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Grass Seeding Forest Roads, Skid Trails, and Landings in the Inland Northwest

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Why seed forest roads, skid trails, and landings?

Clean water is one of the Inland Northwest's greatest natural resources. Many lakes, rivers, and streams originate in forested watersheds. Forested lands assist nature in maintaining water quality by keeping soil in place, storing and filtering nutrients, and balancing water flows. Forest canopies also help moderate stream water temperatures to support healthy fish populations.

Idaho, Oregon, and Washington have established state water quality standards that meet the U.S. Environmental Protection Agency (EPA) standards required under the Clean Water Act (CWA) established in 1972. Additionally, each state has legislated a Forest Practices Act (FPA) that requires stream protection zones and carefully developed road building techniques to protect fish habitat and water quality. These FPAs were designed to protect, restore, and preserve water quality in areas designated for specific beneficial uses (e.g. drinking water, swimming, recreation, fishing, and salmon and trout habitat).

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Best management practices (BMP's) have been established for Inland Northwest forests to keep pollutants out of streams and water bodies. Sediments are one of the main nonpoint source water pollutants. Nonpoint sources of pollution cannot be traced to a single point of entry in a water body. Sediment is defined as any particulate matter that can be transported by fluid flow and which may eventually be deposited as a layer of solid particles on the bed or bottom of a body of water.

Roads, skid trails, and landings are all part of a forest access system that provides multiple benefits for private forest owners. Private roads connect the forest land to existing public roads and provide forest access for activities such as timber management, improving fish and wildlife habitat, fighting fires, and recreation. Skid trails (designated routes used to move trees to a landing) and landings (cleared areas where logs are decked, stacked, stored, and loaded on transport trucks) are also integral to the forest access system. Locating them properly minimizes soil erosion and compaction, improves efficiency, and reduces site impacts.

Forest roads and skid trails that are poorly located, constructed, or maintained are the most common source of nonpoint source pollution (i.e. sediment) from forest management activities, especially during the first few years following their construction. Roads and skid trails built on steep slopes, erodible soils, or stream crossings hold the greatest potential for degrading water quality.

Establishing vegetation on exposed soils stabilizes erodible areas and prevents sediment and nutrients from entering water bodies. Seeding grasses and legumes is also an effective management tool to create forage for livestock and wildlife and reduce weeds and other undesirable plants. The goal for grass seeding forest roads, skid trails, and landings is to encourage the development of dense roots that bind and hold soil, even under adverse weather conditions. Established grass cover can reduce soil loss by up to 95% and nutrient loss via surface runoff by up to 90%.

Seeding strategies: Use two or more perennial species

Grass seeding forest roads, skid trails, and landings requires a different strategy from grass seeding in forests. Successfully establishing grasses and legumes in these disturbed areas involves more than simply scattering seed. Before seeding, evaluate specific areas where ground cover should be established. Determine soil depth and type, slope, steepness, and aspect (what direction does the slope face—north, south, east, or west?) to determine the effective precipitation the site receives. As an example, a site may receive 20 inches of rain or more per year, but on a steep, shallow-soiled, south-facing exposure, much of that moisture can evaporate, leaving less moisture for soil-protecting grass species.

Grass mixtures consisting of two or more perennial species are desirable since seeding areas may present a wide variety of sites, from moist bottoms to dry ridge tops, and no single species has all the characteristics needed to survive and grow well in all conditions. Species that establish and grow rapidly stabilize the soil quickly. Aggressive, long-lived, well-rooted perennials prevent erosion, provide forage, and keep out undesirable plants. Shade tolerance is desirable since most forest roads have varying degrees of shade. After examining and evaluating your site, choose the best-suited grass and legume species by consulting Table 4 or a natural resource professional.

Usually a mixture of overstory and understory grasses mixed with legumes is recommended. Early maturing varieties typically grow

Table 1. Typical seed mixtures for forest roads, skid trails, and landings receiving more than 25 inches of annual precipitation include more than 50% of overstory mix and less than 50% of understory mix plus some legumes.

Overstory (>50% of mix)	Understory: (<50% of mix)	Legumes
Slender wheatgrass (*Elymus trachycaulus* or *Agropyron trachycaulum*)	Timothy (*Phleum pratensis*)	Alsike clover (*Trifolium hybridum*)
Intermediate wheatgrass (*Thinopyrum intermedium* or *Elytrigia intermedia* or *Agropyron intermedium*)	Hard fescue (*Festuca brevipila* or *F. trachyphylla* or F. *ovina duriuscula*)	White (Dutch) clover (*Trifolium repens*)
Pubescent wheatgrass (*Thinopyrum intermedium* or *Elytrigia intermedia* or *Agropyron trichophorum*)	Red (creeping) fescue (*Festuca rubra*)	Northern or Utah sweetvetch (*Hedysarum boreale*)
Mountain brome (*Bromus marginatus* or *B. cartinatus*)	Canada bluegrass (*Poa compressa* or *Poa canadensis)*	
Meadow brome (*Bromus biebersteinii* or *B. erectus* or *B. riparius*)	Redtop bentgrass (*Agrostis gigantea*)	
Blue wildrye (*Elymus glaucus*)	Perennial ryegrass (*Lolium perenne*)	
Orchardgrass (*Dactylis glomerata*)		

Table 2. Use these typical seed mixtures for forest roads, skid trails, and landings receiving less than 25 inches of annual precipitation. Use more than 50% of overstory mix and less than 50% of understory mix.

Overstory: (>50% of mix)	Understory: (<50% of mix)	Legumes
Crested or Siberian wheatgrass (*Agropyron fragile* or *A. sibericum*)	Streambank or Thickspike wheatgrass (*Elymus lanceolatus ssp. lanceolatus* or *Agropyron riparium*)	Yellow sweetclover (*Melilotus officinalis*)
Intermediate wheatgrass (*Thinopyrum intermedium* or *Elytrigia intermedia* or *Agropyron intermedium*)	Hard fescue (*Festuca brevipila* or *F. trachyphylla* or *F. ovina duriuscula*)	Small burnet (*Sanguisorba minor*)
Pubescent wheatgrass (*Thinopyrum intermedium* or *Elytrigia intermedia* or *Agropyron trichophorum*)	Big bluegrass (*Poa secunda*)	
Bluebunch wheatgrass (*Pseudoroegneria spicata* or *Agropyron spicatum*)	Sheep fescue (*Festuca ovina*)	
Snake River wheatgrass (*Elymus wawawaiensis* or *Pseudoroegneria spicata*)	Orchardgrass (*Dactylis glomerata*)	
Tall wheatgrass (*Thinopyrum ponticum* or *Elytrigia elongata* or *Agropyron elongatum)*		

taller (overstory) while later maturing varieties remain in a vegetative state longer (understory). The former help shade out invading weed species such as knapweed and yellow starthistle, while the latter produces higher quality forage for grazing later in the growing season.

A typical seed mixture for a wetter site (more than 25 inches effective precipitation) or drier site (under 25 inches effective precipitation) might include one to several varieties from each category in Table 1 and Table 2. The overstory species should consist of more than 50% of the seed mixture.

Seeding rates vary according to seed size, available moisture on the site, and method of seed dispersal. Large seeds, dry sites, and broadcasting by hand versus machine require a high seeding rate since more seed is needed to cover the same area. Higher seeding rates compensate for uneven seed distribution, uneven seed planting depths, reduced germination due to non-contact with soil, and loss of seed to depredation by wildlife. When broadcasting seed by hand, increase the rate of each species by 1.5 to 2 times the listed rate. Seeding small seeded varieties in wet sites and using a drill allow lower seeding rates.

Grass seed usually contains small percentages of crop seed, weed seed, and inert materials and not all seed will germinate. Whatever varieties of seed you choose, calculate seeding rates based on Pure Live Seed (PLS), which is a measure of seed lot purity and germination percentage. Seed purity and percentage of germination, among other things, are listed on bag labels or tags.

Information found on a seed tag includes:

1) Variety and kind (species and common name)
2) Lot number
3) Origin
4) Net weight
5) Percent pure seed
6) Percent germination (and date of test)
7) Percent inert matter
8) Percent other crop seed
9) Percent weed seeds
10) Name of restricted noxious seed (number per pound of seed)
11) Prohibited noxious seeds are not allowed
12) Name and address of company responsible for analysis (seller)

Use the information on the seed label and in the seed analysis report to determine the quality of the seed you are purchasing. High quality seed will ensure that genetic identity and purity are adequate to help guarantee a successful, weed free, and uniform seeding.

The cheapest seed is not always the most economical. By comparing the purity and germination percentage between seed lots or mixes, you can clearly see which lots or mixes will produce the most potential seedlings after planting. All seeding recommendations are given in Pure Live Seed (PLS) rates.

Seeding rates and how to seed

Recommended seeding rates are based on PLS, which is calculated as follows:

PLS = % purity × % germination × 100.

When seed purity and germination are less than 100%, increase the seeding rate as follows:

(Rate recommended × 100)/PLS = adjusted seeding rate in lbs/acre.

Broadcasting seed rates. Generally, 50 to 100 pure live seeds per square foot are more than adequate for broadcast seeding rates. This may require from 10 to 20 lbs of seed per acre depending on the mix used. Table 3 provides acreage conversion rates for some selected lengths and widths. For example, one mile of logging road 14 feet wide contains 1.7 acres. Pure live seeding rates for individual species can be

found in Table 4. If using a mix, use the desired percentage of this rate combined with the rates of other desired species as shown in the working example on page 6.

Before seeding. Before seeding, make sure the seed will have direct contact with soil. It is best to seed just after a soil disturbance such as road construction because soil is freshly exposed and there are fewer weeds. Remove any surface debris that prevents seed contact with soil and spread the seed by hand or with a broadcast spreader. Try to leave a rough surface so seeds will have a place to lodge. This is especially important on steep slopes—you may even want to create planting sites constructed with dozer cleats or tracks to get grass seedlings started. It is important to control and slow down water that might flow through newly seeded areas with a water bar, turnout, straw mulching, or other water erosion control techniques.

Table 3. Calculate acreage to be seeded based on given lengths and widths (length x width ÷ 43,560 sq. ft. in an acre = acres).

Area Length	Area width - Feet				
Feet	8	10	12	14	18
50	.01 ac	.01 ac	.01 ac	.02 ac	.02 ac
100	.02 ac	.02 ac	.03 ac	.03 ac	.04 ac
250	.05 ac	.06 ac	.07 ac	.08 ac	.10 ac
500	.09 ac	.12 ac	.14 ac	.16 ac	.21 ac
1000	.18 ac	.23 ac	.28 ac	.32 ac	.41 ac
2000	.37 ac	.46 ac	.55 ac	.64 ac	.83 ac
5280	.97 ac	1.21 ac	1.46 ac	1.70 ac	2.18 ac

Establishing vegetation on exposed soils *stabilizes erodible areas and helps prevent sediment and nutrients from entering water bodies.*

Spreading seeds mechanically or by hand. Seed can be spread by hand, broadcast mechanically (e.g. cyclone spreader), or planted mechanically with something like a rangeland drill. The first two methods place the seed on the soil surface dictating that seeding rates should be 1.5 to 2 times the normal drill-seeding rate. Drill seeding can be used if you have a fairly level, easily accessible seeding surface. It is the most desirable method because it places the seed at a controlled depth. You also can hire a professional who can use specialized equipment to seed in a mulch slurry (hydromulch) or use forced air (air seed). Regardless of which technique is used, seed either in the fall (6 to 8 weeks before freeze date), late fall when seed will not germinate (usually after November 1), or in early spring. Seeding in the early fall or very early spring can be risky as this may expose seedlings to potential killing frosts. Late fall seeding is often best since colder temperatures prevent germination until spring. If seeding in the spring, be careful not to compact wet soils.

Fertilizing the site during seeding can be very beneficial, as many roads and skid trails have had most of the topsoil removed, leaving a less-fertile subsoil. If feasible, replace the topsoil to provide a more fertile base. Test the soil for fertilizer or liming needs (see Mahler reference for soil sampling information). Generally, 250 lbs per acre of 16-20-0 fertilizer is adequate. This applies 40 lbs of actual nitrogen per acre (N) and 50 lbs of actual phosphorous (P) per acre.

Mulching with excelsior, clean straw, slurried wood fiber, or similar materials after spreading the seed can provide a better environment for seedling establishment and growth and helps to control erosion while the vegetation is establishing.

Avoid livestock grazing for a year. During establishment of seeding, it is recommended that livestock be kept off the site for at least a year to avoid trampling or overgrazing and ensure the planting is vigorous and well established (producing seedheads). Where livestock grazing cannot be avoided, consider delaying turnout until plants mature and form seed heads. Also, consider placing salt or mineral blocks in areas away from new seedings to provide partial protection.

Establishing grass seedings can effectively reduce erosion and sedimentation from forest roads, skid trails, and landings. Grass seed mixtures can be custom blended to match a range of sites. Pre-blended mixtures have also been established and are available for a variety of purposes. For more information on grass seeding, contact your local extension county office.

Table 4. This table lists seeding rates and plant adaption for common grass and legume species.

Common name	Seedling longevity	Growth rate	Character	Seeds/lb	1 lb/acre = #seeds/ft^2	Avg. precip	Sowing depth	PLS (lbs/ac)
Redtop bentgrass	long	low-med.	sod	4,990,000	115	+18	0-¼	0.5
Big bluegrass	medium	low-med.	bunch	925,000	21	+9	0-¼	2
Canada bluegrass	long	low-med.	sod	1,600,000	37	+18	¼-½	2
Meadow brome	long	med-rapid	bunch	93,000	2	+14	¼-½	10
Mountain brome	short	med-rapid	bunch	80,000	2	+16	¼-½	10
Blue wildrye	medium	medium	bunch	145,000	3	+16	¼-½	8
Hard fescue	long	low	bunch	560,000	13	+14	0-¼	4
Red fescue	long	low	sod	614,00	14	+18	0-¼	4
Sheep fescue	long	low	bunch	680,00	16	+10	0-¼	4
Orchardgrass	long	medium	bunch	540,00	12	+16	¼-½	4
Perennial ryegrass	short	very rapid	bunch	247,000	6	+15	¼-½	4
Timothy	long	medium	bunch	1,230,00	28	+18	⅛-¼	3
Bluebunch wheatgrass	long	medium	bunch	139,00	3	+12	¼-½	8
Intermediate wheatgrass	long	rapid	sod	80,000	2	+13	¼-½	10
Pubescent wheatgrass	long	rapid	sod	80,000	2	+11	¼-½	10
Siberian wheatgrass	long	medium	bunch	160,000	4	+8	¼-½	6
Slender wheatgrass	short	rapid	bunch	135,000	3	+10	½-¾	6
Snake River wheatgrass	long	medium	bunch	139,000	3	+8	¼-½	8
Streambank wheatgrass	long	medium	sod	135,00	3	+8	¼-½	6
Tall wheatgrass	long	very rapid	bunch	78,000	2	+14	¼-¾	10
Alfalfa	medium	medium	erect	200,000	5	+14	⅛-½	5
Small burnet	medium	medium	erect	42,000	1	+14	¼-½	20
Alsike clover	short	medium	erect	700,000	16	+18	⅛-¼	3
White clover	med-long	medium	erect	800,000	18	+18	⅛-¼	4
Blue flax	short	low-med	erect	350,000	8	+10	0-⅛	3
Lewis flax	short	low-med	erect	205,000	5	+10	0-⅛	5
Yellow sweetclover	short	med-rapid	erect	258,000	6	+9	⅛-½	4
Northern (Utah) sweetvetch	medium	low	erect	70,000	2	+10	⅛-¾	10

Rates are based on 12" row spacing for a seed drill. For broadcast methods, increase rates by 1.5 to 2 times. For varietal differences and moisture tolerances, see source below.

Source: Ogle, et.al. *Grass, grass-like, forb, legume, and woody species for the Intermountain West.* USDA NRCS Tech. Note No. 24. Oct. 2009.

Working example: Do the math in 4 steps

Mr. Pine has a newly constructed forest road that is 1.5 miles long and 14 feet wide from ditch to ditch. The road is curvy and receives shade disproportionately throughout the day. His property receives 31 inches of precipitation annually. Since Mr. Pine receives more than 25 inches of precipitation, we will use Table 1 for our species selection. His local extension educator said the desired mix could be 20% intermediate wheatgrass, 20% slender wheatgrass, and 20% orchardgrass as an overstory, mixed with 15% hard fescue, 15% perennial ryegrass and 10% white clover as the understory.

How much grass seed does he need to purchase for this 1.5 miles of new road? He has a cyclone spreader and could borrow a drill if he absolutely had to, but a portion of the new road is fairly rocky.

1. **Area to be seeded:** 1.5 miles of road = 7,920 feet long (1 mile = 5,280 ft). Multiply this by the 14 foot road width = 110,880 square feet (1 acre = 43,560 square feet). Therefore, 110,880 ÷ 43,560 = 2.55 acres of road to be seeded.

   From Table 5, we find average % purity and % germination of certified seed:

   Intermediate wheatgrass – 95% purity and 90% germination

   Slender wheatgrass – 90% purity and 85% germination

   Orchardgrass – 90% purity and 80% germination

   Hard fescue – 95% purity and 85% germination

   Perennial ryegrass – 98% purity and 90% germination

   White clover – 99% purity and 85% germination

2. **From the last column in Table 4**, we find that intermediate wheatgrass should be seeded at 10 lbs Pure Live Seed (PLS) per acre, slender wheatgrass should be seeded at 6 lbs PLS per acre, orchardgrass at 4 lbs PLS per acre, hard fescue at 4 lbs PLS per acre, perennial ryegrass at 4 lbs per acre, and white clover at 4 lbs per acre. Then multiply the recommended PLS times the percentage in the mix:

   (Intermediate wheatgrass 20%) (10 lbs PLS) = 2 lbs PLS/acre mixed;

   (Slender wheatgrass 20%) (6 lbs PLS) = 1.2 lbs PLS/acre mixed;

   (Orchardgrass 20%) (4 lbs PLS) = 0.8 lbs PLS/acre mixed;

   (Hard fescue 15%) (4 lbs PLS) = 0.6 lbs PLS/acre mixed;

   (Perennial ryegrass 15%) (4 lbs PLS) = 0.6 lbs PLS/acre mixed;

   (White clover 10%) (4 lbs PLS) = 0.4 lbs PLS/acre mixed.

Table 5. Average certified seed quality.

	Average Seed Quality	
Common Name	**% Purity**	**% Germination**
Redtop bentgrass	90	85
Big bluegrass	90	75
Canada bluegrass	90	75
Meadow brome	95	85
Mountain brome	90	85
Blue wildrye	80	85
Hard fescue	95	85
Red fescue	98	80
Sheep fescue	95	85
Orchardgrass	90	80
Perennial ryegrass	98	90
Timothy	97	80
Bluebunch wheatgrass	90	85
Intermediate wheatgrass	95	90
Pubescent wheatgrass	95	90
Siberian wheatgrass	95	85
Slender wheatgrass	90	85
Snake River wheatgrass	90	80
Streambank wheatgrass	90	80
Tall wheatgrass	95	85
Alfalfa	99	85
Small burnet	95	90
Alsike clover	95	90
White clover	99	85
Blue flax	95	90
Lewis flax	95	90
Yellow sweetclover	99	85
Northern (Utah) sweetvetch	95	80

Source: Ogle, et.al. *Grass, grass-like, forb, legume, and woody species for the Intermountain West*. USDA NRCS Tech. Note No. 24. Oct. 2009.

3. **Determine the amount of bulk seed** (mixed) per acre. When seed purity and germination are less than 100%, increase the seeding rate as follows:

   (Rate recommended × 100) PLS = adjusted seeding rate in lbs per acre.

   Intermediate wheatgrass 2 lbs PLS/acre ÷ 95% = 2.11 lbs bulk mixed per acre;

   Slender wheatgrass 1.2 lbs PLS/acre ÷ 90% = 1.33 lbs bulk mixed per acre;

   Orchardgrass 0.8 lbs PLS/acre ÷ 90% = 0.9 lbs bulk mixed per acre;

   Hard fescue 0.6 lbs PLS/acre ÷ 95% = 0.63 lbs bulk mixed per acre;

   Perennial ryegrass 0.6 lbs PLS/acre ÷ 98% = 0.61 lbs bulk mixed per acre;

   White clover 0.4 lbs PLS/acre ÷ 99% = 0.4 lbs bulk mixed per acre.

4. Finally, multiply the pounds of bulk seed needed for each species by the acres to be seeded to obtain the total bulk seed required for the entire seeding project acreage (2.55 acres in this example).

   Intermediate wheatgrass 2.11 lbs bulk mixed/acre × 2.55 acres = 5.38 lbs total;

   Slender wheatgrass 1.33 lbs bulk mixed/acre × 2.55 acres = 3.39 lbs total;

   Orchardgrass 0.9 lbs bulk mixed/acre × 2.55 acres = 2.30 lbs total;

   Hard fescue 0.63 lbs bulk mixed/acre × 2.55 acres = 1.61 lbs total;

   Perennial ryegrass 0.61 lbs bulk mixed/acre × 2.55 acres = 1.56 lbs total;

   White clover 0.4 lbs bulk mixed/acre × 2.55 acres = 1.02 lbs total;

   These add up to 15.26 lbs of grass seed for the 1.5 mile long, 14 foot wide road.

If Mr. Pine uses a seed drill, he can use the exact amount calculated. If he uses a cyclone spreader or other means of seed dispersal, he would need to double the amount of seed needed (roughly 30.5 lbs of seed). The drill must be calibrated based on the bulk seeding rates, not PLS. Always place your order to the seed dealer as PLS seeding rate and check to make sure the dealer has mixed the seed as you specified.

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