fall
January	33.3	18.6	25.9	50	-13	2	5.51	2.56	8.05	12	24.7
February	39.3	22.2	30.8	58	-6	4	4.06	2.16	5.73	10	15.6
March	45.5	25.8	35.6	66	4	29	3.72	2.56	4.79	10	10.7
April	54.3	31.8	43.0	80	20	131	2.80	1.82	3.70	8	3.1
May	63.4	38.0	50.7	88	26	334	2.82	1.74	3.79	8	0.4
June	71.6	44.5	58.1	93	33	541	2.58	1.42	3.60	6	0.0
July	80.5	47.7	64.1	98	36	746	1.29	0.35	2.05	3	0.0
August	80.7	47.4	64.1	99	36	746	1.51	0.42	2.47	3	0.0
September	70.2	40.1	55.2	93	26	456	1.98	0.63	3.08	5	0.0
October	57.9	33.0	45.5	81	20	194	2.75	0.98	4.21	7	0.5
November	41.7	27.5	34.6	62	5	25	4.99	2.92	6.84	11	9.4
December	33.4	20.4	26.9	50	-13	2	5.24	3.20	7.08	12	21.7
Yearly :											
Average	56.0	33.1	44.5	---	---	---	----	----	----	---	---
Extreme	106	-31	---	100	-20	---	----	----	----	---	---
Total	---	---	---	---	---	3211	39.25	34.04	44.28	95	86.0

Average # of days per year with at least 1 inch of snow on the ground: 101

*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (Threshold : 40.0 deg. F)

LATAH COUNTY CLIMATE DATA

TAPS Station : POTLATCH 3 NNE, ID7301
Start yr. - 1961 End yr. - 1990
Temperature: 30 years available out of 30 requested in this analysis
Precipitation: 30 years available out of 30 requested in this analysis

	Temperature (Degrees F.)						Precipitation (Inches)				
				2 yrs in 10 will have				2 yrs in 10 will have		avg # of	
Month	avg daily max	avg daily min	avg	max temp. >than	min temp. <than	avg # of grow deg days*	avg	less than	more than	days w/.1 or more	avg total snow fall
January	35.6	20.9	28.2	53	-17	5	3.08	1.58	4.38	8	16.3
February	42.1	25.5	33.8	61	-5	19	2.50	1.28	3.56	7	7.1
March	47.8	28.6	38.2	67	8	50	2.42	1.66	3.13	7	4.8
April	56.3	32.6	44.4	79	20	153	2.05	1.01	2.95	6	1.2
May	65.1	37.3	51.2	88	24	346	2.16	1.26	2.97	5	0.2
June	72.9	42.8	57.8	92	29	532	1.82	0.98	2.57	5	0.0
July	81.5	44.2	62.8	98	31	707	0.91	0.38	1.47	2	0.0
August	82.2	43.4	62.8	99	30	705	1.11	0.27	1.84	2	0.0
September	72.2	37.4	54.8	93	21	443	1.32	0.46	2.11	3	0.0
October	59.7	31.5	45.6	83	15	195	1.64	0.87	2.54	4	0.3
November	43.8	28.5	36.1	64	4	39	3.03	1.80	4.13	9	5.0
December	36.0	22.2	29.1	53	-18	9	3.24	1.74	4.56	9	11.7
Yearly : Average	57.9	32.9	45.4	---	---	---	----	----	----	---	---
Extreme	110	-48	---	100	-25	---	----	----	----	---	---
Total	---	---	---	---	---	3203	25.28	21.75	28.30	67	46.6

Average # of days per year with at least 1 inch of snow on the ground: 15

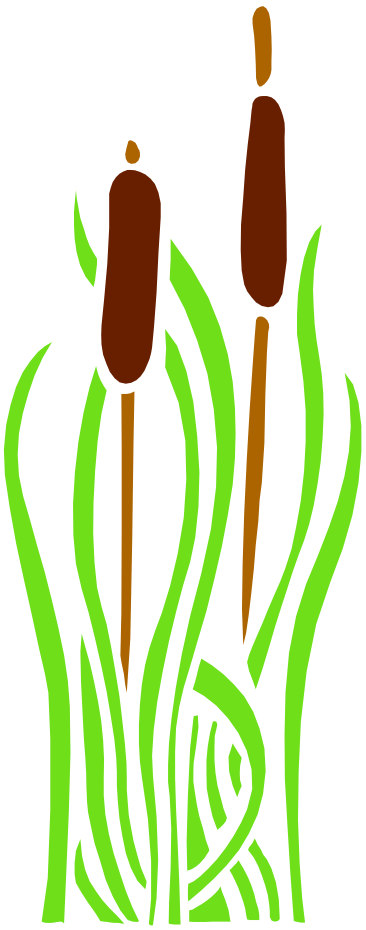
*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (Threshold : 40.0 deg. F)

Appendix B:

Biofiltration Systems

Vegetal Retardance Cover Type

(Vegetation Condition/Height/Slope)



APPENDIX B: Biofiltration Systems - Vegetal Retardance Cover Type (Vegetation Condition/Height/Slope)

Species listed are primarily introduced species noted for good to excellent erosion control traits.

Vegetal Retardance / n[1]		Cover	Average Condition/Height[3]/Slope	
A /	0.170[1]	Reed Canarygrass[5] Creeping Foxtail	Excellent/20-36"+ /5-10%	.37-.06[2]
B /	0.098[1] .31-.04[2]	Smooth Bromegrass[5] Reed Canarygrass[5] Tall Fescue Grass-Legume-Forb Mixture Timothy[4]/Brome/Orchardgrass[4]/ Tall Fescue/Tall Wheatgrass/ Alfalfa[4]/Forbs	Good / 12-20" /5-10%	
C /	0.057[1] .27-.032[2]	Redtop Smooth Bromegrass[5] Intermediate Wheatgrass Pubescent Wheatgrass Western Wheatgrass Grass-Legume-Forb Mixtures Bromegrass, Orchardgrass[4]/ Sod or Bunch Wheatgrasses[4]/ Alfalfa[4]/Forbs	Good / 6-15" / < 5%	
D /	0.046[1] .20-.03[2]	Kentucky bluegrass Red Fescue Grass-Legume-Forb Mixture Sheep Fescue[4]/Hard Fescue[4]/ Bromegrass[5]/Sod or Bunch Wheatgrasses[4]/Alfalfa[4]/Forbs	Good / 2-6" / < 5%	
E /	0.030[1] .83-.024[2]	Kentucky Bluegrass	Burned / 0-1" / < 5%	

[1] n values were selected using Velocity & Hydraulic Radius (VR) Product = 2

[2] n values vary according to product velocity and hydraulic radius (low velocity and shallow flows result in higher Mannings "n"; high velocity and deep flows result in lower Mannings "n"). Refer to SCS-TP-61 "Handbook of Channel Design for Soil and Water Conservation" for experimental results of Vegetal Retardance/VR/Mannings "n" relationships.

[3] During normal critical flow periods, if vegetation has been mowed or flattened due to snow cover, the appropriate vegetal retardance and n value should be used, for example, smooth bromegrass mowed to 4 inch stubble height, use D / 0.046.

[4] These are bunchgrasses or bunch type legumes and should be used only in seed mixtures and on slopes less than or equal to 5 percent.

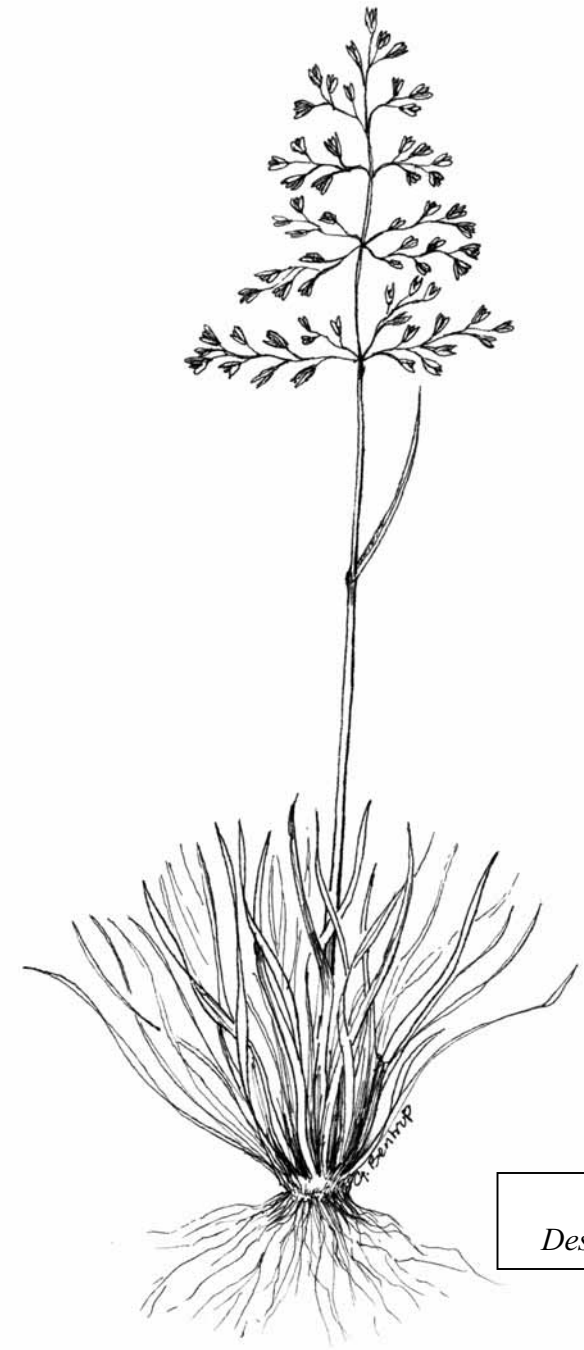
[5] Reed canarygrass and smooth bromegrass are commonly found in Northern Idaho, some consider these species to be weedy.

Appendix C

Plant Information Tables

Illustrated by G. Bentrup

HERBACEOUS GRASS AND GRASS-LIKE PLANTS



Tuffed Hairgrass
Deschampsia caespitosa

Description of Herbaceous Grass and Grass-Like Plants

Species	Elevation Range[1]	Root Type	Hydrologic Regime[2]	Availability In Field[3]	Commerical Availability[4]
Herbaceous Grasses and Grass-Like Species					
Agrostis species Redtop bentgrass	Low-Med.	Rhizomatous Perennial	Seasonally-Flooded	Introduced Common	Yes-Seed
Alopecurus arundinacea Creeping foxtail 11	Low-Med.	Rhizomatous Perennial	Seasonally-Flooded	Introduced	Yes-Seed
Beckmannia syzigachne Sloughgrass	Low-Mid.	Stoloniferous Annual	Seasonally-Flooded	Fairly Common	Yes-Seed & Plugs
Bromus biebersteinii Meadow brome	Low-High	Rhizomatous Perennial	Seasonally-Saturated Well Drained	Introduced	Yes-Seed
Bromus inermis Smooth brome 11	Low-High	Rhizomatous Perennial	Seasonally-Saturated Well Drained	Introduced	Yes-Seed
Bromus marginatus Mountain brome	Low-High	Bunch Short-live per.	Well Drained	Common	Yes-Seed
Calamagrostis canadensis Blue-joint reed grass	Mid.-High	Rhizomatous Perennial	Seasonally-Saturated	Common	Yes-Seed & Plugs
Carex aquatilis Water sedge	Mid.-High	Rhizomatous Perennial	Up to 3" Water Depth	Fairly Common	Yes-Seed & Plugs
Carex nebrascensis Nebraska sedge	Low-High	Rhizomatous Perennial	Seasonally-Saturated	Common	Yes-Seed & Plugs
Carex rostrata Beaked sedge	Low-High	Rhizomatous Perennial	Seasonally-Saturated	Common	Yes-Plugs
Dactylis glomerata Orchardgrass	Low-Med.	Bunch Perennial	Well Drained	Introduced	Yes-Seed
Deschampsia caespitosa Tufted hairgrass	Mid.-High	Fibrous Perennial	Seasonally-Saturated	Common	Yes-Seed
Eleocharis palustris Creeping Spikerush	Low-High	Rhizomatous Perennial	Seasonally-Flooded Up to 6" Water Depth	Very Common	Yes-Seed & Plugs
Elymus trachycaulus Slender Wheatgrass	Low-Med.	Bunch Short-live per.	Well Drained	Common	Yes-Seed
Elymus lanceolatus Streambank wheatgrass	Low-Med.	Rhizomatous Perennial	Seasonally-Saturated	Common	Yes-Seed
Elymus macrourus Thickspike wheatgrass	Low-Med.	Rhizomatous Perennial	Seasonally-Saturated	Common	Yes-Seed
Thinopyrum intermedium Intermediate wheatgrass	Low-Med	Rhizomatous Perennial	Seasonally-Saturated Well Drained	Introduced	Yes-Seed
Thinopyrum intermedium Pubescent wheatgrass	Low-Med.	Rhizomatous Perennial	Seasonally-Saturated Well Drained	Introduced	Yes-Seed
Lolium arundinaceum Tall fescue	Low-Med.	Bunch	Seasonally-Flooded	Introduced	Yes-Seed
Festuca idahoensis Idaho Fescue	Low-High	Bunch Perennial	Well Drained	Common	Yes-Seed
Festuca ovina Sheep fescue	Low-Med.	Bunch Perennial	Seasonally-Saturated Well Drained	Introduced	Yes-Seed
Festuca trachyphylla Hard fescue	Low-Med.	Bunch Perennial	Seasonally-Saturated Well Drained	Introduced	Yes-Seed
Festuca rubra Red fescue	Low-Med.	Rhizomatous Perennial	Seasonally-Saturated Well Drained	Introduced	Yes-Seed

Description of Herbaceous Grass and Grass-Like Plants

Species	Height	Rate of Spread[5]	Acidity Tolerance[6]	Salinity Tolerance[7]
Herbaceous Grasses and Grass-Like Species				
Agrostis species Redtop bentgrass	18-36"	Rapid	High	Low
Alopecurus arundinacea Creeping foxtail	24-48"	Rapid	Med.	Med.
Beckmannia syzigachne Sloughgrass	36"	Rapid	U	U
Bromus erectus Meadow brome	24-48"	Medium	Low	Low
Bromus inermis Smooth brome	18-36"	Rapid	Low	Low
Bromus marginatus Mountain brome	30-48"	Medium	Med.	Low
Calamagrostis canadensis Blue-joint reed grass	24-36"	Medium	Med.	Low
Carex aquatilis Water sedge	10-24"	Medium	Med.	Low
Carex nebrascensis Nebraska sedge	10-24"	Medium	Low	Medium
Carex utriculata Beaked sedge	10-40"	Rapid	Med.	Low
Dactylis glomerata Orchardgrass	24-48"	Slow	Low	Low
Deschampsia caespitosa Tufted hairgrass	18-30"	Medium	Med.	Med.
Eleocharis palustris Spikerush	6-30"	Rapid	Low	Med.
Elymus trachycaulus Slender Wheatgrass	24-36"	Medium	Low	High
Elymus lanceolatus Streambank wheatgrass	6-12"	Medium	Low	Med.
Elymus macrourus Thickspike wheatgrass	8-24"	Medium	Low	Med.
Thinopyrum intermedium Intermediate wheatgrass	24-48"	Rapid	Med.	Med.
Thinopyrum intermedium Pubescent wheatgrass	24-48"	Rapid	Med.	Med.
Lolium arundinaceum Tall fescue	24-48"	Rapid	High	High
Festuca idahoensis Idaho Fescue	12-24"	Slow	Low	Low
Festuca ovina Sheep fescue	6-18"	Slow	Med.	Low
Festuca trachyphylla Hard fescue	6-18"	Slow	Med.	Low
Festuca rubra Red fescue	6-12"	Medium	Med.	Low

Description of Herbaceous Grass and Grass-Like Plants

Species	Wildlife Value	Notes	Use in Hydrologic Zone[8]	Flood Tolerance[9]	Plant Ind. Status[10]
Herbaceous Grasses and Grass-Like Species					
Agrostis species Redtop bentgrass	Waterfowl food	Good soil stabilizer	3,4,5	H	FACW
Alopecurus arundinacea Creeping foxtail	Waterfowl, small mammal, and big game food	Excellent soil stabilizer Slow initial establishment	3,4,5,6	H	FACW
Beckmannia syzigachne Sloughgrass	Waterfowl and small mammal food	Palatable forage grass	3,4,5	H	OBL
Bromus erectus Meadow brome	Waterfowl, small mammal, and big game food	Excellent soil stabilizer	4,5,6	H	FACU
Bromus inermis Smooth brome	Waterfowl, small mammal, and big game food	Excellent soil stabilizer	4,5,6	H	FACU
Bromus marginatus Mountain brome	Small mammal food and upland bird cover	Excellent soil stabilizer	4, 5, 6	M	FACU
Calamagrostis canadensis Blue-joint reed grass	Small mammal food and upland bird cover	Excellent soil stabilizer	3,4,5	H	FACW+
Carex aquatilis Water sedge	Waterfowl food and cover		2,3,4	H	OBL
Carex nebrascensis Nebraska sedge	Waterfowl food and cover, small mammal cover	Tolerates heat if provided with adequate moisture	2,3,4	H	OBL
Carex utriculata Beaked sedge	Waterfowl and small mammal food	Also known as *C. rostrata*	2,3,4	H	OBL
Dactylis glomerata Orchardgrass	Waterfowl, small mammal, and big game food		5,6	L	FACU
Deschampsia caespitosa Tufted hairgrass	Small mammal cover		3,4	H	FACW
Eleocharis palustris Spikerush	Waterfowl food	Excellent soil stabilizer	2,3,4,5	H	OBL
Elymus trachycaulus Slender Wheatgrass	Waterfowl, small mammal, and big game food	Excellent soil stabilizer	5, 6	L	FACU
Elymus lanceolatus Streambank wheatgrass		Good soil stabilizer, low growth form, drought tol.	5,6	M	FACU
Elymus macrourus Thickspike wheatgrass		Good soil stabilizer and very drought tolerant	5,6	M	FACU
Thinopyrum intermedium Intermediate wheatgrass	Small mammal and big game food	Excellent soil stabilizer	5,6	M	FACU
Thinopyrum intermedium Pubescent wheatgrass	Small mammal and big game food	Excellent soil stabilizer	5,6	M	FACU
Lolium arundinaceum Tall fescue		Excellent soil stabilizer	2,3,4,5,6	H	FAC
Festuca idahoensis Idaho Fescue	Small mammal and big game food	Excellent soil stabilizer	5,6	M	FACU
Festuca ovina Sheep fescue		Excellent soil stabilizer	5,6	M	FACU
Festuca trachyphylla Hard fescue		Excellent soil stabilizer	5,6	M	FACU
Festuca rubra Red fescue		Excellent soil stabilizer	4,5,6	M	FAC

Description of Herbaceous Grass and Grass-Like Plants

Species	Elevation Range[1]	Root Type	Hydrologic Regime[2]	Availability In Field[3]	Commerical Availability[4]
Glyceria striata Mannagrass	Mid.-High	Rhizomatous Perennial	Seasonally-Flooded	Fairly Common	Yes-Seed & Plugs
Juncus balticus Baltic rush	Low-High	Rhizomatous Perennial	Seasonally-Saturated	Very Common	Yes-Seed & Potted
Juncus mertensianus Merten's rush	Mid.-High	Rhizomatous Perennial	Saturated Seasonally-Saturated	Fairly Common	Yes-Seed & Plugs
Juncus tenuis Poverty rush	Mid.-High	Rhizomatous Perennial	Saturated Seasonally-Saturated	Fairly Common	Yes-Plugs
Lolium perenne Perennial Ryegrass	Low-Med.	Bunch Short-live per.	Seasonally flooded Well Drained	Introduced	Yes-Seed
Pascopyrum smithii Western wheatgrass	Low- Med.	Rhizomatous Perennial	Seasonally-Flooded	Common	Yes-Seed
Poa secunda (ampla) Big Bluegrass	Low-High	Bunch Perennial	Well drained Seasonally flooded	Common	Yes-Seed
Poa compressa Canada Bluegrass	Low-High	Rhizomatous Perennial	Well drained Seasonally flooded	Introduced	Yes-Seed
Poa pratensis Kentucky bluegrass	Low-High	Rhizomatous Perennial	Seasonnaly-Flooded Well Drained	Introduced	Yes-Seed
Phallaris arundinacea Reed canarygrass 12	Low-Mid.	Rhizomatous Perennial	Seasonally-Flooded	Common	Yes-Seed & Plugs
Phleum pratensis Timothy	Low-High	Rhizomatous Perennial	Seasonally-Flooded	Introduced	Yes-Seed
Puchinella nuttalliana Alkali grass	Low-Mid.	Fibrous Perennial	Seasonally-Saturated	Common	Yes-Seed & Plugs
Schoenoplectus acutus Hardstem bulrush	Low-High	Rhizomatous Perennial	Up to 36" Water Depth	Very Common	Yes-Seed & Plugs
Schoenoplectus pungens Three-square bulrush	Low-Mid.	Rhizomatous Perennial	Up to 6" Water Depth	Very Common	Yes-Seed & Plugs
Schoenoplectus tabernaemontani Softstem bulrush	Low-High	Rhizomatous Perennial	Up to 36" Water Depth	Common	Yes-Seed & Plugs
Typha latifolia Cattail	Low-Mid.	Rhizomatous Perennial	Up to 12" Water Depth	Very Common	Yes-Seed & Plugs
Verbena hastata Blue vervain	Low-Mid.	Fibrous Perennial	Seasonally-Saturated	Common	Yes-Seed & Plugs

Footnotes:

1. **Elevation Range:** for this region.
   - **Low** 2000-4500 feet
   - **Middle** 4500-7000 feet
   - **High** 7000-10000 feet
2. **Hydrologic Regime:** This indicates optimal moisture conditions, although local conditions are the best benchmarks for design. Well-drained species may tolerate short periods of saturation. Seasonally saturated species prefer soil that is saturated early in the season but later dry out. Seasonally flooded species prefer flooding in the early portion of the season. Saturated indicates species that prefer very wet conditions all season. Others prefer standing water to the depths described.
3. **Availability in the Field:** This refers to natural occurrences in the region. Introduced are not native species and are probably not available in field. The order of the ranking is from least to greatest:
   Fairly Common **Common** **Very Common**
4. **Commercial Availability:** This refers to whether the species is available in the seed or nursery trade.
5. **Rate of Spread:** Refers to the horizontal rate of growth. These rates are only guidelines since rates will vary with growing season, elevation, soil, soil limitations, etc.
   - **Rapid** More than 1.0 feet per year
   - **Medium** About 0.5 feet per year
   - **Slow** About 0.2 feet per year
   - **V. Slow** Less than 0.2 feet per year

Description of Herbaceous Grass and Grass-Like Plants

Species	Height	Rate of Spread[5]	Acidity Tolerance[6]	Salinity Tolerance[7]
Glyceria striata Mannagrass	24-36"	Rapid	U	Low
Juncus balticus Baltic rush	18-24"	Medium	Med.	Med.
Juncus mertensianus Merten's rush	4-16"	Medium	U	U
Juncus tenuis Poverty rush	6-12"	Medium	U	U
Lolium perenne Perennial Ryegrass	18-24"	Medium	Med.	Low
Pascopyrum smithii Western wheatgrass	6-12"	Rapid	Med.	Med.
Poa secunda (ampla) Big Bluegrass	24-36"	Rapid	Med.	Low
Poa compressa Canada Bluegrass	12-24"	Rapid	Med.	Low
Poa pratensis Kentucky bluegrass	6-18"	Rapid	Low	Low
Phalaris arundinacea Reed canarygrass	24-48"	Rapid	Low	Low
Phleum pratensis Timothy	24-48"	Medium	Med.	Low
Puchinella nuttalliana Alkali grass	6-12"	Medium	Low	High
Schoenoplectus acutus Hardstem bulrush	Up to 6'	Rapid	Low	Med.
Schoenoplectus pungens Three-square bulrush	24-48"	Rapid	Low	Med.
Schoenoplectus tabernaemontani Softstem bulrush	Up to 6'	Slow	Low	High
Typha latifolia Cattail	Up to 6'	Rapid	Med.	High
Verbena hastata Blue vervain	18-30"	Slow	U	Low

6. Tolerance to Acidity: Resistance to acidity relative to native vegetation on similar sites.

7. Tolerance to Salinity: Resistance to salinity relative to native vegetation on similar sites.

8. Hyrologic Zone: 1-Deep Water; **2**-Shallow Bench; **3**-Shallow Fringe; 4-Shoreline Fringe; 5-Terrace; 6-upland

9. Flooding Tolerance: (H)igh; **(M)**edium; **(L)**ow

10. Plant Indicator Status for Occurrence in Wetlands:

OBL = Obligate

FACW = Facultative Wet

FAC = Facultative

FACU = Facultative Upland

Upland = Upland

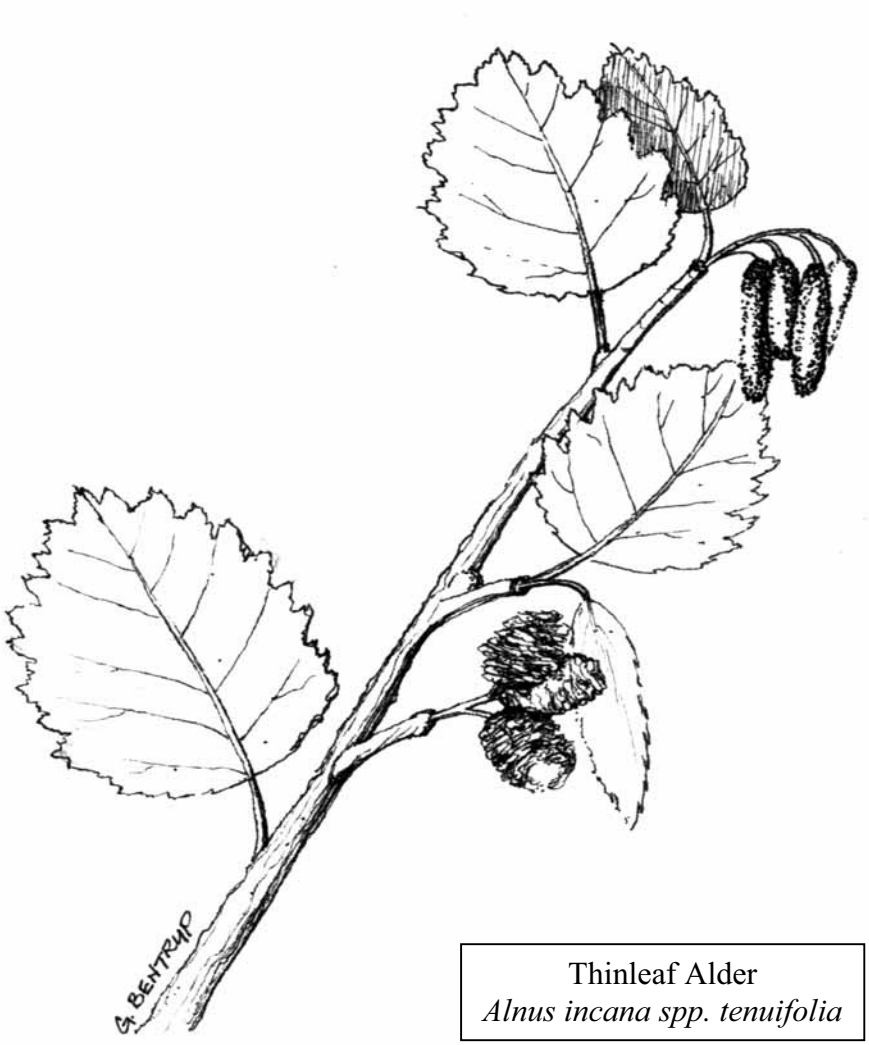
11 Considered Invasive - caution recommended when using this species

U - Unknown

Description of Herbaceous Grass and Grass-Like Plants

Species	Wildlife Value	Notes	Use in Hydrologic Zone[8]	Flood Tolerance[9]	Plant Ind. Status[10]
Glyceria striata Mannagrass	Waterfowl and big game food	Excellent soil stabilizer	3,4,5	H	OBL
Juncus balticus Baltic rush	Waterfowl food	Tolerates wide range of hydrologic conditions	2,3,4,5,6	H	OBL
Juncus mertensianus Merten's rush	U		3,4,5	H	OBL
Juncus tenuis Poverty rush	U		3,4,5	M	FAC
Lolium perenne Perennial Ryegrass	U		4,5,6	M	FAC
Pascopyrum smithii Western wheatgrass		Excellent soil stabilzer	4,5,6	H	FACU
Poa secunda (ampla) Big Bluegrass	Waterfowl, small mammal, and big game food	Excellent soil stabilizer	4, 5, 6	L	FACU
Poa compressa Canada Bluegrass	Waterfowl, small mammal, and big game food	Excellent soil stabilizer	5, 6	L	FACU
Poa pratensis Kentucky bluegrass	Waterfowl, small mammal, and big game food	Excellent soil stabilizer	3,4,5,6	H	FACU
Phalaris arundinacea Reed canarygrass	Waterfowl food	Excellent soil stabilizer	2,3,4,5,6	H	FACW
Phleum pratensis Timothy	Waterfowl, small mammal, and big game food	Excellent soil stabilizer Slow establishment	3,4,5,6	H	FACU
Puchinella nuttalliana Alkali grass	Small mammal cover	Tolerates high salinity	3,4,5,6	H	OBL
Schoenoplectus acutus Hardstem bulrush	Waterfowl food and cover, small mammal cover	Excellent soil stabilizer	2,3,4	H	OBL
Schoenoplectus pungens Three-square bulrush	Waterfowl food and cover, small mammal cover	Tolerates some hydrologic drawdown	2,3,4	H	OBL
Schoenoplectus tabernaemontani Softstem bulrush	Waterfowl food and cover, small mammal cover	Excellent soil stabilizer	2,3,4	H	OBL
Typha latifolia Cattail	Waterfowl food and cover, small mammal cover and food	Can be invasive	2,3,4	H	OBL
Verbena hastata Blue vervain	Upland bird food	Very fibrous root system	2,3,4	M	FACW

NATIVE
RIPARIAN TREES
AND SHRUBS



Thinleaf Alder
Alnus incana spp. tenuifolia

Description of Native Riparian Trees and Shrubs

Species	Size/Form	Elev. Range[1]	Root Type	Rooting From Cuttings	Riparian Zone[2]	Availability In Field[3]	Commerical Availability[4]
Riparian Shrubs and Trees							
Acer negundo Boxelder	Med.-Lg. Tree	Low - Mid.	Moderately Spreading	Poor	4	Common	Yes
Alnus rubra Red alder	Med. Tree	Mid. - High	Shallow Spreading	Poor	3,4	Fairly Common	Yes
Alnus sinuata Sitka alder	Sm.- Med. Tree	Mid. - High	Shallow Spreading	Poor	2,3	Fairly Common	Yes
Alnus incana spp. tenuifolia Thinleaf alder	Sm.- Med. Tree	Mid. - High	Shallow Spreading	Poor	2,3	Common	Yes
Amelanchier alnifolia Serviceberry	Sm.- Med. Shrub	Low - Mid.	Shallow to Deep Spreading	Good from roo cuttings	4, 5	Common	Yes
Betula occidentalis Water birch	Lg. Shrub to Sm. Tree	Mid. - High	Shallow to Deep Spreading	Poor	2,3	Fairly Common	Yes
Cornus sericea Redosier dogwood	Med. Shrub	Mid.	Shallow	*Moderate	2,3,4	Fairly Common	Yes
Crataegus douglasii Black/Douglas hawthorn	Sm. Tree	Low - Mid.	Shallow to Deep Spreading	Poor	3,4	Fairly Common	Yes
Pentaphylloides floribunda Shrubby cinquefoil	Sm. Shrub	Low - Mid.	Shallow to Deep Spreading	Poor	3,4	Very Common	Yes
Philadelphus lewisii Mockorange	Sm. - Med. Shrub	Low - Mid.	Spreading Fibrous	Good	3,4	Common	Yes
Populus angustifolia Narrowleaf cottonwood	Lg. Tree	Mid.	Shallow	Very Good	4	Very Common	Yes
Populus tremuloides Quaking aspen	Med. Tree	Mid. - High	Shallow	Poor	4	Very Common	Yes
Populus trichocarpa Black cottonwood	Lg. Tree	Low - Mid.	Shallow Fibrous	Very Good	4	Very Common	Yes
Prunus virginiana Chokecherry	Med. - Lg. Shrub	Low - Mid.	Rhizomatous	Good from roo cuttings	4,5	Common	Yes
Rhus trilobata Skunkbush sumac	Med. - Lg. Shrub	Low - Mid.	Deep Spreading Rhizomatous	Poor	4,5	Fairly Common	Yes
Ribes aureum Golden current	Sm. - Med. Shrub	Low - Mid.	Spreading	Good (in greenhouse)	3,4,5	Common	Yes
Ribes cereum Wax/Squaw current	Sm. - Med. Shrub	Mid. - High	Spreading	Fair	3,4,5	Common	Yes
Rosa woodsii Wood's rose	Sm. - Med. Shrub	Low - Mid.	Shallow to Deep	Good (in greenhouse)	2,3,4,5	Very Common	Yes
Sambucus coerulea Blue elderberry	Sm. Tree	Mid.	Rhizomatous	Poor	4,5	Fairly Common	Yes
Sambucus racemosa Red elderberry	Med. Shrub	Mid. - High	Spreading	Poor	4,5	Fairly Common	Yes

Footnotes:

U Unknown

1. Elevation Range: for this region.

Low	2000-4500 feet
Middle	4500-7000 feet
High	7000-10000 feet

2. Riparian Zone: 1-Toe Zone; 2-Bank Zone 3-Overbank Zone; 4-Transitional Zone; 5-Upland Zone; 6-Unknown

3. Availability in the Field: This refers to natural occurrences in the region. The order of the ranking is from least to greatest:
Fairly Common-Common-Very Common

4. Commercial Availability: This refers to whether the species is currently available in the nursery trade.

Description of Native Riparian Trees and Shrubs

Species	Deposition Tolerance[5]	Flooding Tolerance[6]	Drought Tolerance[7]	Salinity Tolerance[8]	Wildlife Value/Misc. Notes	Plant Ind. Status[9]
Riparian Shrubs and Trees						
Acer negundo Boxelder	High	High	High	Med.	Birds and small mammals eat fruits	FAC
Alnus rubra Red alder	Med.	Med.	Low	Low	Big game browse upland bird food	FAC
Alnus sinuata Sitka alder	Med.	Med.	Low	Low	Big game browse upland bird food	FACW
Alnus incana spp. tenuifolia Thinleaf alder	Med.	Med.	Low	Low	Big game browse upland bird food	FACW
Amelanchier alnifolia Serviceberry	Low	Low	Low - Med.	Low	Big Game Browse upland bird food	FACU
Betula occidentalis Water birch	Med.	Med	Low	Low	Big game browse	FACW
Cornus sericea Redosier dogwood	Low	High	Med.	Low	Big game browse, sm. mammal food, upland bird food.	FACW
Crataegus douglasii Black/Douglas hawthorn	Med.	Low	High	Low	Browse for many species and cover	FACU
Pentaphylloides floribunda Shrubby cinquefoil	U	U	High	U	Big game browse	FACW FAC
Philadelphus lewisii Mockorange	U	High	U	U	Big game browse	FACU,U
Populus angustifolia Narrowleaf cottonwood	Med.	Med.	High	Med.	Big game browse	FACW
Populus tremuloides Quaking aspen	Low	Low	Med.	Med.	Big game browse	FAC FACU
Populus trichocarpa Black cottonwood	Med.	Med.	Med.	U	Big game browse	FACW
Prunus virginiana Chokecherry	Low	Low	Low-Med.	Low-Med	Birds and small mammals eat fruits	FACU
Rhus trilobata Skunkbush sumac	High	Med.-High	Med.-High	Med.	Birds and sm. mammals eat fruits Doesn't tolerate long-term flood	FACU,U
Ribes aureum Golden current	U	U	U	High	Birds and small mammals eat fruits	FAC FACW
Ribes cereum Wax/Squaw current	U	U	U	U	Birds and small mammals eat fruits	FACU,U
Rosa woodsii Wood's rose	U	Low	Low-High	Low	Rosehips eaten by many species	FACU
Sambucus coerulea Blue elderberry	Med.	Med.	Med.	Low	Fruits are important for birds	FAC
Sambucus racemosa Red elderberry	Med.	Med.	Med.	Low	Big game browse, Fruits eaten by birds and small mammals	FACU

5. Deposition Tolerance: Regrowth following shallow coverage by soil.

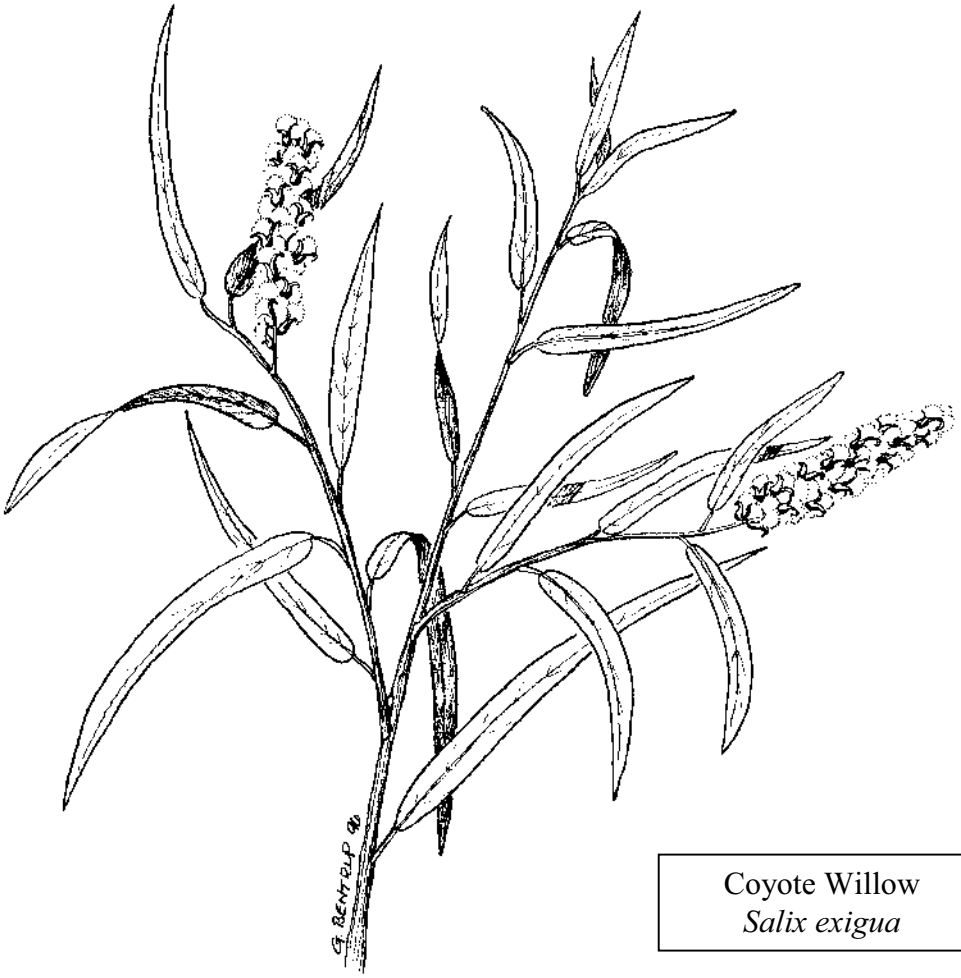
6. Tolerance to Flooding:
- **High** – tolerates 10-30+ days of flooding
- **Medium** – tolerates 6-10 days of flooding
- **Low** – tolerates 1-5 days or less of flooding

7. Tolerance to Drought: Resistance to drought relative to native vegetation on similar sites

8. Tolerance to Salinity: Resistance to salinity relative to native vegetation on similar sites.

9. Plant Ind. Status-Occurrence in Wetlands:
- **OBL** = Obligate
- **FACW** = Facultative Wet
- **FAC** = Facultative
- **FACU** = Facultative Upland
- **U** = Upland

NATIVE WILLOWS



Coyote Willow
Salix exigua

Descriptions of Native Willows

Species	Size/Form	Elevation Range[1]	Root Type	Rooting Ability From Cuttings	Riparian Zone[2]	Availability In Field[3]
Riparian Willows						
Salix alba White/Golden willow	Med. - Lg. Tree	Low - Mid.	Shallow to Deep	Good	4	Common
Salix amygdaloides Peachleaf willow	Sm. Tree	Low	Fibrous	Very Good	4	Common
Salix bebbiana Bebb's willow	Lg. Shrub	Low to Mid.	Shallow to Deep	Good	4	Common
Salix boothii Booth willow	Med. Shrub	Mid.	Shallow to Deep	Moderate	2,3	Very Common
Salix drummondiana Drummond willow	Sm. - Med. Shrub	Mid. - High	Shallow to Deep	Good	2,3	Common
Salix exigua Coyote willow	Med. Shrub	Low - Mid.	Rhizomatous	Very Good	2,3,4	Very Common
Salix geyeriana Geyer willow	Med.. Shrub	Mid.	Shallow to Deep	Good	2,3	Very Common
Salix lasiandra Pacific willow	Sm. Tree	Low - Mid.	Shallow to Deep	Good	4	Common
Salix lemmonii Lemmon willow	Sm. - Med. Shrub	Mid. - High	Shallow to Deep	Good	2,3	Fairly Common
Salix lutea Yellow willow	Med. - Lg. Shrub	Low	Shallow to Deep	Good	2,3	Very Common
Salix nigra Black willow	Lg. Tree	Low - Med.	Shallow to Deep	Good	4	Fairly Common
Salix planifolia Planeleaf willow	Sm. Shrub	Mid. - High	Shallow to Deep	Moderate	2,3	Fairly Common
Salix prolixa Mackenzie willow	Sm. Tree	Low - Med.	Shallow to Deep	Good	3	Fairly Common
Salix scouleriana Scouler willow	Lg. Shrub	Low - Mid.	Shallow to Deep	Need to treat with hormone	5 (upland willow)	Fairly Common
Salix sitchensis Sitka willow	Sm. - Med. Tree	Low - Med.	Shallow to Deep	Moderate	3	Common

Footnotes:

U Unknown

1. Elevation Range: for this region.

Low 2000-4500 feet
Middle 4500-7000 feet
High 7000-10000 feet

2. Riparian Zone: 1-Toe Zone; 2-Bank Zone; 3-Overbank Zone; 4-Transitional Zone; 5-Upland Zone; 6-Unknown

3. Availability in the Field: This refers to natural occurrences in the region. The order of the ranking is from least to greatest:

Fairly Common-Common-Very Common

4. Commercial Availability: This refers to whether the species is currently available in the nursery trade.

Descriptions of Native Willows

Species	Commerical Availability[4]	Deposition Tolerance[5]	Flooding Tolerance[6]	Drought Tolerance[7]	Salinity Tolerance[8]	Wildlife Value	Plant Ind. Status[9]
Riparian Willows							
Salix alba White/Golden willow	Yes	High	High	Med.	Low	Good	FACW
Salix amygdaloides Peachleaf willow	Yes-limited	High	High	Low	Med.	Good	FACW
Salix bebbiana Bebb's willow	Yes-limited	High	High	Low - Med.	Low	Good	FACW
Salix boothii Booth willow	Yes-limited	High	Med. - High	Low - Med	Low	Good	FACW
Salix drummondiana Drummond willow	Yes-limited	High	Med. - High	Low - Med	Low	Good	FACW
Salix exigua Coyote willow	Yes	High	Med. - High	Low - Med.	Low	Good	OBL
Salix geyeriana Geyer willow	Yes-limited	High	Med. - High	Low - Med	Low	Good	OBL
Salix lasiandra Pacific willow	Yes	High	Med. - High	Low - Med	Low	Good	FACW
Salix lemmonii Lemmon willow	No	High	Med. - High	Low - Med	Low	Good	FACW
Salix lutea Yellow willow	Yes-limited	Med.	Med. - High	Low - Med.	Med.	Good	FACW OBL
Salix nigra Black willow	Yes	Med.	Med. - High	Low - Med.	Low	Good	FACW OBL
Salix planifolia Planeleaf willow	No	High	Med. - High	Low - Med.	Low	Good	OBL
Salix prolixa Mackenzie willow	Yes-Limited	High	Med. - High	Low - Med.	Low	Good	OBL
Salix scouleriana Scouler willow	Yes	High	Med. - High	Low - Med.	High	Good	FACU FAC
Salix sitchensis Sitka willow	Yes-Limited	High	Med. - High	Low - Med.	Low	Good	FACW

5. Deposition Tolerance: Regrowth following shallow coverage by soil.

6. Tolerance to Flooding:

High – tolerates 10-30+ days of flooding

Medium – tolerates 6-10 days of flooding

Low – tolerates 1-5 days or less of flooding

7. Tolerance to Drought: Resistance to drought relative to native vegetation on similar sites.

8. Tolerance to Salinity: Resistance to salinity relative to native vegetation on similar sites.

9. Plant Ind. Status-Occurrence in Wetlands:

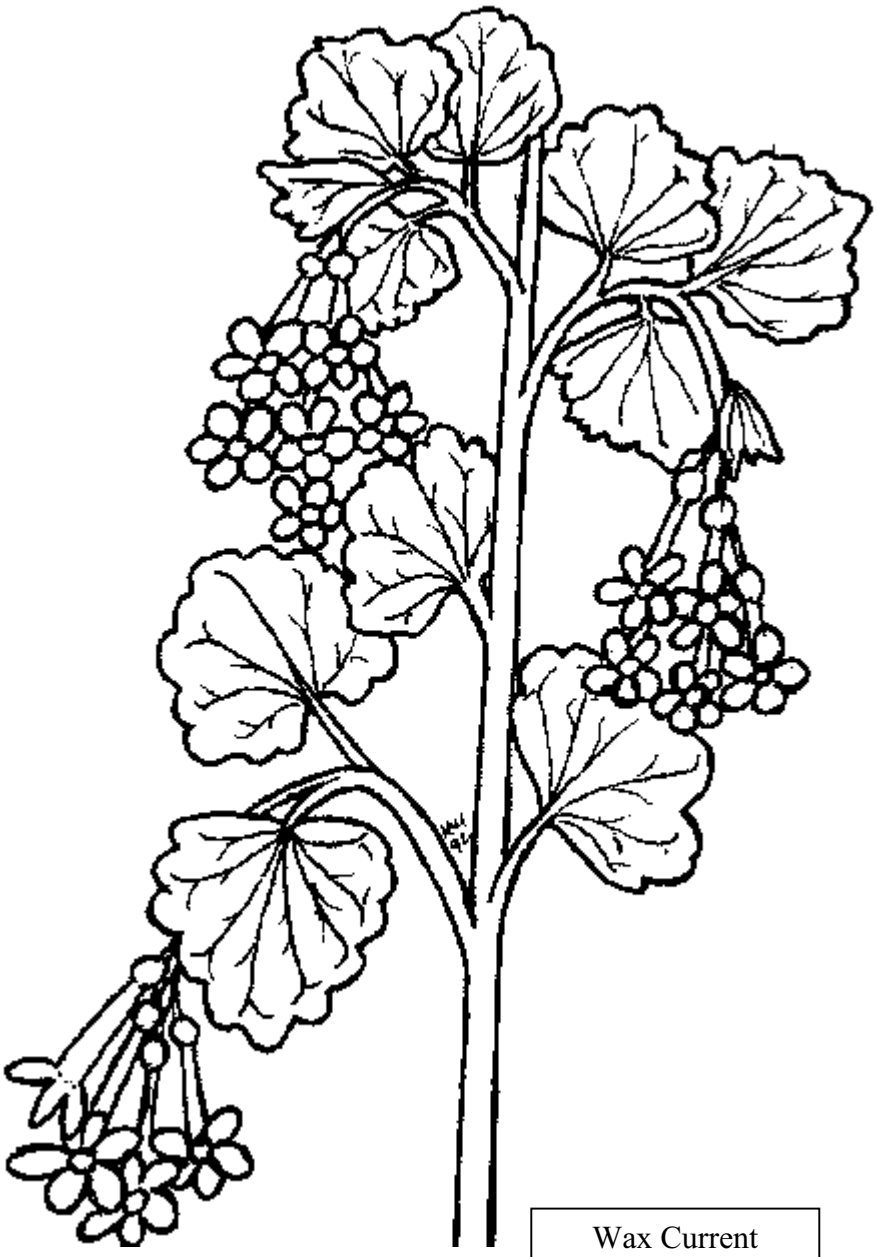
OBL = Obligate

FACW = Facultative Wet

FAC = Facultative

FACU/Upland = Facultative Upland/Upland

UPLAND
TREES AND SHRUBS



Wax Current
Ribes cereum

Descriptions of Upland Trees and Shrubs

Species	Mature Size 20 Yr. Height	Crown Spread	Growth Rate[1]	Flower[2]	Fruit Usable[3]	Fall Leaf Color	Suckers[4]	Plant Ind. Status[5]
Upland Shrubs								
Prunus fruticosa Cherry, Mongolian	3-6'	3-6'	Slow	Yes	No	Yellow	Yes	Upland
Prunus virginiana Chokecherry	10-25'	10-25'	Medium	Yes	Yes	Yellow to Purple	Yes	FACU
Ribes aureum Golden Current	5-10'	5-10'	Medium	Yes	Yes	Yellow	Moderate	FAC +
Cornus sericea Dogwood, redosier	5-10'	10-15'	Fast	Yes	No	Purple	Moderate	FACW
Forsythia species Forsythia	6-11'	6-11'	Medium	Yes	No	Purple to Yellow	No	Upland
Lonicera maackii Honeysuckle, Amur	10-14'	10-14'	Medium	Yes	No	Brown to Purple	No	FAC
Lonicera korolkowi Honeysuckle, Blueleaf	10-14'	10-14'	Medium	Yes	No	Brown to Purple	No	FAC
Amelanchier alnifolia Serviceberry	6-15'	6-15'	Slow	Yes	Yes	Yellow	Yes	FACU
Syringa vulgaris Lilac, Common	8-12'	8-12'	Slow	Yes	No	Brown	Yes	Upland
Prunus americana Plum, American	8-10'	8-10'	Medium	Yes	Yes	Yellow to Orange	Yes	Upland
Potentilla fruticosa Shrubby Cinquefoil	3-4'	3-4'	Slow	Yes	No	Brown	No	FAC
Spiraea species Spiraea	4-8'	4-8'	Medium	Yes	No	Purple	No	FAC
Upland Conifers								
Pseudotsuga menziesii Douglas Fir	40-70'	20-30'	Slow	No	No	Green	No	Upland
Juniperus scopulorum Rocky Mountain Juniper	20-40'	12-20'	Medium	No	No	Green	No	Upland
Pinus ponderosa Ponderosa Pine	50-70'	25-30'	Medium	No	No	Green	No	Upland
Picea pungens Colorado Spruce	30-65'	15-25'	Slow	No	No	Green to Blue	No	Upland
Upland Small Trees								
Prunus maackii Chockcherry, Amur	15-25'	15-25'	Medium	Yes	No	Yellow	No	Upland
Malus hybrids Crabapple, flowering	10-15'	15-25'	Medium	Yes	Yes	Yellow to Red	No	Upland
Crataegus arnoldiana Hawthorn, Arnold	15-30'	15-25'	Slow	Yes	No	Yellow	No	Upland
Acer ginnala Maple, Amur	15-20'	15-20'	Medium	No	No	Yellow to Red	No	Upland
Sorbus aucuparia Mountain Ash	20-30'	15-25'	Medium	Yes	Yes	Red to Yellow	No	Upland
Upland Medium and Tall Trees								
Fraxinus pennsylvannica Ash, Green	35-65'	30-40'	Medium	No	No	Yellow	No	Upland
Populus tremuloides Aspen, Quaking	25-60'	30-30'	Fast	No	No	Yellow	Yes	FAC
Betula papyifera Birch, Paper	30-55'	20-40'	Medium	No	No	Yellow	No	Upland
Celtis occidentalis Hackberry	40-60'	25-45'	Medium	No	No	Yellow	No	FAC
Tilia americana Linden, American	50-70'	30-50'	Medium	Yes	No	Brown to Yellow	Moderate	Upland
Acer species Maple, Norway/Silver/Sugar	40-65'	30-50'	Fast	No	No	Yellow to Orange	Moderate	Upland
Quercus species Oak, Mongolian/Red/White	50-70'	50-70'	Slow to Medium	No	No	Brown to Yellow to Red	No	Upland
Populus species Poplar, Hybrids	40-60'	20-35'	Fast	No	No	Brown to Yellow	Moderate	FAC
Salix alba Golden Willow	40-55'	40-55'	Fast	No	No	None to Yellow	No	FAC
Salix pentandra Laurel Willow	25-40'	20-35'	Fast	No	No	Brown to Yellow	No	FAC

Footnotes: 1. Growth Rate: Slow = < 1 foot/year; Medium = 1-2 feet/year; Fast = > 2 feet/year **2. Flowers:** Yes = showy; No = inconspicuous **3. Fruit:** Yes = usable; No = rarely or not **4. Suckers:** Yes = common; Moderate = rarely develop; No = None

Descriptions of Upland Trees and Shrubs

Species	Commer. Available	Cold/Wind Tolerance	Drought Tolerance	Salinity Tolerance	Wildlife Value/Misc. Notes
Upland Shrubs					
Prunus fruticosa Cherry, Mongolian	Yes	Yes	Moderate	No	Good nesting cover and food Fruit Color
Prunus virginiana Chokecherry	Yes	Yes	Moderate	No	Excellent nesting cover and food Fruit
Ribes aureum Golden Current	Yes	Yes	Moderate	Yes	Excellent nesting cover and food Bright Golden Flower
Cornus sericea Dogwood, redosier	Yes	Yes	No	No	Excellent nesting cover and food Red Stems - Winter Color
Forsythia species Forsythia	Yes	Yes	Moderate	No	Bright Yellow Spring Flowers
Lonicera maackii Honeysuckle, Amur	Yes	Yes	Moderate	No	Good nesting cover and food Aphid Resistant
Lonicera korolkowi Honeysuckle, Blueleaf	Yes	Yes	Moderate	No	Good nesting cover and food Aphid Resistant
Amelanchier alnifolia Serviceberry	Yes	Yes	Moderate	No	Good nesting cover and food Fruit
Syringa vulgaris Lilac, Common	Yes	Yes	Moderate	Yes	Fair nesting cover
Prunus americana Plum, American	Yes	Yes	Moderate	No	Good nesting cover Fruit
Potentilla fruticosa Shrubby Cinquefoil	Yes	Yes	Yes	Moderate	Fair nesting cover
Spiraea species Spiraea	Yes	Moderate	Moderate	No	Good nesting cover and food Flower
Upland Conifers					
Pseudotsuga menziesii Douglas Fir	Yes	Yes	No	No	Fair wildlife food and cover Winter Hardy
Juniperus scopulorum Rocky Mountain Juniper	Yes	Yes	Yes	Yes	Excellent wildlife food and cover Wildlife Value
Pinus ponderosa Ponderosa Pine	Yes	Yes	Yes	Moderate	Excellent wildlife food and cover Long Life
Picea pungens Colorado Spruce	Yes	Yes	Moderate	Moderate	Good wildlife cover value Needle Color
Upland Small Trees					
Prunus maackii Chockcherry, Amur	Yes	Yes	Moderate	No	Fair wildlife food value Orange Bark
Malus hybrids Crabapple, flowering	Yes	Moderate	Moderate	No	Good wildlife food value Varied shape fruit, flowers
Crataegus arnoldiana Hawthorn, Arnold	Yes	Yes	Yes	Moderate	Good nesting cover and food value Thorns, Fruit
Acer ginnala Maple, Amur	Yes	Yes	Moderate	No	Fair wildlife nesting value Fall Color
Sorbus aucuparia Mountain Ash	Yes	Moderate	No	No	Good wildlife food value Fruit, Flower
Upland Medium and Tall Trees					
Fraxinus pennsylvannica Ash, Green	Yes	Yes	Yes	Yes	Fair wildlife food and cover Hardy Tree
Populus tremuloides Aspen, Quaking	Yes	Yes	No	No	Good wildlife food and cover Quaking Leaf
Betula papyifera Birch, Paper	Yes	Yes	No	No	Fair wildlife food White Bark
Celtis occidentalis Hackberry	Yes	Yes	Moderate	No	Good wildlife food and cover Ridged Bark
Tilia americana Linden, American	Yes	No	No	No	Fair wildlife food and cover Flowers, Seeds
Acer species Maple, Norway/Silver/Sugar	Yes	Moderate	No	No	Fair wildlife food and cover Soft Wood
Quercus species Oak, Mongolian/Red/White	Yes	Yes	Moderate	No	Fair wildlife food and cover Partial Leaf Retension
Populus species Poplar, Hybrids	Yes	Moderate	No	No	Fair wildlife food and cover Fast growth
Salix alba Golden Willow	Yes	Yes	No	No	Fair wildlife food and cover Yellow Stems
Salix pentandra Laurel Willow	Yes Limited	Moderate	No	No	Fair wildlife food and cover Shiny Green Leaf

5. Plant Indicator Status: FACW = faculative wet; FAC = faculative; FACU = faculative upland; U = upland

Appendix D

Plant and Seed Vendors List for Idaho and Surrounding States

APPENDIX D: Plant and Seed Vendors List for Northern Idaho and Surrounding States

PLANT AND SEED VENDORS
FOR
NORTHERN IDAHO

IDAHO-MONTANA-WASHINGTON

This is a seed and plant vendor's list for the Pacific Northwest. Users of this list should note that this is only a partial listing of conservation plant and seed sources (retailers, wholesalers, nurseries and private growers) for each state. This list does not constitute an endorsement of the included vendors, nor does it guarantee the reliability or quality of products.

IDAHO

Apple Creek Propagators Inc	HCR 60 Box 30Z, Bonners Ferry ID 83805	(208)-267-5305
Buffaloberry Farm	51 East Lake Fork Rd, McCall, ID 83638	(208) 634-3062
Bremers Nursery	HCR 62 Box 108, Moyie Springs, ID 83845	(208)-267-4501
Bonners Ferry Nursery	HCR 85 Box 336, Bonners Ferry, ID 83805	(208)-267-3020
Clifty View Nursery	Route 1, Box 509, Bonners Ferry, ID 83805	(208) 267-7129
Coeur d'Alene Landscaping	Box 1556, Coeur d'Alene, ID 83814	
Cold Hardy Plant Material Inc	PO Box 714, Bonners Ferry, 83805	(208) 267-2798
Dahlin's Landscape Nursery	Route 1, Box 304, Priest River, ID 83856	
Erico Nursery	P.O. Box 209, Plummer, ID 83851	
Fantasy Farms Nursery	Route 2, Lenore, ID 83541	
Grassland West Company	Box A, Culdesac, ID 83524	(208) 843-5121
Green Things Nursery	P.O. Box 1900, 2230 Michigan, Orofino, ID 83544	
Hash Company Nurs. and Lndsc.	Troy Highway, Moscow, ID 83843	(208) 875-1030
Hash Tree Co.	1199 Bear Creek Road, Princeton, ID; 83857	(208) 875-1000
Hillcrest Farms, Inc.	Route 1, Grangeville, ID 83530	
Jacklin Seed Company	17300 Jacklin Ave., Post Falls, ID 83854	(208) 773-7581
Johnson's Quality Evergreens	HCR 68, Box 293, Cocolalla, ID 83813	
Levig Nursery	Star Route 1, Kings Row, Bonners Ferry, ID 83805	
Mountain Seed Nursery	Route 1, Box 271, Moscow, ID 83843	

Mountain View Nursery	Route 3, Box 170, Sandpoint, ID 83864	

IDAHO continued

Native Seed Foundation	Star Route, Moyie Springs, ID 83845	(208) 267-7938
Nishek Nursery	Route 1, Box 516, Bonners Ferry, ID 83805	
Northwest Nursery	P.O. Box 455, Sandpoint, ID 83864	
Plato Nursery	HRC 60, Box 1, Bonners Ferry, ID 83805	(208) 267-3742
Providence Nursery	Route 1, Box 588, Sandpoint, ID 83864	
Puffer-Ridge Farms	Baldy Road, P.O. Box 132, Sandpoint, ID 83864	
Reggear Tree Farm	1525 Loseth Rd, Orofino, ID 83544	(208) 476-5913
Riteway Industries	Route 1, Box 31-B, Potlatch, ID 83855	
Seed Specialists	10260 N Taryne St, Hayden Lake, ID 83835	(208) 762-8308
Smith Garden Square, Inc.	415 North 22nd Street, Lewiston, ID 83501	
Spencer Mountain	P.O. Box 3, Cocalalla, ID 83813	
Twin Butte Evergreens	416 N. Blaine Street, Moscow, ID 83843	
University of Idaho Nursery	Dept of Forest Resources, UofI, Moscow, ID 83844	(208) 885-3888
Western Forest Systems	1509 Ripon Ave, Lewiston, ID	(208) 743-0147
Wildlife Habitat Institute	Rt 1, Box 102-A, Princeton, ID 83857	(208) 875-1246
Young's Nursery and Landsc.	Orchard and Ramsey Rds., P.O. Box 570,Hayden Lake, ID	

MONTANA

Alpine Nursery	1763 Highway 2 East, Kalispell, MT 59901	
Bitterroot Nursery	521 East Side Hwy., Hamilton, MT 59828	(406) 961-3806
Bitterroot Restoration	445 Quast Lane, Corvallis, MT 59828	(406) 961-4626
Buffalo Bill Nursery	Route 2, Box 66, Plains, MT 59859	(406) 826-3405
Cenex Supply and Marketing	4570 N. Reserve, Missoula, MT 59802	(406) 543-8383
Cenex Supply and Marketing	1408 Hwy 93 So., Ronan, MT 59864	(406) 676-2201
Earth and Wood Craftsman, Inc.	3204 Highway 93 South, Stevensville, MT 59870	
Farmers Exchange	115 Main St., Stevensville, MT 59870	(800) 240-5441

Four Winds Nursery	5853 E. Shore Rd., Polson, MT 59860	
Hardy Trees	P.O. Box 9346, Kalispell, MT 59904	

MONTANA continued

Hi-Mountain Farm	Route 1, Box 29, Seligman, MT	
Lake Milling, Inc.	Box 288, Hamilton, MT 59840	(406) 363-2334
Lawyer's Nursery	950 Hwy. 200 West, Plains, MT 59859	(406) 826-3881 (800) 551-9875
Marchie's Nursery	1845 South Third West, Missoula, MT 59801	
Mo's Greenhouse	185 Swan River Rd., Bigfork, MT 59911	
Montana Bitterroot Gardens	1990 Lower Valley Rd., Kalispell, MT 59901	
Montana Cons. Seedling Nursery	2705 Spurgin Rd, Missoula, MT 59804	(406) 542-4244
Mountain Brooks Nursery	P.O. Box 1114, Eureka, MT 59917	
Renn's Blue Spruce Nursery	6305 Highway 2 East, Columbia Falls, MT 59912	
Snow Line Tree Co., Inc.	Highway 93 South, Kalispell, MT 59901	
Two Dog Seed Co.	800 Steel Bridge Rd., Kalispell, MT 59901	(406) 752-3656
Wanner Nursery	Corvallis, MT 59828	

WASHINGTON

Arnold Thomas Seed Services	Lowden, WA 99360	(509) 529-4580
Bear Creek Nursery	PO Box 411, Northport, WA 99157	
Central Marketing Inc	517 Northtown Office Bldg, Spokane, WA 99207	(509) 484-4554
Columbia Basin Nursery	PO Box 458, Quincy, WA 98848	(509) 787-4411
Coulee Co-op	310-W. Main, Coulee City, WA 99115	(509) 632-5292
Davenport Seed Corp	PO Box 187, Davenport, WA 99122	(509) 725-1235
Firstline Seeds	11703 Rd 1 SE, Moses Lake, WA 98837	(509) 765-1772
Full Circle	3132 Rd “O” NE, Mose Lake, WA 98837	(509) 765-5617
Gibson’s Nursery	S. 1401 Pines Rd, Spokane, WA 99206	(509) 928-0973
Golden West Services	524 S. 7th, Sunnyside, WA 98944	(509) 839-4700

Grassland West	PO Box 489, Clarkston, WA 99403	(509) 758-9100
Hillview Gardens	5405 W. Metaline Ave, Kennewick, WA	(509) 783-2695
Inland Native Plants	PO Box 30292, Spokane, WA 99223	
Jacklin Seed Co	PO Box 181, Ritzville, WA 99169	(509) 659-1065
KinderGarden Nursery	1137 S. Hwy 17, Othello, WA 99344	(509) 488-5017

WASHINGTON continued

Krause Nursery	S. 205 Pines, Box 14130, Spokane, WA 99215	(509) 926-1572
Landmark Seeds	PO Box 20087, Spokane WA	(509) 835-4967
Lamb Nursery	East 101 Sharp Ave, Spokane, WA 99202	(509) 328-7956
L&H Seeds	4756 W Hwy 260, Connell, WA 99326	(509) 234-4433
LMF Feeds Inc	N 39124 Sherman Rd, Deer Park, WA 99006	(509) 276-6018
McLean Seed Co.	PO Box 815, Coulee City, WA 99115	(509) 632-8709
Moses Lake Cons. Dist. Nursery	1775 SE Hwy 17, Moses Lake, WA 98837	(509) 765-5333
Nelson Landscaping Service	N 10801 Newport Hwy, Spokane, WA 99218	(509) 466-6050
Pendleton Grain growers	Pasco, WA	(509) 786-7469
Plants of the Wild	PO Box 866, Tekoa, WA 99033	(509) 284-2848
Rainer Seed Co	PO Box 1549, Port Orchard, WA 98366	(360) 769-8113
Rainier Seed Corp.	PO Box 187, Davenport WA 99122-0187	(509) 725-1235
Sun Mountain Native Seeds	N. 120 Wall St. Suite 400, Spokane, WA 99201	(509) 835-4967
Walla Walla Grain Growers	North 2nd St, Walla Walla, WA 99362	(509) 529-3253
Wildlands Inc	1941 Saint St, Richland, WA 99352	(509) 375-4177
Wolfkill Feed & Fertilizer	11763 Rd 1 SE, Mose Lake, WA 98837	(509) 765-7252