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Refertilization of Roadsides

REFERTILIZATION OF ROADSIDES

by

Stanton E. Brauen and Gwen K. Stahnke
Department of Crops and Soils
Washington State University
Puyallup Research and Extension Center

Washington State Transportation Center (TRAC)
Washington State University
Department of Civil and Environmental Engineering
Pullman, Washington 99164

Washington State Department of Transportation
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R.L. Berger

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16. ABSTRACT

Roadsides prone to scotch broom and alder invasion were used to evaluate the timing and rate of IBDU, Escote 150 slow release nitrogen (SRN) application and the effects of fall grass/legume overseeding on improving cover. Fall fertilization with SRN increased cover and biomass of grass along roadsides where good bentgrass or fescue populations existed. A 20 to 40% increase in grass cover was realized with fall fertilization at >90 kg SRN ha^{-1} and significantly reduced open space where seeds of invading species could germinate. Poor grass growth occurred following spring SRN application and 45 kg N ha^{-1} in the fall as SRN or 16-16-16 was too low to improve cover. Liming and overseeding of grass/legume mixes were not reliable as a one-time method to improve grass/legume cover when precipitation began by early October. Overseeding may be successful if practiced regularly and by mid September when moisture might be available during some years. No overseeding grass or legume species survived better than another when overseeded in early October. A 5-year test program is recommended. Fall apply SRN to roadsides prone to scotch broom invasion where good bentgrass/fine fescue populations exist. The SRN should consist of a 0.6 cm minus particle IBDU, Escote 150 and urea combination (40:40:20 w/w, respectively) in a 2:1:1 ratio with P_2O_5 and K_2O in a 2-1-1 ratio. Divide each test area into annually mowed, biannually mowed or non-mowed areas. Overseeding with fertilization should occur in early September. The seed mix should consist of 70% improved varieties of slender, creeping red or hard fescue, 20% fine-leaved perennial ryegrass and 10% colonial bentgrass. Dwarf white clover, although a desirable component of the mix, is not suggested unless seed is pre-inoculated and sufficient P, K and lime have been previously applied.

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SUMMARY

Fertilization significantly increased above ground biomass of grasses and percent cover from total vegetation along roadsides. Slow release nitrogen (N) fertilizer (SRN), that was selected to release the N for five to six months (0.6 cm minus particle IBDU and Escote 150) during the growth period, provided the best response when fertilizer was applied in the fall. Poor grass growth occurred from spring application of SRN. Although the most growth and cover occurred at 135 kg N ha^{-1}, 90 kg N ha^{-1} improved cover significantly if a good grass population was present. Alternate year application of SRN fertilization of 135 kg N ha^{-1} in the fall also increased biomass. Forty five kg N ha^{-1} applied in the fall from SRN or 16-16-16 appeared inadequate over the short term to significantly increased grass competition. In the short period of this study, the vegetation cover from all species ranged 20 to 40 percent where fertilization was practiced. As a consequence, fertilization reduced the exposed surface area by about 50 percent and significantly reduced the area where seeds of invading species could germinate and establish.

Although the fertilization studies were overseeded with a grass/legume mixture consisting of perennial ryegrass, creeping red fescue, white clover and English trefoil (Table 2) during the first fall of this study, the overseeding did not have an effect on grass/legume cover or composition. Good germination of grasses was observed during October 1990 but few seedlings managed to survive the winter. This is not an uncommon result. Fine fescue, tall fescue and Kentucky bluegrass are very prone to death during the winter if seedlings do not develop to sufficient size during the fall. This lack of winter survival of young seedlings is primary reason roadside seeding and germination of these species must occur in late summer. If early fall moisture is not available for germination and growth, then overseeding success will usually be poor.

At Tinkham and Scott Lake, the major cover species was bentgrass which was not included in the overseeding mixture (Table 8 and 9). At both of these sites, fertilization with any form of fertilizer increased the percent cover of bentgrass 20 to 130 percent more than the non-fertilized areas. Fall fertilization with SRN at 90 to 135 kg N ha^{-1} was the most effective but 45 kg N ha^{-1} of SRN or 45 kg N ha^{-1} from 16-16-16 increased bentgrass cover by 20 to 80 percent. Where bentgrass was the dominant cover species, the other cover grass species (creeping red fescue and perennial ryegrass) that were present in very low amounts seemed to be improved only marginally and then only where nitrogen was applied in the fall at 135 kg N ha^{-1} in the SRN form (Table 8 and 9). Even at McChord where no grass species was dominant, fertilization seemed to increase the percent cover of bentgrass and creeping red fescue (Table 10).

There were no clear statistical differences in the aggression of the broadleaf invader species to fertilization. Essentially no red alder was observed to invade any treatment area during the two year lapse of this study. Scotch broom cover was significantly higher in areas that were treated with 16-16-16 at Scott Lake (Table 9) but there were no similar significance effects or trends at McChord. The percent cover by false dandelion often was higher in non-fertilized areas compared to fertilized

areas but these differences were never significantly different. Moss cover was not affected by fertilization practice (Table 10).

The research area at Westport had just recently been cleared of alder and brush prior to establishing the fertilization efforts. Most of these species with the exception of red alder quickly recovered during the next two years and dominated the cover of the area. Grass cover, although present in the first year, was crowded out in the second year. Blackberry, thimbleberry, salal, bracken fern, and sword fern were not favored by fertilization practice (Table 11). There were no clear changes in percent composition of species due to fertilization (Table 12 to 15). Although grasses would be expected to dominate over time with increased N fertilization, the duration of the study may have been too short for those changes to occur.

RECOMMENDATIONS

The findings of this research project do not clearly make an association between fertilization of roadside grasses and reduced invasion of red alder or scotch broom to roadsides. This may in part be to the short duration of these studies. Therefore, it would be premature to suggest extensive and specific forms of SRN be recommended at this time. The following recommendation is suggested. In a 5-year test program, fall apply SRN in September to early October to areas prone to scotch broom or red alder invasion but only to areas with good bentgrass/fine fescue cover. Fertilizer mix should consist of a large particle IBDU, Escote 150 and urea combination (40%-40%-20% N, respectively) with P_2O_5 and K_2O in a 2-1-1 ratio [Example 20-10-10]. Other forms of SRN could substitute for the specification above, however, the features necessary are as follows: Virtually dust free, 25% soluble N available at fall application time, fertilizer N release rate not altered by air gun application method, particle size large enough to be conveyed 50 feet by air applicator, very limited N release in winter, extended good spring and early summer release to coincide with soil moisture and temperatures during that period. Each test area should be divided into annually mowed, biannually mowed or non-mowed areas since it is suspected that increasing the growth and competition from amenity grasses will slow down invasion by red alder or scotch broom but not eliminate intrusion. Occasional mowing maybe a reasonable alternative to herbicide control. Overseeding and fertilization should be practiced only in early to mid September where early fall rainfall has occurred or is anticipated. Seedings made later than September 15 is discouraged due to poor ability of slender and creeping red fescue to survive the following winter. The seed mix should consist of slender fescue or creeping red fescue and 10% colonial bentgrass. Neither turftype perennial ryegrass, common perennial ryegrass is recommended. Dutch white clover nor Kalo English trefoil is recommended unless seed is pre-inoculated, early seeded, soils disturbed, and sufficient agricultural grade limestone and P and K fertilizers have been recently applied.

INTRODUCTION AND RESEARCH APPROACH

BACKGROUND

Vegetation management of low maintenance areas in turf, such as, roadside, industrial grounds, utility rights of way and airfields has always been difficult. Herbicides have been a very useful tool in reducing vegetation management costs while retaining control of weeds, shrubs and trees. The desire to use fewer chemicals, particularly pesticides, in the control of troublesome vegetation compounds the problems of dealing with species invasion and strongly increases the maintenance costs encountered with alternative mechanical or hand control systems. Also, limited physical and labor resources, which are used extensively in mechanical systems, often do not permit completion of maintenance tasks within the time period available .

Control of tree vegetation in the vehicle recovery zone or 'clear zone' 30 feet away from the side of vehicle lanes on interstate highways is mandated by federal legislation. Mechanical mowing of accessible roadside costs approximately $50 to $100 per acre for each mowing depending on the extraneous costs included. Mowing will control shrubs and trees on accessible areas if practiced on a regular basis but may reduce turf density of some species. However, access by mechanical equipment is often not possible, very limited or very slow. As a result, maintenance costs skyrocket where vegetation management is dependent on mowing. An integrated approach of physical, nutritional and cultural systems in combination with selective herbicide measures could be desirable and useful.

There are a number of invader species that are difficult to manage along these roadside areas where regular mowing maintenance is not practiced or where mowing

maintenance is not possible. Scotch broom (Scots broom, Common broom) [*Cytisus scoparius* L.], an introduced species which is a native of warmer and drier regions of the old world, occurs most widely in various growth forms (Hitchcock et al 1961). But related species like White Spanish Broom (*Cytisus multiflorus*) and *Cytisus monspessulanus* L. have escaped too. Red alder (*Alnus rubra* Bong.), a native of the Pacific Northwest, is also a major invader of roadside areas. Usually, these species are ecologically adapted to different environmentally defined sites and specific species succession is to be expected since soil, climate, vegetation pressure and man do affect the principles of ecology and vegetation succession in plant communities (Stallings 1957).

The effect of grass competition on establishment, growth and survival has been studied and observed in many environments from apple orchards, to prairies, to forest clearcuts, to urban landscapes (Messenger 1976, Baron 1962, Clark and McLean 1978, Fales and Wakefield 1981, Newton 1964). But few studies of any detail have been conducted in the Northwest. No clear conclusions can be drawn from these studies because many are reported in brief annual reports and cover short time spans with discontinuous management and summary efforts. Often, grass competition is a strong competitor of tree vegetation which slows down establishment, retards development and reduces survival but does not control or eliminate tree or shrub populations (Klingler 1986.). Brush species are often better controlled than tree species. Nitrogen fixation by scotch broom and red alder have been studied by workers in the Pacific Northwest (Helgerson 1981, Tripp et al 1979).

Forest clearcuts that naturally seed to grasses often are found to have little or

no wood vegetation to compete with Douglas-fir survival and growth (Klingler 1986). Field observations by soil conservationists, foresters and land managers have often noted slower invasion by brush and trees of areas that have received fertilization in the past or have been overseeded with grass and legume species. Generations of cultural studies with grass and legume forage species has shown nitrogen (N) fertility will eliminate or suppress forage legumes in grass stands (Heath et al 1976).

Successful establishment of abundant grass vegetation at the end of road construction or as a renovation scheme is a first line of defense against woody shrub invasion. Klingler (1986) found that grass and legume seeding was effective in reducing the amount of cover and frequency of thimbleberry (*Rubus parviflorus* Nutt) and red alder on clearcuts of the Oregon Coast Range. Big trefoil (*Lotus uliginosus*) was more aggressive and persistent than the sod forming grasses used in the research. Colonial bentgrass (*Agrostis tenuis* Sibth.) competed best against most shrubs and hardwoods, followed by dwarf intermediate wheatgrass (*Agropyron intermedium* [Host] Beauv). However, bentgrass and pubescent wheatgrass (*Agropyron trichophorum* [Link] Richt.) had the least impact on conifer establishment followed by dwarf wheatgrass and then by creeping red fescue (*Festuca rubra rubra* L.). Norris et al (1982) found that once perennial ryegrass (*Lolium perenne* and subclover (*Trifolium subterraneum)* were established, brush cover was decreased.

Studies were conducted through the Soil Conservation Service Plant Materials Centers at Corvallis, Oregon and Pullman, Washington during the 1970's to evaluate roadbank stabilization throughout the Pacific Northwest. Significant variability in species success was observed among locations in these studies but bentgrass and

creeping red fescue was often the most aggressive and/or persistent species. Legumes, such as, dwarf white clover (*Trifolium repens* L.), 'Cascade' birdsfoot trefoil (*Lotus corniculatus* L.), 'Kalo' dwarf English trefoil (*L. corniculatus* var. *arvensis* L.), 'Marshfield' big trefoil and sickle-keeled lupine (*Lupinus albicaulis*) were very aggressive at some locations. In recent work by Dernoeden et al (1994), Bighorn blue fescue (*Festuca ovina* L. spp. *glauca*) and Aurora hard fescue (*Festuca longifolia* Thuill.) maintained better quality better resisted weed invasion compared with new turftype tall fescue cultivars.

PROBLEM STATEMENT

This research was divided into two efforts. The objectives of the nitrogen fertilization studies were; (a) to identify the timing of application of slow or extended N release fertilizer to encourage the most competition from grass species and b) to determine the effect of annual nitrogen rate and application timing on grass species persistence and competition. The objectives of the second study were; (a) to determine the effect of lime application on grass/legume species establishment, persistence and competition on roadside and (b) to determine the effect of overseeding of roadsides with selected grass and/or legume combinations and select the most appropriate mix suited overseeding renovation.

EXPERIMENTAL DESIGN

Four roadside locations were identified that characterize typical scotch broom and alder vegetation invasion sites. Four of the locations were used to evaluate the effects of **slow release nitrogen rate and timing** on vegetation development and were identified in the coded name with a **'FERT'** ending. Three locations were used to

evaluate the effects of **grass and legume mixes** on improving the grass or legume composition of the cover and were identified in the coded name with a **'SPEC'** ending. The four sites were coded as follows to identify location and experiment type in one code word.

Tinkham (I-90): This site was located on the west bound on-ramp to I-90 at mile 42 (Tinkham Exit). Alder brush had recently been cut and dropped on the site. Two experiments were conducted and were coded **I90FERT** and **I90SPEC.**

McChord (I-5): This site was located on the east side of I-5, 1/2 mile north of Exit 123. A few scotch broom plants were scattered over the site and soils were gravelly without a topsoil. One experiment was conducted and was coded **MCORFERT.** This location was not large enough to include a species study.

Scott Lake (I-5): These sites were located at mile 98 on both the east and west sides of I-5, one mile south of Exit 99 (Scott Lake Exit). Scotch broom brush had been removed the previous year and a very sparse bentgrass planting had been established in the shallow loam topsoil. Two experiments were conducted and were coded **SCOTFERT** and **SCOTSPEC.**

Westport (WA 105): This site was located on the south side of State Hiway 105, 8 miles west of Aberdeen city limit near Markham. Heavy alder, salal and berry vegetation had been removed prior to use of the area. Two experiments were conducted and were coded **WESTFERT** and

WESTSPEC.

Each research location consisted of 368 to 914 linear feet of roadside and was the maximum available area at any location. Although it would have been desirable to include additional treatments, the selection of treatments was limited by the linear feet of roadside area available. Each research area included one or two experimental areas consisting of twenty-four 15 m wide experimental units (plots). All studies were layed out as randomized complete block designs with three replicates per study except the WESTSPEC study which was limited to two replicates due to limited linear feet of plot area available.

Each experimental unit extended from a point approximately 4.5 m from the roadway edge to the highway right of way boundary which ranged from 15 to 23 m deep. Experimental units were marked by 5 x 5 x 61 cm stakes located at the boundary edge to the rear of each experimental unit. Nitrogen fertilizer applications were applied with an air blast applicator (gun) from the front side (roadside edge) of each experimental unit. The applicator was similar to that employed by DOT road maintenance personnel. Preliminary efforts showed it was not practical to apply lime or seed by air blast applicator because of the hazard of airborne particles and control of application. To reduce suspended particles, improve treatment uniformity, some P and K fertilizer, agriculture limestone and seed were applied by broadcast application with a Spyker Model 75 hand crank seeder. Although application of these materials by broadcast spreader is inconsistent with DOT air gun application, the performance of these products would not be expected to be altered by broadcast application. By

request from DOT, no site preparation was conducted prior to fertilization or seeding. In order to operate within budget constraints, all slow release nitrogen was donated by Vigoro Industries, 4060 E. 26th St., Los Angeles, CA. 90023. Agricultural limestone was donated by J.A. Jack and Sons, Inc., 5427 Ohio S., Seattle, WA 98108. Tinkham and Westport sites were overseeded with red alder on November 9 and 12 1990, respectively. McChord and Scott Lake were overseeded with scotch broom on October 17 1990.

Nitrogen Rate and Timing Studies

The nitrogen rate and nitrogen timing studies were conducted at Tinkham (I90FERT), McChord (MCORFERT), Scott Lake (SCOTFERT), and Westport (WESTFERT). A phosphorous and potassium mixture of 0-26-26 was applied during the fall of 1990 and 1991 to treatments 3 through 8. The mixture was developed from 0-45-0 and 0-0-60 . No P or K was applied to the control (treatment number 1). Phosphorous and potassium was applied to treatment number 2 as a part of standard DOT Unipel 16-16-16 fertilization.

Nitrogen applications were made during the fall of 1990, the spring and fall of 1991 and the spring of 1992 where the treatment schedule required treatments (See treatment list and Table 1). Except for treatment 1 in which no fertilizer was applied and for treatment 2 in which 16-16-16 Unipel fertilizer granule was applied, all P an K fertilizer treatments (0-26-26) were applied as a broadcast treatment to improve uniformity between treatments. Nitrogen treatments and 16-16-16 treatments in the fertilization studies were applied by air gun. SRN treatment consisted of a special mixture of 40% large particle (0.6 cm minus) isobutylidene diurea (IBDU) 40% Escote

150 (150 day release) plastic coated urea and 20% urea (w/w).

Table 1. List of fertilizer treatments applied during 1990-1992.

Treatment Number	Rate and time of application	Fertilizer form used[1]
1.	No Fertilizer	No N, P_2O_5 or K_2O applied.
2.	40-40-40 fall;	N, P_2O_5, K_2O applied as 16-16-16 Unipel in 1990 and 1991.
3	0-40-40 fall;	P_2O_5, K_2O applied as 0-26-26 mixed from 0-45-0 and potassium chloride in 1990, 1991.
4.	40-40-40 fall;	P_2O_5, K_2O applied as 0-26-26 Nitrogen applied as SRN (35.5-0-0) in 1990, 1991.
5.	80-40-40 fall;	P_2O_5, K_2O applied as 0-26-26 Nitrogen applied as SRN (35.5-0-0) in 1990, 1991.
6.	120-40-40 fall;	P_2O_5, K_2O applied as 0-26-26 Nitrogen applied as SRN (35.5-0-0) in 1990, 1991.
7.	120-40-40 spring;	P_2O_5, K_2O applied as 0-26-26 in fall. Nitrogen applied as SRN (35.5-0-0) in 1991, 1992.
8.	120-40-40 fall and alternate year	P_2O_5, K_2O applied as 0-26-26 Nitrogen applied as SRN (35.5-0-0) in 1990

[1] SRN treatment consisted of a special mixture of 40% large particle (0.6 cm minus) isobutylidene diurea (IBDU) 40% Escote 150 (150 day release) plastic coated urea and 20% urea (w/w).

Table 2. Application dates of fertilizer, lime and seed treatments to fertilizer studies from 1990-92.

Location	Application date				
	0-26-26	Fall N	Spring N	Fall Lime	Seed Mix
I90fert	Sept 18, 90	Sept 18, 90	Apr 3, 91	Oct 11, 90	Oct 3, 90
	Sept 26, 91	Sept 26, 91	Apr 6, 92		
Mcorfert	Sept 14, 90	Sept 12, 90	Apr 4, 91	Oct 12, 90	Oct 4, 90
	Sept 24, 91	Sept 24, 91	Apr 5, 92		
Scotfert	Sept 21, 90	Sept 21, 90	Apr 5, 91	Oct 17, 90	Oct 5, 90
	Sept 25, 91	Sept 25, 91	Apr 7, 92		
Westfert	Sept 20, 90	Sept 20, 90	Apr 5, 91	Oct 17, 90	Oct 5, 90
	Sept 27, 91	Sept 27, 91	Apr 7, 92		

Table 3. Standard seed mix used in overseeding of fertilization study[1].

Percent by Weight	Species
48.4	Dandy perennial ryegrass
24.2	Shademaster creeping red fescue
24.2	Illahee creeping red fescue
1.6	New Zealand white clover
1.6	Kalo English trefoil

[1] The seed mixture was broadcast with a Spyker Model 75 hand crank seeder at 100 lb per acre.

All areas were treated with 4484 kg ha^{-1} of agriculture limestone with a hand crank spreader. Dates of fertilizer application are recorded in Table 2. The overseed mixture is listed in Table 2 and was applied from October 2 to 4 1990.

Liming and Seed Mixture Studies

The liming and seed mixture studies were seeded at three locations to determine if selected species would establish and survive better in fall overseeding programs and if the application of agriculture limestone would enhance establishment and survival of seedlings in conditions of no seedbed preparation. The seed mixtures (Table 4) were limited to three selected species that have superior low amenity turf maintenance characteristics and a DOT standard mixture but each mixture was seeded in the presence or absence of agriculture lime. The grass species included were, 'Shademaster' creeping red fescue, 'Dawson' slender fescue and 'Shortstop' tall fescue. Slender fescue was selected in preference to chewings fescue because of its similar tiller production and density characteristics but provides the additional short

rhizome spreading attribute. Past unpublished research at Puyallup also has shown most improved chewings fescues are less tolerant to drought than improved creeping red fescue or slender fescue varieties. The three locations were at Tinkham (I90SPEC), Scott Lake (SCOTSPEC), and Westport (WESTSPEC). Seed mixtures were applied by Spyker Model 75 hand seeders prior to the first fall rains in 1990 on October 3 and October 5, 1990 at Tinkham, Scott Lake and Westport, respectively. The species composition of the seed mixtures are listed in Table 3.

Table 4. Percent composition of species in seed mixtures compared in overseeding studies seeded in the fall of 1990.

Species	Mixture Number[1]			
	1	2	3	4
	---------Percent composition of mixture --------			
Dawson slender fescue		44		
Shademaster creeping fescue			44	
Shortstop tall fescue				66
Illahee creeping red fescue				40
Manhattan II per. ryegrass		44	44	26
Common per. ryegrass				40
Exeter colonial bentgrass		5	5	3.3
Highland colonial bentgrass				10
White dutch clover		2	2	1.3 10
Kalo dwarf English trefoil		4	4	2.6

[1] Mixture 1 seeded at 164 kg ha^{-1}; Mixture 2 seeded at 164 kg ha^{-1}; Mixture 3 seeded at 269 kg ha^{-1}; Mixture 4 seeded at 112 kg ha^{-1}.

Vegetation Measurement

From August through October, 1992 experimental units were evaluated. Numerous types of data were collected during this period. Visual estimates of percent vegetation cover, plant counts per random quadrat, quadrat dry yields, and detailed

point-line quadrat plant density counts were made depending on the vegetation type at each location. Point-line quadrat and dry yield estimates are reported here. Grass dry yield data was collected by harvesting three random 1 meter square quadrats per experimental unit in August and oven dried prior to weighing. Point-line estimates of vegetation cover was conducted by recording five random locations within each experimental unit. Each record consisted of identifying the species contacted at 10 points, 0.5 meter apart along a 5 meter line. The line consisted of a 5 cm PVC pipe supported 1.2 m above the soil surface. The vegetation was identified that was contacted by a wire slipped through two vertical holes in the PVC pipe. From this data, percent total vegetation cover, percent ground cover, percent cover by species and percent composition by species was calculated. Species identified were: red fescue, hard fescue, perennial ryegrass, orchardgrass (*Dactylis* glomerata L.), reed canarygrass (*Phalaris arundinacea*), colonial bentgrass, tall fescue (*Festuca arundinacea* L.), thimbleberry (*Rubus parviflorus* Nutt.), evergreen blackberry (*Rubus laciniatus* Willd.), Himalayan blackberry (*Rubus procerus* Muell.), scotch broom, red alder, salal (*Gaultheria shallon* Pursh.), and western sword fern (*Polystichum munitum* [Kaulf.] Presl).

RESULTS:

FERTILIZATION

The raw data from point-line quadrat evaluations is reported in Appendix Tables A1 to A7. This data is summarized into comparisons of total grass vegetation dry weight, percent cover of total vegetation, percent cover of bare soil/litter, percent

cover of individual species and percent composition of individual species as related to total vegetation. The effect of fertilization practices on these parameters is summarized in Tables 5 through 16.

Dry Weight, Total Vegetation and Bare Soil/litter Cover

The response to fertilization was different at each location. Where a grass population was already established, the application of N significantly increased above ground biomass of grasses. Where this was not the case, there was either no increase in grass biomass or the response was very small or non-uniform. The above ground biomass of grasses was significantly increased at Tinkham and at Scott Lake by fall fertilization with 135 kg SRN ha^{-1} (large particle IBDU and Escote 150), but very little grass biomass increase was observed with spring fertilization with 135 kg SRN ha^{-1} (Table 5 and 6). Alternate year application of SRN of 135 kg ha^{-1} in the fall also increased biomass at these two sites. Neither 45 or 90 kg SRN ha^{-1} applied in the fall from SRN or the standard DOT 16-16-16 significantly increased grass biomass at Tinkham.

At Scott Lake, fertilization with either 45 or 90 kg SRN ha^{-1} or 16-16-16 was effective in increasing biomass of grass. At McChord no consistent biomass response to any fertilization treatment was observed (Table 7). Check plots had as much or more biomass as fertilized plots. Grass population was sparse at McChord in most areas and much of the site was either bare soil or covered with moss. The moss was very effective in competing against existing grasses and seeded grasses. At Westport, no grass biomass measurement was taken since the grasses were not able to compete with brush growth and were crowded out.

The percent cover from total vegetation tended to increase in areas that received fertilization at Tinkham and Scott Lake and the percent bare soil or litter tended to decrease. Generally, the vegetation cover from all species ranged from 40 to 60 percent where the area was not fertilized and ranged from 70 to 80 percent where fertilization was practiced. As a consequence, fertilization reduced the amount of exposed surface area by about 50 percent and significantly reduced the area where seeds of invading species could most easily germinate and establish. For the most part, this was only true at Tinkham and Scott Lake where the areas were fertilized with 90 to 135 kg SRN ha^{-1} in the fall (Table 5 and 6). These locations had good populations of colonial bentgrass that responded to the N fertilization.

Table 5. The effect of nitrogen fertilizer applications on the dry weight of grass, percent cover of total vegetation and percent bare soil/litter two years after treatment at the I90FERT (Tinkham) location.

Fertilizer	Dry weight (kg ha^{-1})	Percent cover Total vegetation	Percent cover soil/litter
No fertilizer	1103 bc[1]	53.3 b[1]	46.7 a[1]
16-16-16 Fall	1179 bc	72.0 ab	28.0 ab
No nitrogen Fall	1120 bc	58.7 ab	41.3 ab
45 kg SRN ha^{-1} Fall	1130 bc	72.7 ab	27.3 ab
90 kg SRN ha^{-1} Fall	1708 b	80.0 ab	18.7 ab
135 kg SRN ha^{-1} Fall	2904 a	84.7 a	15.3 b
135 kg SRN ha^{-1} Spring	1018 c	72.7 ab	27.3 ab
135 kg SRN ha^{-1} Alt. yr	1658 bc	72.7 ab	27.3 ab

[1] Means followed by the same letter are not different significantly at the 0.05 probability level by Duncan's New Multiple Range Test.

Table 6. The effect of nitrogen fertilizer applications on the dry weight of grass and percent cover of total vegetation and percent bare soil/litter two years after treatment at the SCOTFERT (Scott Lake) location.

Fertilizer	Dry weight (kg ha^{-1})	Percent cover Total vegetation	Percent cover soil/litter
No fertilizer	1579 ef[1]	40.0 d[1]	60.0 a[1]
16-16-16 Fall	2881 cd	54.0 cd	46.0 ab
No nitrogen Fall	1040 f	44.0 d	56.0 a
45 kg SRN ha^{-1} Fall	2732 cd	54.7 cd	45.3 ab
90 kg SRN ha^{-1} Fall	3373 bc	70.7 ab	29.3 cd
135 kg SRN ha^{-1} Fall	5451 a	80.0 a	20.0 d
135 kg SRN ha^{-1} Spring	2292 de	43.3 d	56.7 a
135 kg SRN ha^{-1} Alt. yr	3898 b	61.3 bc	38.7 bc

[1] Means followed by the same letter are not different significantly at the 0.05 probability level by Duncan's New Multiple Range Test.

Table 7. The effect of nitrogen fertilizer applications on the dry weight of grass and percent cover of total vegetation and percent bare soil/litter two years after treatment at the MCORFERT (McChord) location.

Fertilizer	Dry weight (kg ha^{-1})	Percent cover Total vegetation	Percent cover bare soil/litter
No fertilizer	925 a[1]	78.0 a[1]	22.0 a[1]
16-16-16- Fall	862 ab	74.7 a	25.3 a
No nitrogen Fall	717 abc	80.0 a	20.0 a
45 kg SRN ha^{-1} Fall	684 bcd	67.3 a	32.7 a
90 kg SRN ha^{-1} Fall	601 cde	77.3 a	22.7 a
135 kg SRN ha^{-1} Fall	548 cde	82.0 a	16.7 a
135 kg SRN ha^{-1} Spring	492 de	72.7 a	40.7 a
135 kg SRN ha^{-1} Alt. yr	416 e	66.0 a	34.0 a

[1] Means followed by the same letter are not different significantly at the 0.05 probability level by Duncan's New Multiple Range Test.

Table 8. The effect of nitrogen fertilizer applications on the dry weight of grass and percent cover of total vegetation and percent bare soil/litter two years after treatment at the WESTFERT (Westport) location.

Fertilizer	Percent cover Total vegetation	Percent cover bare soil/litter
No fertilizer	94.3 a[1]	5.3 a[1]
16-16-16 Fall	90.0 a	10.0 a
No nitrogen	87.3 a	12.7 a
45 kg SRN ha^{-1} Fall	89.7 a	10.7 a
90 kg SRN ha^{-1} Fall	69.0 a	16.0 a
135 kg SRN ha^{-1} Fall	88.7 a	11.3 a
135 kg SRN ha^{-1} Spring	93.3 a	5.3 a
135 kg SRN ha^{-1} Alt. yr	89.0 a	21.3 a

[1] Means followed by the same letter are not different significantly at the 0.05 probability level by Duncan's New Multiple Range Test.

Percent Cover and Composition of Species

Although the fertilization studies were overseeded with a grass/legume mixture consisting of perennial ryegrass, creeping red fescue, dwarf white clover and English trefoil (Table 3) during the first fall of this study, the overseeding did not have an effect on grass/legume cover or composition. Good germination of grasses was observed during October 1990 but few seedlings managed to survive the winter at any location. At Tinkham and Scott Lake, the major cover species was bentgrass which was not included in the overseeding mixture (Table 9 and 10).

At both of these sites, fertilization with any form of fertilizer increased the percent cover of bentgrass 20 to 130 percent more than the non-fertilized areas. Fall fertilization with slow release fertilizer at 90 to 135 kg SRN ha^{-1} was the most effective but 45 kg SRN ha^{-1} or 45 kg N ha^{-1} from 16-16-16 increased bentgrass cover by 20 to 80 percent. Where bentgrass was the dominant cover species, the other cover grass species (creeping red fescue and perennial ryegrass) that were present in very low amounts seemed to be improved only marginally and then only where nitrogen was applied in the fall at 135 kg ha^{-1} in SRN form (Table 9 and 10). Even at McChord where no grass species was dominant, fertilization seemed to increase the percent cover of bentgrass and creeping red fescue (Table 11).

There were no clear statistical differences in the aggression of the broadleaf invader species to fertilization treatments. Essentially no red alder was observed to invade any treatment area during the two year lapse of this study. Scotch broom cover was significantly higher in areas that were treated with 16-16-16 at Scott Lake (Table 10) but there were no similar significance effects or trends at McChord. The

percent cover by false dandelion often was higher in non-fertilized areas compared to fertilized areas but these differences were never significantly different. Moss cover was not affected by fertilization practice (Table 11).

The research area at Westport had just recently been cleared of alder and brush prior to establishing the fertilization efforts. Most of these species with the exception of red alder quickly recovered during the next two years and dominated the cover of the area. Grass cover, although present in some areas in the first year was crowded out in the second year. Blackberry, thimbleberry, salal, bracken fern, and sword fern were not favored by fertilization practice (Table 12). There were no clear changes in percent composition of species due to fertilization (Table 13 to 16). Although some grasses would be expected to dominate with time, at least in scattered areas with increased N fertilization, the duration of the study may have been too short for those changes to occur.

Table 9. The effect of nitrogen fertilizer applications on the percent of cover species two years after treatment at the I90FERT (Tinkham) location.

Fertilizer	Percent cover (Sept. 9, 1992)							
	Red fescue	Hard fescue	Bent-grass	Orchard-grass	White clover	False dande-lion	Red alder	Black-berry
No fertilizer	4.7	0.7	28.0	2.0	2.0	2.0	0.7	0.7
16-16-16 Fall	18.7	1.3	47.3	0.0	2.0	2.7	0.0	0.0
No nitrogen Fall	19.3	2.7	23.3	0.7	0.7	2.0	0.0	0.0
45 kg SRN ha^{-1} Fall	17.3	2.0	48.0	0.7	2.7	1.3	0.0	0.0
90 kg SRN ha^{-1} Fall	18.7	0.7	60.0	0.0	0.7	0.0	0.0	0.0
135 kg SRN ha^{-1} Fall	21.3	2.0	58.7	0.7	0.7	0.0	0.7	0.7
135 kg SRN ha^{-1} Spring	10.0	0.7	62.0	0.0	0.0	0.0	0.0	0.0
135 kg SRN ha^{-1} Alt. yr	27.3	1.3	38.7	1.3	0.7	2.0	0.7	0.7
LSD (.05)[1]	20.8	2.8	32.3	2.2	2.7	3.3	1.0	1.0

[1] To determine statistical differences among fertilizer treatments, subtract one entry's mean from another entries mean. Statistical differences occur when this value is larger than the corresponding LSD value.

Table 10. The effect of nitrogen fertilizer applications on the percent of cover species two years after treatment at the SCOTFERT (Scott Lake) location.

Fertilizer	Percent cover (Sept. 28, 1992)						
	Red fescue	Perennial ryegrass	Bent-grass	Salal	Scotch broom	Red alder	Black-berry
No fertilizer	0.0	0.7	38.0	0.0	1.3	0.0	0.0
16-16-16 Fall	0.0	2.0	46.0	0.0	6.7	0.0	0.0
No nitrogen Fall	1.3	1.3	37.3	0.0	4.0	0.0	0.0
45 kg SRN ha^{-1} Fall	0.0	2.7	50.0	0.7	1.4	0.0	0.0
90 kg SRN ha^{-1} Fall	1.3	3.3	64.7	0.0	0.7	0.7	0.0
135 kg SRN ha^{-1} Fall	2.7	5.3	69.3	0.0	1.3	0.0	1.3
135 kg SRN ha^{-1} Spring	3.3	1.3	34.7	0.0	2.7	1.3	0.0
120 kg SRN ha^{-1} Alt. yr	4.7	3.3	50.0	0.0	1.3	1.3	0.7
LSD (.05)[1]	3.7	3.9	13.1	0.7	2.7	1.9	1.6

[1] To determine statistical differences among fertilizer treatments, subtract one entry's mean from another entries mean. Statistical differences occur when this value is larger than the corresponding LSD value.

Table 11. The effect of nitrogen fertilizer applications on the percent of cover species two years after treatment at the MCORFERT (McChord) location.

Fertilizer	Percent cover (Sept. 29, 1992)					
	Red fescue	Perennial ryegrass	Bentgrass	Moss	Scotch broom	False dandelion
No fertilizer	0.0	0.0	2.0	39.3	25.3	11.3
16-16-16 Fall	3.3	0.0	8.0	28.0	28.0	7.3
No nitrogen Fall	0.0	0.0	3.3	35.3	30.0	11.3
45 kg SRN ha^{-1} Fall	0.7	0.0	4.7	38.0	14.0	10.0
90 kg SRN ha^{-1} Fall	6.0	0.0	9.3	38.0	16.7	7.3
135 kg SRN ha^{-1} Fall	5.3	0.0	9.3	36.7	24.0	6.7
135 kg SRN ha^{-1} Spring	2.0	0.0	6.0	31.3	20.7	12.7
135 kg SRN kg^{-1} Alt. yr	2.0	0.0	3.3	30.0	16.7	8.0
LSD (.05)[1]	4.4	0.0	10.1	14.4	12.1	8.2

[1] To determine statistical differences among fertilizer treatments, subtract one entry's mean from another entries mean. Statistical differences occur when this value is larger than the corresponding LSD value.

Table 12. The effect of nitrogen fertilizer applications on the percent of species cover two years of treatment after the WESTFERT (Westport) location.

Fertilizer	Percent cover (Sept. 15, 1992)										
	Red fescue	Perennial ryegrass	Bent-grass	Reed canarygrass	Salal	Bracken fern	Sword fern	Red alder	Thimble-berry	Evergreen blackberry	Himalayan blackberry
No fertilizer	4.0	21.3	0.0	0.0	12.0	1.3	0.0	0.0	2.7	0.0	53.3
16-16-16 Fall	0.7	9.3	0.0	0.0	8.7	3.3	0.0	0.0	0.0	0.0	68.0
No nitrogen	2.0	12.7	0.7	0.0	6.7	0.7	0.0	0.7	0.0	0.0	64.0
45 kg SRN ha^{-1} Fall	6.7	1.3	0.0	0.0	16.0	6.7	0.0	0.0	3.3	0.0	56.0
90 kg SRN ha^{-1} Fall	0.7	8.0	0.0	0.0	12.0	0.7	0.0	0.0	4.7	3.3	67.3
135 kg SRN ha^{-1} Fall	0.0	2.0	0.0	0.0	8.0	1.3	0.0	0.0	11.3	0.7	65.3
135 kg SRN ha^{-1} Spring	2.0	14.7	0.0	0.0	10.7	0.0	0.7	0.0	14.0	2.7	48.7
135 kg SRN ha^{-1} Alt. yr	6.0	6.7	0.0	0.0	10.0	1.3	0.7	0.0	0.0	0.0	64.7
LSD (.05)[1]	9.0	13.6	0.7	-	20.7	8.7	1.1	0.7	16.8	4.1	30.4

To determine statistical differences among fertilizer treatments, subtract one entry's mean from another entries mean. Statistical differences occur when this value is larger than the corresponding LSD value.

Table 13. The effect of nitrogen fertilizer applications on the percent composition of species two years after treatment at the I90FERT (Tinkham) location.

Fertilizer	Percent composition (Sept. 9, 1992)							
	Red fescue	Hard fescue	Bent-grass	Orchard-grass	White clover	False dande-lion	Red alder	Black-berry
No fertilizer	22.1	0.0	64.7	4.1	2.0	2.0	1.0	4.1
16-16-16 Fall	25.8	1.9	65.4	0.0	2.9	4.2	0.0	0.0
No nitrogen Fall	34.1	4.6	54.5	1.4	1.4	3.9	0.0	0.0
45 kg SRN ha^{-1} Fall	22.1	3.5	66.8	0.7	3.8	2.2	0.0	0.9
90 kg SRN ha^{-1} Fall	24.2	0.8	74.2	0.0	0.8	0.2	0.0	0.0
135 kg SRN ha^{-1} Fall	26.6	2.4	67.5	0.7	1.0	0.0	1.0	1.0
135 kg SRN ha^{-1} Spring	12.8	0.9	86.3	0.0	0.0	0.0	0.0	0.0
135 kg SRN ha^{-1} Alt. yr	36.1	13.0	53.8	2.0	1.0	3.2	1.0	0.7
LSD (.05)[1]	31.4	13.0	34.9	4.1	4.1	5.4	1.5	3.4

[1] To determine statistical differences among fertilizer treatments, subtract one entry's mean from another entries mean. Statistical differences occur when this value is larger than the corresponding LSD value.

Table 14. The effect of nitrogen fertilizer applications on the percent composition of species two years after treatment at the SCOTFERT (Scott Lake) location.

Fertilizer	Percent composition (Sept. 28, 1992)						
	Red fescue	Perennial ryegrass	Bent-grass	Salal	Scotch broom	Red alder	Black-berry
No fertilizer	0.0	2.0	94.8	0.0	3.2	0.0	0.0
16-16-16 Fall	0.0	3.3	56.6	0.0	9.5	0.0	0.0
No nitrogen Fall	2.8	2.8	84.7	0.0	9.6	0.0	0.0
45 kg SRN ha^{-1} Fall	0.0	7.2	91.6	1.2	2.3	0.0	0.0
90 kg SRN ha^{-1} Fall	1.9	4.7	91.4	0.0	1.0	1.0	0.0
135 kg SRN ha^{-1} Fall	3.2	6.9	86.7	0.0	1.6	0.0	1.6
135 kg SRN ha^{-1} Spring	6.7	2.4	81.3	0.0	6.3	3.3	0.0
135 kg SRN ha^{-1} Alt. yr	7.8	5.5	81.3	0.0	2.1	2.1	1.1
LSD (.05)[1]	6.1	7.7	32.3	1.3	6.8	4.1	2.1

[1] To determine statistical differences among fertilizer treatments, subtract one entry's mean from another entries mean. Statistical differences occur when this value is larger than the corresponding LSD value.

Table 15. The effect of nitrogen fertilizer applications on the percent composition of species two years after treatment at the MCORFERT (McChord) location.

Fertilizer	Percent composition (Sept. 29, 1992)					
	Red fescue	Perennial ryegrass	Bentgrass	Moss	Scotch broom	False dandelion
No fertilizer	0.0	0.0	2.3	51.2	32.9	13.6
16-16-16 Fall	4.7	0.0	9.6	37.6	39.1	9.0
No nitrogen Fall	0.0	0.0	4.7	42.8	38.6	13.8
45 kg SRN ha^{-1} Fall	0.9	0.0	7.5	56.5	20.4	14.8
90 kg SRN ha^{-1} Fall	7.6	0.0	11.9	50.1	20.6	9.8
135 kg SRN ha^{-1} Fall	7.0	0.0	12.2	44.7	28.0	8.2
135 kg SRN ha^{-1} Spring	2.8	0.0	8.5	42.6	28.5	17.6
135 kg SRN ha^{-1} Alt. yr	3.2	0.0	14.2	46.3	23.5	12.7
LSD (.05)[1]	5.9	0.0	13.0	18.7	16.4	10.4

[1] To determine statistical differences among fertilizer treatments, subtract one entry's mean from another entries mean. Statistical differences occur when this value is larger than the corresponding LSD value.

Table 16. The effect of nitrogen fertilizer applications on the percent composition of species two years after treatment at the WESTFERT (Westport) location.

Fertilizer	Percent composition (Sept. 15, 1992)										
	Red fescue	Perennial ryegrass	Bent-grass	Reed canarygrass	Salal	Bracken fern	Sword fern	Red alder	Thimble-berry	Evergreen blackberry	Himalayan blackberry
No fertilizer	4.3	22.2	0.0	0.0	12.7	1.5	0.0	0.0	2.8	0.0	56.5
16-16-16 Fall	0.7	10.3	0.0	0.0	10.8	4.4	0.0	0.0	0.0	0.0	73.8
No nitrogen	2.3	15.6	0.7	0.0	7.7	0.7	0.0	0.7	0.0	0.0	72.2
45 kg SRN ha^{-1} Fall	7.4	1.5	0.0	0.0	17.5	8.3	0.0	0.0	0.0	0.0	62.0
90 kg SRN ha^{-1} Fall	0.7	8.1	0.0	0.0	12.6	0.7	0.0	0.0	4.8	3.7	69.3
135 kg SRN ha^{-1} Fall	0.0	2.2	0.0	0.0	9.3	1.4	0.0	0.0	13.6	0.8	72.7
135 kg SRN ha^{-1} Spring	2.1	15.8	0.0	0.0	12.0	0.0	0.7	0.0	14.6	3.0	51.7
135 kg SRN ha^{-1} Alt. yr	6.5	7.6	0.0	0.0	11.1	1.4	0.7	0.0	0.0	0.0	72.8
LSD (.05)[1]	9.7	14.8	0.8	-	21.2	10.9	1.1	0.8	18.0	4.7	30.6

[1] To determine statistical differences among fertilizer treatments, subtract one entry's mean from another entries mean. Statistical differences occur when this value is larger than the corresponding LSD value.

Species Renovation

Three seed mixes that typify the range of concepts of improved grasses for amenity turf were used at three of the four test locations. The McChord location was not used because the area was too small in size. The purpose of this effort was to determine if annual fall overseeding practices without site preparation would improve the grass/legume composition of roadside turf and provide greater competition to invader species. Many past studies have shown that overseeding is most successful when some form of site preparation is performed. This usually implies some form of vegetation/soil disturbance or drilled seeding to decrease seedling competition, improve seed to soil contact, seed/soil moisture relations or timely seeding to make best use of growing conditions. Without these practices, seeding is less dependable but may be effective when repeated annually over several years.

The contract approval of these studies between WSU and WSDOT delayed initiation of the procurement of seeds used. This delay was of considerable concern since it has been well documented by many years of research that early fall seeding with adequate nutrient availability (when moisture is available) is the best guarantee of successful seedling establishment. Late seedings, particularly with fine fescue and tall fescue, often enter the late fall too small or poorly rooted to withstand wet winter and frost conditions. However, all seeding was completed between October 3 and October 5, 1990 as soon as seed arrived. Although this is very late for fescues to establish in a harsh environment, earlier seeding in 1990 would likely not been of value because no rains occurred prior to the first days of October. Visits to the research locations throughout October and November showed good germination had

occurred but seedlings were very small and most were in the one to two leaf stage by late fall.

As can be seen by the following tables (Tables 17-25), these seedlings did not appear to survive the winter and provide additional cover or increase the composition of the seeded species. No significant differences in grass dry weight, percent total vegetation cover, percent bare soil/litter cover or changes in percent cover of individual species were identified two years after these seedings were made. Since no seeding mixture was effective in increasing the grass/legume cover, the standard DOT mix had no advantage or disadvantage compared to species mixtures of slender, creeping red or tall fescue.

The presence or absence of agriculture lime on all species mixtures was evaluated in side by side plots (split plot experimental design). These lime treatments were never apparent in the field for any parameter observed or for any parameter measured. Table 26 shows the average values for fine fescue, perennial ryegrass, colonial bentgrass, and white clover. Generally, we would expect to see some positive result from lime applications but in this instance there may be several reasons for not observing some improved plant growth or development. First, few seedlings survived the winter which suggests the fall seed germination and early growth was insufficient to allow good expression of lime benefits on later survival of even the best conditioned seedlings. Expression of lime benefits on seedlings establishment may be best implemented by the application of lime six months or one year prior to the initiation of overseeding practices. In these short-term studies there was no benefit to lime application on the species tested.

Additional Tall Fescue Seedings

On October 10, 1990, three additional tall fescue varieties were seeded at the Scott Lake location. The intent of this seeding was to observe the general performance of the most recent developments in turftype dwarf tall fescues. These grasses grow less than older forage varieties and have much greater density. As was the case with the other fall seedings, these varieties did not survive the winter.

Table 17. The effect of fall overseeding of four fescue/perennial ryegrass mixes on the dry weight and percent cover of total vegetation of species and percent bare soil/litter two years after treatment at the I90SPEC (Tinkham) location.

Fescue Mix	Dry weight (lb/A)	Percent cover Total vegetation	Percent cover bare soil/litter
Slender fescue	1981	88.3	9.0
Creeping fescue	2396	84.0	16.0
Tall fescue	1972	81.0	6.3
DOT mix	1565	97.3	2.7
LSD (.05)[1]	783	24.8	10.0

[1] To determine statistical differences among fertilizer treatments, subtract one entry's mean from another entries mean. Statistical differences occur when this value is larger than the corresponding LSD value.

Table 18. The effect of fall overseeding of four fescue/perennial ryegrass mixes on the dry weight and percent cover of total vegetation of species and percent bare soil/litter two years after treatment at the SCOTSPEC (Scott Lake) location.

Fescue Mix	Dry weight (lb/A)	Percent cover Total vegetation	Percent cover Bare soil/litter
Slender fescue	1565	80.3	18.7
Creeping fescue	2043	75.0	26.0
Tall fescue	1618	82.3	16.3
DOT mix	1901	82.3	17.7
LSD (.05)[1]	912	6.1	4.8

[1] To determine statistical differences among fertilizer treatments, subtract one entry's mean from another entries mean. Statistical differences occur when this value is larger than the corresponding LSD value.

Table 19. The effect of fall overseeding of four fescue/perennial ryegrass mixes on the dry weight and percent cover of total vegetation of species and percent bare soil/litter two years after treatment at the WESTSPEC (Westport) location.

Fescue Mix	Dry weight (lb/A)	Percent cover Total vegetation	Percent cover Bare soil/litter
Slender fescue	2131	98.5	6.0
Creeping fescue	805	95.0	6.0
Tall fescue	2388	97.0	6.5
DOT mix	2105	97.5	4.0
LSD (.05)[1]	837	6.9	12.3

[1] To determine statistical differences among fertilizer treatments, subtract one entry's mean from another entries mean. Statistical differences occur when this value is larger than the corresponding LSD value.

Table 20. The effect of fall overseeding of four fescue/perennial ryegrass mixes on the percent cover of individual species two years after treatment at the I90SPEC (Tinkham) location.

Fescue Mix	% Cover (Sept. 10, 1992)							
	Red fescue	Hard fescue	Bent-grass	Orchard-grass	White clover	False dandelion	Red alder	Himalayan blackberry
Slender fescue	18.0	0.7	71.0	1.0	0.0	0.0	0.0	0.3
Creeping fescue	18.0	1.7	68.0	1.7	0.0	0.0	0.0	0.0
Tall fescue	22.3	5.3	64.0	0.7	0.0	0.0	0.0	0.0
DOT mix	26.0	0.0	68.3	1.0	0.0	0.0	0.0	2.0
LSD (.05)[1]	21.6	6.0	19.0	3.4	-	-	-	3.1

[1] To determine statistical differences among fertilizer treatments, subtract one entry's mean from another entries mean. Statistical differences occur when this value is larger than the corresponding LSD value.

Table 21. The effect of fall overseeding of four fescue/perennial ryegrass mixes on the percent cover of individual species two years after treatment at the SCOTSPEC (Scott Lake) location.

Fescue Mix	% Cover (Sept 30, 1992)						
	Red fescue	Hard fescue	Perennial ryegrass	Bentgrass	Scotch broom	False dandelion	Himalayan blackberry
Slender fescue	5.3	0.0	0.0	68.0	5.0	2.3	0.3
Creeping fescue	2.3	0.0	0.0	61.3	5.7	3.3	0.3
Tall fescue	0.0	0.0	0.0	70.7	8.7	3.0	0.0
DOT mix	0.7	0.0	0.0	71.7	7.0	2.7	0.3
LSD (.05)[1]	3.6	-	-	7.6	4.8	3.4	0.8

[1] To determine statistical differences among fertilizer treatments, subtract one entry's mean from another entries mean. Statistical differences occur when this value is larger than the corresponding LSD value.

Table 22. The effect of fall overseeding of four fescue/perennial ryegrass mixes on the percent cover of individual species two years after treatment at the WESTSPEC (Westport) location.

Fescue Mix	% Cover (Sept 17, 1992)											
	Red fescue	Perennial ryegrass	Tall fescue	Bent-grass	Reed canarygrass	Salal	Bracken fern	Sword fern	Red alder	Thimble-berry	Evergreen blackberry	Himalayan blackberry
Slender fescue	16.5	17.5	0.0	0.0	0.5	24.0	4.5	2.0	0.5	10.0	0.0	23.0
Creeping fescue	0.0	12.0	2.0	0.0	0.5	46.0	0.0	0.0	0.0	5.0	0.0	29.5
Tall fescue	9.5	22.5	0.0	4.0	0.0	12.0	0.0	0.0	0.0	22.0	0.5	26.5
DOT mix	14.0	27.0	0.0	0.5	0.0	26.5	6.5	1.0	0.0	8.0	0.0	14.0
LSD (.05)[1]	14.3	8.6	1.3	3.1	1.2	28.7	9.4	1.6	0.8	18.8	0.8	33.4

To determine statistical differences among fertilizer treatments, subtract one entry's mean from another entries mean. Statistical differences occur when this value is larger than the corresponding LSD value.

Table 23. The effect of fall overseeding of four fescue/perennial ryegrass mixes on the percent composition of individual species two years after treatment at the 190SPEC (Tinkham) location.

Fescue Mix	% Composition (Sept. 10, 1992)							
	Red fescue	Hard fescue	Bent-grass	Orchard-grass	White clover	False dandelion	Red alder	Himalayan blackberry
Slender fescue	20.0	0.0	78.3	1.4	0.0	0.0	0.0	0.3
Creeping fescue	16.6	0.8	80.8	1.8	0.0	0.0	0.0	0.0
Tall fescue	25.4	5.6	68.3	0.7	0.0	0.0	0.0	0.0
DOT mix	26.6	0.0	70.3	1.0	0.0	0.0	0.0	2.0
LSD (.05)[1]	21.5	6.6	20.5	3.9	-	-	-	3.1

To determine statistical differences among fertilizer treatments, subtract one entry's mean from another entries mean. Statistical differences occur when this value is larger than the corresponding LSD value.

Table 24. The effect of fall overseeding of four fescue/perennial ryegrass mixes on the percent composition of individual species two years after treatment at the SCOTSPEC (Scott Lake) location.

Fescue Mix	% Composition (Sept 30, 1992)						
	Red fescue	Hard fescue	Perennial ryegrass	Bentgrass	Scotch broom	False dandelion	Himalayan blackberry
Slender fescue	6.9	0.0	0.0	83.9	6.0	2.9	0.4
Creeping fescue	3.2	0.0	0.0	84.3	7.6	4.4	0.4
Tall fescue	0.0	0.0	0.0	86.1	10.4	3.5	0.0
DOT mix	0.8	0.0	0.0	87.4	8.1	3.3	0.4
LSD (.05)[1]	4.7	-	-	9.2	6.1	4.3	1.0

To determine statistical differences among fertilizer treatments, subtract one entry's mean from another entries mean. Statistical differences occur when this value is larger than the corresponding LSD value.

Table 25. The effect of fall overseeding of four fescue/perennial ryegrass mixes on the percent composition of individual species two years after treatment at the WESTSPEC (Westport) location.

Fescue Mix	% Composition (Sept 17, 1992)											
	Red fescue	Perennial ryegrass	Tall fescue	Bent-grass	Reed canarygrass	Salal	Bracken fern	Sword fern	Red alder	Thimble-berry	Evergreen blackberry	Himalayan blackberry
Slender fescue	16.8	17.8	0.0	0.0	0.5	24.4	4.6	2.0	0.5	10.2	0.0	23.3
Creeping fescue	0.0	12.3	2.0	0.0	0.5	47.9	0.0	0.0	0.0	5.0	0.0	32.3
Tall fescue	9.9	23.0	0.0	4.1	0.0	12.4	0.0	0.0	0.0	22.5	0.5	27.5
DOT mixture	14.4	28.4	0.0	0.5	0.0	27.0	6.9	1.0	0.0	8.2	0.0	14.4
LSD (.05)[1]	14.7	9.2	1.3	3.2	1.2	28.3	9.9	1.6	0.8	18.8	0.8	34.8

To determine statistical differences among fertilizer treatments, subtract one entry's mean from another entries mean. Statistical differences occur when this value is larger than the corresponding LSD value.

Table 26. Percent cover by red fescue, colonial bentgrass, perennial ryegrass and white clover in lime and non-limed roadside vegetation.

Lime	Percent cover[1]			
	Red fescue	Colonial bentgrass	Perennial ryegrass	White clover
Tinkham				
No lime	22.0 a	73.5 a	0.0 a	0.0 a
Lime	22.8 a	75.4 a	0.0 a	0.0 a
Scott Lake				
No lime	1.8 a	67.5 a	0.0 a	0.0 a
Lime	1.8 a	70.0 a	0.0 a	0.0 a
Westport				
No lime	8.0 a	1.2 a	15.8 a	0.0 a
Lime	11.2 a	1.0 a	23.0 a	0.0 a

[1] Means followed by the same letter within a column and within a location are not different significantly at the 0.05 probability level by Duncan's New Multiple Range Test.

Conclusions and Recommendations

CONCLUSIONS

Fertilization significantly increased above ground biomass of grasses and percent cover from total vegetation along roadsides. Slow release fertilizer, that was selected to release the N for five to six months (large particle IBDU and Escote 150) during the growth period, provided the best response when fertilizer was applied in the fall. Poor grass growth occurred from spring application of slow release N. Although the most growth and cover occurred at 135 kg SRN ha^{-1}, 90 kg SRN ha^{-1} improved cover significantly if a good grass population was present. Alternate year application of SRN of 135 kg N ha^{-1} in the fall also increased biomass. Forty five kg SRN ha^{-1} applied in the fall or 16-16-16 appeared inadequate over the short term to significantly increased grass competition. In the short period of this study, the vegetation cover from all species ranged 20 to 40 percent where fertilization was practiced. As a consequence, fertilization reduced the exposed surface area by about 50 percent and significantly reduced the area where seeds of invading species could germinate and establish.

Although the fertilization studies were overseeded with a grass/legume mixture consisting of perennial ryegrass, creeping red fescue, white clover and English trefoil (Table 3) during the first fall of this study, the overseeding did not have an effect on grass/legume cover or composition. Good germination of grasses was observed during October 1990 but few seedlings managed to survive the winter. This is not an uncommon result. Fine fescue, tall fescue and Kentucky bluegrass are very prone to death during the winter if seedlings do not develop to sufficient size during the fall.

This lack of winter survival of young seedlings is primary reason roadside seeding and germination of these species must occur in late summer. If early fall moisture is not available for germination and growth, then overseeding success will usually be poor.

At Tinkham and Scott Lake, the major cover species was bentgrass which was not included in the overseeding mixture (Table 8 and 9). At both of these sites, fertilization with any form of fertilizer increased the percent cover of bentgrass 20 to 130 percent more than the non-fertilized areas. Fall fertilization with SRN at 90 to 135 kg N ha^{-1} was the most effective but 45 kg N ha^{-1} of SRN or 45 kg N ha^{-1} from 16-16-16 increased bentgrass cover by 20 to 80 percent. Where bentgrass was the dominant cover species, the other cover grass species (creeping red fescue and perennial ryegrass) that were present in very low amounts seemed to be improved only marginally and then only where nitrogen was applied in the fall at 135 kg N ha^{-1} in the SRN form (Table 9 and 10). Even at McChord where no grass species was dominant, fertilization seemed to increase the percent cover of bentgrass and creeping red fescue (Table 11).

There were no clear statistical differences in the aggression of the broadleaf invader species to fertilization. Essentially no red alder was observed to invade any treatment area during the two year lapse of this study. Scotch broom cover was significantly higher in areas that were treated with 16-16-16 at Scott Lake (Table 9) but there were no similar significance effects or trends at McChord. The percent cover by false dandelion often was higher in non-fertilized areas compared to fertilized areas but these differences were never significantly different. Moss cover was not

affected by fertilization practice (Table 11).

The research area at Westport had just recently been cleared of alder and brush prior to establishing the fertilization efforts. Most of these species with the exception of red alder quickly recovered during the next two years and dominated the cover of the area. Grass cover, although present in the first year was crowded out in the second year. Blackberry, thimbleberry, salal, bracken fern, and sword fern were not favored by fertilization practice (Table 12). There were no clear changes in percent composition of species due to fertilization (Table 13 to 16). Although grasses would be expected to dominate over time with increased N fertilization, the duration of the study may have been too short for those changes to occur.

RECOMMENDATIONS AND IMPLEMENTATION

The findings of this research project do not clearly make an association between fertilization of roadside grasses and invasion of red alder or scotch broom to roadsides. This may in part be to the short term nature of these studies. Therefore, it would be premature to suggest extensive specific SRN fertilization be conducted at this time. The following recommendation is suggested. In a 5-year test program, fall apply SRN in September to early October to areas prone to scotch broom or red alder invasion but only to areas with good bentgrass/fine fescue cover. Fertilizer mix should consist of a large particle IBDU, Escote 150 and urea combination (40%-40%-20%, respectively) with P_2O_5 and K_2O in a 2-1-1 ratio [Example 20-10-10]. Other forms of SRN could substitute for the specification above, however, the features necessary are as follows: Virtually dust free, 25% soluble N available at fall application time,

fertilizer N release rate not altered by air gun application method, particle size large enough to be conveyed 50 feet by air applicator, very limited N release in winter, extended good spring and early summer release to coincide with soil moisture and temperatures during that period. Each test area should be divided into annually mowed, biannually mowed or non-mowed areas since it is suspected that increasing the growth and competition of amenity grasses will only slow down invasion by red alder or scotch broom but not eliminate invasion. Occasional mowing maybe a reasonable alternative to herbicide control. Thinning of grasses is typical when grasses are mowed once annually but there is great variability between varieties within species in this characteristic. Recent unpublished data at Puyallup shows some improved turftype fescues have much greater tolerance to low maintenance than older common varieties such as Cascade chewings, Jamestown chewings and common red fescues. Overseeding and fertilization should be practiced only in early to mid September where early fall rainfall has occurred or is anticipated. The seed mix should consist of 50% spreading red fescue or creeping red fescue, 40% turftype perennial ryegrass and 10% colonial bentgrass. Neither dutch white clover nor Kalo English trefoil is suggested unless seed is pre-inoculated, early seeded, soils disturbed, and sufficient agricultural grade limestone and P and K fertilizers have been recently applied.

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APPENDIX

Refertilization of Roadsides

Table A1. Line-point sampling, percent cover, percent composition data from I-90 (Tinkham) fertilization study on cutover roadside grass and moss cover.

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
Block I									
101	Red fescue	01	02	03	02	01	09	18	26.4
101	Hard fescue	01	00	00	01	00	02	4	5.9
101	Bentgrass	04	03	04	02	03	16	32	47.1
101	Orchardgrass	00	00	00	00	00	00	0	0.0
101	White clover	01	01	00	00	01	03	6	8.8
101	False dandelion	00	01	01	02	00	04	8	11.8
101	Red alder	00	00	00	00	00	00	0	0.0
101	E. Blackberry	00	00	00	00	00	00	0	0.0
101	Total vegetation	07	07	08	07	05	34	68	100.0
101	Bare soil/litter	03	03	02	03	05	16	32	
102	Red fescue	03	02	03	01	03	12	24	48.0
102	Hard fescue	00	00	00	00	00	00	0	0.0
102	Bentgrass	04	02	03	01	03	13	26	52.0
102	Orchardgrass	00	00	00	00	00	00	0	0.0
102	White clover	00	00	00	00	00	00	0	0.0
102	False dandelion	00	00	00	00	00	00	0	0.0
102	Red alder	00	00	00	00	00	00	0	0.0
102	E. Blackberry	00	00	00	00	00	00	0	0.0
102	Total vegetation	07	04	06	02	06	25	50	100.0
102	Bare soil/litter	03	06	04	08	04	25	50	
103	Red fescue	04	02	04	03	02	15	30	33.3
103	Hard fescue	00	00	00	00	01	01	2	2.2
103	Bentgrass	05	06	05	06	07	29	58	64.5
103	Orchardgrass	00	00	00	00	00	00	0	0.0
103	White clover	00	00	00	00	00	00	0	0.0
103	False dandelion	00	00	00	00	00	00	0	0.0
103	Red alder	00	00	00	00	00	00	0	0.0

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
103	E. Blackberry	00	00	00	00	00	00	0	0.0
103	Total vegetation	09	08	09	09	10	45	90	100.0
103	Bare soil/litter	01	02	01	01	00	05	10	
104	Red fescue	00	01	02	01	02	06	12	20.0
104	Hard fescue	00	00	00	00	00	00	0	0.0
104	Bentgrass	05	06	03	04	05	23	46	76.7
104	Orchardgrass	00	00	00	00	00	00	0	0.0
104	White clover	00	00	00	00	00	00	0	0.0
104	False dandelion	00	00	01	00	00	01	2	3.3
104	Red alder	00	00	00	00	00	00	0	0.0
104	E. Blackberry	00	00	00	00	00	00	0	0.0
104	Total vegetation	05	07	06	05	07	30	60	100.0
104	Bare soil/litter	05	03	04	05	03	20	40	
105	Red fescue	02	03	02	00	04	11	22	26.2
105	Hard fescue	00	00	00	00	00	00	0	0.0
105	Bentgrass	07	05	07	06	06	31	62	73.8
105	Orchardgrass	00	00	00	00	00	00	0	0.0
105	White clover	00	00	00	00	00	00	0	0.0
105	False dandelion	00	00	00	00	00	00	0	0.0
105	Red alder	00	00	00	00	00	00	0	0.0
105	E. Blackberry	00	00	00	00	00	00	0	0.0
105	Total vegetation	09	08	09	06	10	42	84	100.0
105	Bare soil/litter	01	02	01	04	00	08	16	
106	Red fescue	00	01	02	00	02	05	10	19.2
106	Hard fescue	01	00	00	00	01	02	4	7.7
106	Bentgrass	03	03	04	02	05	17	34	65.5
106	Orchardgrass	00	00	00	00	00	00	00	0.0
106	White clover	00	00	00	00	01	01	2	3.8
106	False dandelion	01	00	00	00	00	01	2	3.8

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
106	Red alder	00	00	00	00	00	00	0	0.0
106	E. Blackberry	00	00	00	00	00	00	0	0.0
106	Total vegetation	05	04	06	02	09	26	52	100.0
106	Bare soil/litter	05	06	04	08	01	24	48	
107	Red fescue	00	01	01	00	00	02	4	7.1
107	Hard fescue	00	00	00	00	01	01	2	3.6
107	Bentgrass	05	04	06	05	04	24	48	85.7
107	Orchardgrass	00	00	00	00	00	00	0	0.0
107	White clover	00	00	00	00	00	00	0	0.0
107	False dandelion	00	00	00	01	00	01	2	3.6
107	Red alder	00	00	00	00	00	00	0	0.0
107	E. Blackberry	00	00	00	00	00	00	0	0.0
107	Total vegetation	05	05	07	06	05	28	56	100.0
107	Bare soil/litter	05	05	03	04	05	22	44	
108	Red fescue	01	00	03	02	01	07	14	15.2
108	Hard fescue	00	00	00	00	00	00	0	0.0
108	Bentgrass	08	09	07	07	08	39	78	84.8
108	Orchardgrass	00	00	00	00	00	00	0	0.0
108	White clover	00	00	00	00	00	00	0	0.0
108	False dandelion	00	00	00	00	00	00	0	0.0
108	Red alder	00	00	00	00	00	00	0	0.0
108	E. Blackberry	00	00	00	00	00	00	0	0.0
108	Total vegetation	09	09	10	09	09	46	92	100.0
108	Bare soil/litter	01	01	00	01	01	04	8	
Block II									
201	Red fescue	03	02	03	02	01	11	22	32.4
201	Hard fescue	00	00	02	00	00	02	4	5.9
201	Bentgrass	03	04	03	05	06	21	42	61.7
201	Orchardgrass	00	00	00	00	00	00	0	0.0
201	White clover	00	00	00	00	00	00	0	0.0

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
201	False dandelion	00	00	00	00	00	00	0	0.0
201	Red alder	00	00	00	00	00	00	0	0.0
201	E. Blackberry	00	00	00	00	00	00	0	0.0
201	Total vegetation	06	06	08	07	07	34	68	100.0
201	Bare soil/litter	04	04	02	03	03	16	32	
202	Red fescue	00	00	01	00	01	02	4	6.9
202	Hard fescue	00	00	00	00	00	00	0	0.0
202	Bentgrass	06	04	05	06	06	27	54	93.1
202	Orchardgrass	00	00	00	00	00	00	0	0.0
202	White clover	00	00	00	00	00	00	0	0.0
202	False dandelion	00	00	00	00	00	00	0	0.0
202	Red alder	00	00	00	00	00	00	0	0.0
202	E. Blackberrry	00	00	00	00	00	00	0	0.0
202	Total vegetation	06	04	06	06	07	29	58	100.0
202	Bare soil/litter	04	06	04	04	03	21	42	
203	Red fescue	03	01	02	02	03	11	22	27.5
203	Hard fescue	00	00	00	00	00	00	0	0.0
203	Bentgrass	05	06	07	05	06	29	58	72.5
203	Orchardgrass	00	00	00	00	00	00	0	0.0
203	White clover	00	00	00	00	00	00	0	0.0
203	False dandelion	00	00	00	00	00	00	0	0.0
203	Red alder	00	00	00	00	00	00	0	0.0
203	E. Blackberry	00	00	00	00	00	00	0	0.0
203	Total vegetation	08	07	09	07	09	40	80	100.0
203	Bare soil/litter	02	03	01	03	01	10	20	
204	Red fescue	01	03	02	01	03	10	20	31.3
204	Hard fescue	00	00	00	00	00	00	0	0.0
204	Bentgrass	03	05	04	06	04	22	44	68.8
204	Orchardgrass	00	00	00	00	00	00	0	0.0
204	White clover	00	00	00	00	00	00	0	0.0

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
204	False dandelion	00	00	00	00	00	00	0	0.0
204	Red alder	00	00	00	00	00	00	0	0.0
204	E. Blackberry	00	00	00	00	00	00	0	0.0
204	Total vegetation	04	08	06	07	07	32	64	100.0
204	Bare soil/litter	06	02	04	03	03	16	32	
205	Red fescue	00	00	01	00	01	02	4	9.5
205	Hard fescue	00	00	00	00	00	00	0	0.0
205	Bentgrass	04	02	02	03	04	15	30	71.5
205	Orchardgrass	00	01	00	00	01	02	4	9.5
205	White clover	00	00	00	00	00	00	0	0.0
205	False dandelion	00	00	00	00	00	00	0	0.0
205	Red alder	00	00	00	00	00	00	0	0.0
205	E. Blackberry	01	00	01	00	00	02	4	9.5
205	Total vegetation	05	03	04	03	06	21	42	100.0
205	Bare soil/litter	05	07	06	07	04	29	58	
206	Red fescue	00	00	01	01	01	03	6	6.4
206	Hard fescue	00	01	00	00	00	01	2	2.1
206	Bentgrass	10	08	07	08	09	42	84	89.4
206	Orchardgrass	00	00	01	00	00	01	2	2.1
206	White clover	00	00	00	00	00	00	0	0.0
206	False dandelion	00	00	00	00	00	00	0	0.0
206	Red alder	00	00	00	00	00	00	0	0.0
206	E. Blackberry	00	00	00	00	00	00	0	0.0
206	Total vegetation	10	09	09	09	10	47	94	100.0
206	Bare soil/litter	00	01	01	01	00	03	6	
207	Red fescue	04	03	05	04	02	18	36	37.5
207	Hard fescue	00	00	00	00	00	00	0	0.0
207	Bentgrass	05	06	05	06	07	29	58	60.4
207	Orchardgrass	00	00	00	00	00	00	0	0.0
207	White clover	00	00	00	00	00	00	0	0.0

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
207	False dandelion	00	00	00	00	00	00	0	0.0
207	Red alder	00	00	00	00	00	00	0	0.0
207	E. Blackberry	00	01	00	00	00	01	2	2.1
207	Total vegetation	09	10	10	10	09	48	96	100.0
207	Bare soil/litter	01	00	00	00	01	02	4	
208	Red fescue	02	04	05	03	04	18	36	39.1
208	Hard fescue	00	00	00	00	00	00	0	0.0
208	Bentgrass	07	04	05	06	04	26	52	56.5
208	Orchardgrass	00	01	00	00	00	01	2	2.2
208	White clover	00	01	00	00	00	01	2	2.2
208	False dandelion	00	00	00	00	00	00	0	0.0
208	Red alder	00	00	00	00	00	00	0	0.0
208	E. Blackberry	00	00	00	00	00	00	0	0.0
208	Total vegetation	09	10	10	09	08	46	92	100.0
208	Bare soil/litter	01	00	00	01	02	04	8	
Block III									
301	Red fescue	00	00	01	01	01	03	6	8.8
301	Hard fescue	00	00	00	00	00	00	0	0.0
301	Bentgrass	04	06	06	03	05	24	48	70.5
301	Orchardgrass	00	01	00	00	00	01	2	2.9
301	White clover	00	00	00	02	00	02	4	6.0
301	False dandelion	01	00	00	00	01	02	4	6.0
301	Red alder	00	00	01	00	00	01	2	2.9
301	E. Blackberry	00	00	00	00	01	01	2	2.9
301	Total vegetation	05	07	08	06	08	34	68	100.0
301	Bare soil/litter	05	03	02	04	02	16	32	
302	Red fescue	02	02	04	00	00	08	16	23.5
302	Hard fescue	00	00	00	00	00	00	0	0.0
302	Bentgrass	05	04	04	06	07	26	52	76.5
302	Orchardgrass	00	00	00	00	00	00	0	0.0

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
302	White clover	00	00	00	00	00	00	0	0.0
302	False dandelion	00	00	00	00	00	00	0	0.0
302	Red alder	00	00	00	00	00	00	0	0.0
302	E. Blackberry	00	00	00	00	00	00	0	0.0
302	Total vegetation	07	06	08	06	07	34	68	100.0
302	Bare soil/litter	03	04	02	04	03	16	32	
303	Red fescue	01	00	00	01	00	02	4	5.3
303	Hard fescue	00	00	00	00	01	01	2	2.6
303	Bentgrass	07	08	06	06	08	35	70	92.1
303	Orchardgrass	00	00	00	00	00	00	0	0.0
303	White clover	00	00	00	00	00	00	0	0.0
303	False dandelion	00	00	00	00	00	00	0	0.0
303	Red alder	00	00	00	00	00	00	0	0.0
303	E. Blackberry	00	00	00	00	00	00	0	0.0
303	Total vegetation	08	08	06	07	09	38	76	100.0
303	Bare soil/litter	02	02	04	03	01	12	24	
304	Red fescue	00	00	00	01	02	03	6	8.1
304	Hard fescue	00	00	01	00	00	01	2	2.7
304	Bentgrass	06	05	07	06	05	29	58	78.4
304	Orchardgrass	00	00	00	00	00	00	0	0.0
304	White clover	02	00	00	00	00	02	4	5.4
304	False dandelion	00	01	00	00	00	01	2	2.7
304	Red alder	00	00	00	00	00	00	0	0.0
304	E. Blackberry	00	00	00	01	00	01	2	2.7
304	Total vegetation	08	06	08	08	07	37	74	100.0
304	Bare soil/litter	02	04	02	02	03	13	26	
305	Red fescue	04	03	02	03	02	14	28	40.0
305	Hard fescue	01	00	00	00	00	01	2	2.9
305	Bentgrass	03	03	05	02	04	17	34	48.5
305	Orchardgrass	00	00	00	00	00	00	0	0.0

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
305	White clover	00	00	00	00	01	01	2	2.9
305	False dandelion	00	00	00	00	00	00	0	0.0
305	Red alder	00	00	01	00	00	01	2	2.9
305	E. Blackberry	00	01	00	00	00	01	2	2.9
305	Total vegetation	08	07	08	05	07	35	70	100.0
305	Bare soil/litter	02	03	02	05	03	15	30	
306	Red fescue	02	02	01	02	04	11	22	26.2
306	Hard fescue	00	00	00	01	00	01	2	2.4
306	Bentgrass	06	05	06	07	05	29	58	69.0
306	Orchardgrass	00	00	00	00	00	00	0	0.0
306	White clover	00	01	00	00	00	01	2	2.4
306	False dandelion	00	00	00	00	00	00	0	0.0
306	Red alder	00	00	00	00	00	00	0	0.0
306	E. Blackberry	00	00	00	00	00	00	0	0.0
306	Total vegetation	08	08	07	10	09	42	84	100.0
306	Bare soil/litter	02	02	03	00	01	08	16	
307	Red fescue	06	05	04	04	02	21	42	63.6
307	Hard fescue	00	00	00	00	01	01	2	3.0
307	Bentgrass	00	00	02	01	02	05	10	15.2
307	Orchardgrass	00	00	01	00	01	02	4	6.1
307	White clover	00	00	00	01	00	01	2	3.0
307	False dandelion	00	02	00	00	00	02	4	6.1
307	Red alder	00	00	00	00	01	01	2	3.0
307	E. Blackberry	00	00	00	00	00	00	0	0.0
307	Total vegetation	07	07	07	07	07	33	66	100.0
307	Bare soil/litter	04	03	03	04	03	17	34	
308	Red fescue	02	01	04	02	03	12	24	50.0
308	Hard fescue	00	00	00	02	00	02	4	8.3
308	Bentgrass	01	02	01	02	00	06	12	25.0
308	Orchardgrass	00	00	00	00	01	01	2	4.2

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
308	White clover	01	00	00	00	00	01	2	4.2
308	False dandelion	00	00	00	01	01	02	4	8.3
308	Red alder	00	00	00	00	00	00	0	0.0
308	E. Blackberry	00	00	00	00	00	00	0	0.0
308	Total vegetation	04	03	05	07	05	24	48	100.0
308	Bare soil/litter	06	07	05	03	05	26	52	

[1] Five randomly selected line-point samplings were conducted in each experimental unit. A line-point transect was 5 meter long with a point dropped at 0.5 m intervals. Percent cover was calculated as the total number hits per species divided by the total number of hits. Percent composition was calculated as the number of hits per species divided by the total vegetation hits per experimental unit.

Table A2. Line-point sampling, percent cover, percent composition data from MCORFERT fertilization study on roadside grass and moss cover.

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
Block I									
101	Red fescue	01	00	01	00	00	02	4	4.4
101	P. ryegrass	00	00	00	00	00	00	0	0.0
101	Bentgrass	02	03	01	02	01	09	18	20.1
101	Moss	02	03	04	02	04	15	30	33.4
101	Scotch broom	03	03	02	01	02	11	22	24.4
101	False dandelion	02	01	00	03	02	08	16	17.7
101	Total vegetation	10	10	08	08	09	45	90	100.0
101	Bare soil/litter	00	00	02	02	01	05	10	
102	Red fescue	00	00	00	00	00	00	0	0.0
102	P. ryegrass	00	00	00	00	00	00	0	0.0
102	Bentgrass	01	01	00	00	00	02	4	4.3
102	Moss	05	03	05	06	05	24	48	51.1
102	Scotch broom	03	03	01	03	02	12	24	25.5
102	False dandelion	01	02	04	01	01	09	18	19.1
102	Total vegetation	10	09	10	10	08	47	94	100.0
102	Bare soil/litter	00	01	00	00	02	03	06	
103	Red fescue	00	00	01	00	00	01	2	2.2
103	P. ryegrass	00	00	00	00	00	00	0	0.0
103	Bentgrass	00	00	01	00	00	01	2	2.2
103	Moss	05	06	03	06	04	24	48	52.2
103	Scotch broom	01	02	05	04	04	16	32	34.8
103	False dandelion	02	01	00	00	01	04	8	8.6
103	Total vegetation	08	09	10	10	09	46	92	100.0
103	Bare soil/litter	02	01	00	00	01	04	8	
104	Red fescue	00	00	00	00	00	00	0	0.0
104	P. ryegrass	00	00	00	00	00	00	0	0.0
104	Bentgrass	00	00	00	00	00	00	0	0.0

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
104	Moss	04	06	06	04	05	25	50	53.2
104	Scotch broom	05	02	02	02	04	15	30	31.9
104	False dandeion	01	02	01	03	00	07	14	14.9
104	Total vegetation	10	10	09	09	09	47	94	100.0
104	Bare soil/litter	00	00	01	01	01	03	6	
105	Red fescue	00	01	00	00	00	01	2	2.6
105	P. ryegrass	00	00	00	00	00	00	0	0.0
105	Bentgrass	00	00	01	00	00	01	2	2.6
105	Moss	06	03	05	06	03	23	46	60.5
105	Scotch broom	02	01	03	01	01	08	16	21.1
105	False dandelion	00	02	01	02	00	05	10	13.2
105	Total vegetation	08	07	10	09	04	38	76	100.0
105	Bare soil/litter	02	03	00	01	06	12	64	
106	Red fescue	00	00	00	00	00	00	0	0.0
106	P. ryegrass	00	00	00	00	00	00	0	0.0
106	Bentgrass	00	00	00	00	01	01	2	2.9
106	Moss	04	03	05	03	06	21	42	60.0
106	Scotch broom	02	00	03	02	00	07	14	20.0
106	False dandelion	01	01	00	02	02	06	12	17.1
106	Total vegetation	07	04	08	07	09	35	70	100.0
106	Bare soil/litter	03	06	02	03	01	15	30	
107	Red fescue	01	00	00	01	00	02	4	6.1
107	P. ryegrass	00	00	00	00	00	00	0	0.0
107	Bentgrass	01	00	03	01	00	05	10	15.2
107	Moss	03	03	05	02	01	14	28	42.3
107	Scotch broom	01	00	00	01	03	05	10	15.2
107	False dandelion	01	01	00	02	03	07	14	21.2
107	Total vegetation	07	04	08	07	07	33	66	100.0
107	Bare soil/litter	03	06	02	03	03	17	34	
108	Red fescue	00	01	00	00	00	01	2	2.6

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
108	P. ryegrass	00	00	00	00	00	00	0	0.0
108	Bentgrass	00	02	02	00	03	07	14	18.4
108	Moss	02	03	03	05	05	18	36	47.4
108	Scotch broom	02	02	01	00	02	07	14	18.4
108	False dandelion	03	00	00	02	00	05	10	13.2
108	Total vegetation	07	08	06	07	10	38	76	100.0
108	Bare soil/litter	03	02	04	03	00	12	24	
Block II									
201	Red fescue	00	00	00	00	00	00	00	0.0
201	P. ryegrass	00	00	00	00	00	00	00	0.0
201	Bentgrass	00	00	02	00	00	02	4	5.0
201	Moss	05	02	03	06	02	18	36	45.0
201	Scotch broom	02	04	04	00	03	13	26	32.5
201	False dandelion	02	01	00	02	02	07	14	17.5
201	Total vegetation	09	07	09	08	07	40	80	100.0
201	Bare soil/litter	01	03	01	02	03	10	20	
202	Red fescue	00	01	00	00	00	01	2	2.9
202	P. ryegrass	00	00	00	00	00	00	0	0.0
202	Bentgrass	01	04	00	00	02	07	14	20.0
202	Moss	00	00	03	04	02	09	18	25.7
202	Scotch broom	02	03	00	01	01	07	14	20.0
202	False dandelion	03	00	05	02	01	11	22	31.4
202	Total vegetation	06	08	08	07	06	35	70	100.0
202	Bare soil/litter	04	02	02	03	04	15	30	
203	Red fescue	00	02	00	00	01	03	6	9.7
203	P. ryegrass	00	00	00	00	00	00	0	0.0
203	Bentgrass	00	00	01	00	00	01	2	3.2
203	Moss	02	02	01	03	02	10	20	32.2
203	Scotch broom	02	01	05	05	02	15	30	48.4
203	False dandelion	00	01	00	00	01	02	4	6.5

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
203	Total vegetation	04	06	07	08	06	31	62	100.0
203	Bare soil/litter	06	04	03	02	04	19	38	
204	Red fescue	02	00	00	01	00	03	6	8.6
204	P. ryegrass	00	00	00	00	00	00	0	0.0
204	Bentgrass	00	00	02	00	00	02	4	5.7
204	Moss	04	06	03	06	04	23	46	65.7
204	Scotch broom	02	00	01	00	00	03	6	8.6
204	False dandelion	00	01	01	00	02	04	8	11.4
204	Total vegetation	08	07	07	07	06	35	70	100.0
204	Bare soil/litter	02	03	03	03	04	15	30	
205	Red fescue	00	00	00	00	00	00	0	0.0
205	P. ryegrass	00	00	00	00	00	00	0	0.0
205	Bentgrass	00	00	00	00	00	00	0	0.0
205	Moss	04	02	05	03	04	18	36	60.0
205	Scotch broom	03	03	02	01	01	10	20	33.3
205	False dandelion	00	01	00	01	00	02	4	6.7
205	Total vegetation	07	06	07	05	05	30	60	100.0
205	Bare soil/litter	03	04	03	05	05	20	40	
206	Red fescue	02	00	02	01	00	05	10	13.9
206	P. ryegrass	00	00	00	00	00	00	0	0.0
206	Bentgrass	02	03	00	01	02	08	16	22.2
206	Moss	03	02	05	04	04	18	36	50.0
206	Scotch broom	01	00	00	00	00	01	2	2.8
206	False dandelion	00	01	00	02	01	04	8	11.1
206	Total vegetation	08	06	07	08	07	36	72	100.0
206	Bare soil/litter	02	04	03	02	03	14	28	
207	Red fescue	00	00	01	00	00	01	2	3.6
207	P. ryegrass	00	00	00	00	00	00	0	0.0
207	Bentgrass	01	00	02	00	01	04	8	14.3
207	Moss	02	04	01	06	03	16	32	57.1

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
207	Scotch broom	00	00	01	00	02	03	6	10.7
207	False dandelion	02	00	01	00	01	04	8	14.3
207	Total vegetation	05	04	06	06	07	28	56	100.0
207	Bare soil/litter	05	06	04	04	03	22	44	
208	Red fescue	00	00	00	00	00	00	0	0.0
208	P. ryegrass	00	00	00	00	00	00	0	0.0
208	Bentgrass	00	01	01	03	00	05	10	16.7
208	Moss	05	07	02	00	03	17	34	56.7
208	Scotch broom	01	00	02	01	00	04	8	13.3
208	False dandelion	00	00	01	01	02	04	8	13.3
208	Total vegetation	06	08	06	05	05	30	60	100.0
208	Bare soil/litter	04	02	04	05	05	20	40	
Block III									
301	Red fescue	00	00	00	00	00	00	0	0.0
301	P. ryegrass	00	00	00	00	00	00	0	0.0
301	Bentgrass	00	00	00	01	00	01	2	2.5
301	Moss	02	06	01	04	04	17	34	42.5
301	Scotch broom	04	03	05	01	03	16	32	40.0
301	False dandelion	02	00	01	01	02	06	12	15.0
301	Total vegetation	08	09	07	07	09	40	80	100.0
301	Bare soil/litter	02	01	03	03	01	10	20	
302	Red fescue	00	00	00	00	00	00	0	0.0
302	P. ryegrass	00	00	00	00	00	00	0	0.0
302	Bentgrass	00	00	00	02	00	02	4	5.6
302	Moss	03	05	02	04	03	17	34	47.2
302	Scotch broom	03	04	06	01	02	16	32	44.4
302	False dandelion	00	00	00	01	00	01	2	2.8
302	Total vegetation	06	09	08	08	05	36	72	100.0
302	Bare soil/litter	04	01	02	02	05	14	28	
303	Red fescue	00	00	02	00	00	02	4	4.8

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
303	P. ryegrass	00	00	00	00	00	00	00	0.0
303	Bentgrass	00	01	02	00	02	05	10	12.2
303	Moss	02	03	03	03	02	13	26	31.8
303	Scotch broom	06	03	01	05	04	19	38	46.3
303	False dandelion	01	00	01	00	00	02	4	4.9
303	Total vegetation	09	07	09	08	08	41	82	100.0
303	Bare soil/litter	01	03	01	02	02	09	14	
304	Red fescue	00	00	01	00	00	01	2	2.8
304	P. ryegrass	00	00	00	00	00	00	0	0.0
304	Bentgrass	00	00	00	00	01	01	2	2.8
304	Moss	04	06	00	07	02	19	38	52.7
304	Scotch broom	03	01	04	01	01	10	20	27.8
304	False dandelion	01	00	02	00	02	05	10	13.9
304	Total vegetation	08	07	07	08	06	36	72	100.0
304	Bare soil/litter	02	03	03	02	04	14	28	
305	Red fescue	00	01	00	00	00	01	2	2.8
305	P. ryegrass	00	00	00	00	00	00	0	0.0
305	Bentgrass	00	00	00	00	00	01	2	2.8
305	Moss	03	04	02	04	02	15	30	41.7
305	Scotch broom	02	02	06	02	05	16	32	44.4
305	False dandelion	01	00	00	02	00	03	6	8.3
305	Total vegetation	06	07	08	08	07	36	72	100.0
305	Bare soil/litter	04	03	02	02	03	14	28	
306	Red fescue	03	00	00	02	00	05	10	11.6
306	P. ryegrass	00	00	00	00	00	00	0	0.0
306	Bentgrass	01	00	03	01	00	05	10	11.6
306	Moss	04	03	04	03	02	16	32	37.2
306	Scotch broom	00	06	02	02	05	15	30	34.9
306	False dandelion	01	00	00	01	00	02	4	4.7
306	Total vegetation	09	09	09	09	07	43	86	100.0

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
306	Bare soil/litter	01	01	01	01	03	07	14	
307	Red fescue	00	00	00	00	00	00	0	0.0
307	P. ryegrass	00	00	00	00	00	00	0	0.0
307	Bentgrass	04	01	00	00	00	05	10	13.2
307	Moss	02	03	05	03	02	15	30	39.5
307	Scotch broom	02	04	03	05	03	17	34	44.7
307	False dandelion	01	00	00	00	00	01	2	2.6
307	Total vegetation	09	08	08	08	05	38	76	100.0
307	Bare soil/litter	01	02	02	02	05	12	24	
308	Red fescue	00	00	00	00	00	00	0	0.0
308	P. ryegrass	00	00	00	00	00	00	0	0.0
308	Bentgrass	00	00	00	02	01	03	8	9.1
308	Moss	03	00	03	02	02	10	20	30.3
308	Scotch broom	02	05	03	02	05	17	34	51.5
308	False dandelion	01	00	01	01	00	03	6	9.1
308	Total vegetation	06	05	07	07	08	33	70	100.0
308	Bare soil/litter	04	05	03	03	02	17	34	

Five randomly selected line-point samplings were conducted in each experimental unit. A line-point transect was 5 meter long with a point dropped at 0.5 m intervals. Percent cover was calculated as the total number hits per species divided by the total number of points. Percent composition was calculated as the number of hits per species divided by the total vegetation hits per experimental unit.

Table A3. Line-point sampling, percent cover, percent composition data from SCOTFERT fertilization study on roadside bentgrass cover.

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
Block I									
101	Red fescue	00	01	00	00	00	01	2	4.3
101	P. ryegrass	00	01	00	00	00	01	2	4.3
101	Bentgrass	05	03	05	02	04	19	38	82.6
101	Salal	00	00	00	00	00	00	0	0.0
101	Scotch broom	00	00	00	01	01	02	4	8.7
101	Red alder	00	00	00	00	00	00	0	0.0
101	E. Blackberry	00	00	00	00	00	00	0	0.0
101	Total vegetation	05	05	05	03	05	23	46	100.0
101	Bare soil/litter	05	05	05	07	05	27	54	
102	Red fescue	01	00	00	00	01	02	4	4.9
102	P. ryegrass	00	00	00	00	00	00	0	0.0
102	Bentgrass	06	08	09	06	09	38	76	92.7
102	Salal	00	00	00	00	00	00	0	0.0
102	Scotch broom	00	00	00	01	00	01	2	2.4
102	Red alder	00	00	00	00	00	00	0	0.0
102	E. Blackberry	00	00	00	00	00	00	0	0.0
102	Total vegetation	07	08	09	07	10	41	82	100.0
102	Bare soil/litter	03	02	01	03	00	09	18	
103	Red fescue	00	00	00	00	00	00	00	0.0
103	P. ryegrass	00	00	00	00	00	00	0	0.0
103	Bentgrass	06	05	03	01	02	17	34	85.0
103	Salal	00	00	00	00	00	00	00	0.0
103	Scotch broom	00	00	02	00	01	03	6	15.0
103	Red alder	00	00	00	00	00	00	0	0.0
103	E. Blackberry	00	00	00	00	00	00	0	0.0
103	Total vegetation	06	05	05	01	03	20	40	100.0
103	Bare soil/litter	04	05	05	09	07	30	60	

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
104	Red fescue	00	00	00	00	00	00	0	0.0
104	P. ryegrass	00	01	00	01	00	02	4	7.1
104	Bentgrass	06	04	05	06	03	24	48	85.7
104	Salal	01	00	00	00	00	01	2	3.6
104	Scotch broom	00	00	01	00	00	01	2	3.6
104	Red alder	00	00	00	00	00	00	0	0.0
104	E. Blackberry	00	00	00	00	00	00	0	0.0
104	Total vegetation	07	05	06	07	03	28	56	100.0
104	Bare soil/litter	03	05	04	03	07	22	44	
105	Red fescue	00	00	00	00	00	00	0	0.0
105	P. ryegrass	00	00	00	00	00	00	0	0.0
105	Bentgrass	06	02	02	04	03	17	34	94.4
105	Salal	00	00	00	00	00	00	0	0.0
105	Scotch broom	00	01	00	00	00	01	2	5.6
105	Red alder	00	00	00	00	00	00	0	0.0
105	E. Blackberry	00	00	00	00	00	00	0	0.0
105	Total vegetation	06	03	02	04	03	18	36	100.0
105	Bare soil/litter	04	07	08	06	07	32	64	
106	Red fescue	00	00	01	00	00	01	2	2.8
106	P. ryegrass	00	01	00	00	00	01	2	2.8
106	Bentgrass	07	05	06	08	08	34	68	94.4
106	Salal	00	00	00	00	00	00	0	0.0
106	Scotch broom	00	00	00	00	00	00	0	0.0
106	Red alder	00	00	00	00	00	00	0	0.0
106	E. Blackberry	00	00	00	00	00	00	0	0.0
106	Total vegetation	07	06	07	08	08	36	72	100.0
106	Bare soil/litter	03	04	03	02	02	14	28	
107	Red fescue	00	02	00	01	00	03	6	10.4
107	P. ryegrass	00	00	01	01	00	02	4	6.9
107	Bentgrass	04	06	02	05	05	22	44	75.9

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
107	Salal	00	00	00	00	00	00	0	0.0
107	Scotch broom	00	00	00	01	00	01	2	3.4
107	Red alder	00	00	00	00	00	00	0	0.0
107	E. Blackberry	00	00	00	00	01	01	2	3.4
107	Total vegetation	04	08	03	08	06	29	58	100.0
107	Bare soil/litter	06	02	07	02	04	21	42	
108	Red fescue	00	00	00	00	00	00	0	0.0
108	P. ryegrass	00	00	00	00	00	00	0	0.0
108	Bentgrass	02	03	06	03	04	18	36	90.0
108	Salal	00	00	00	00	00	00	0	0.0
108	Scotch broom	00	00	00	00	00	00	0	0.0
108	Red alder	00	00	02	00	00	02	4	10.0
108	E. Blackberry	00	00	00	00	00	00	0	0.0
108	Total vegetation	02	03	08	03	04	20	40	100.0
108	Bare soil/litter	08	07	02	07	06	30	60	
Block II									
201	Red fescue	00	00	00	00	00	00	00	0.0
201	P. ryegrass	02	00	01	00	02	05	10	13.9
201	Bentgrass	06	07	06	07	05	31	62	86.1
201	Salal	00	00	00	00	00	00	0	0.0
201	Scotch broom	00	00	00	00	00	00	0	0.0
201	Red alder	00	00	00	00	00	00	0	0.0
201	E. Blackberry	00	00	00	00	00	00	0	0.0
201	Total vegetation	08	07	07	07	07	36	72	100.0
201	Bare soil/litter	02	03	03	03	03	14	28	
202	Red fescue	00	00	00	00	00	00	0	0.0
202	P. ryegrass	00	00	00	01	00	01	2	4.0
202	Bentgrass	05	04	06	06	03	24	48	96.0
202	Salal	00	00	00	00	00	00	0	0.0
202	Scotch broom	00	00	00	00	00	00	0	0.0

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
202	Red alder	00	00	00	00	00	00	0	0.0
202	E. Blackberrry	00	00	00	00	00	00	0	0.0
202	Total vegetation	05	04	06	07	03	25	50	100.0
202	Bare soil/litter	05	06	04	03	07	25	50	
203	Red fescue	02	00	02	00	00	04	8	14.3
203	P. ryegrass	00	00	01	00	01	02	4	7.1
203	Bentgrass	04	05	03	04	04	20	40	71.5
203	Salal	00	00	00	00	00	00	0	0.0
203	Scotch broom	00	01	00	01	00	02	4	7.1
203	Red alder	00	00	00	00	00	00	0	0.0
203	E. Blackberry	00	00	00	00	00	00	0	0.0
203	Total vegetation	06	06	06	05	05	28	56	100.0
203	Bare soil/litter	04	04	04	05	05	22	44	
204	Red fescue	00	00	00	00	00	00	0	0.0
204	P. ryegrass	01	00	00	01	00	02	4	5.7
204	Bentgrass	06	07	07	05	06	31	62	88.5
204	Salal	00	00	00	00	00	00	0	0.0
204	Scotch broom	01	00	00	00	00	01	2	2.9
204	Red alder	00	00	00	01	00	01	2	2.9
204	E. Blackberry	00	00	00	00	00	00	0	0.0
204	Total vegetation	08	07	07	07	06	35	70	100.0
204	Bare soil/litter	02	03	03	03	04	15	30	
205	Red fescue	00	00	00	00	00	00	0	0.0
205	P. ryegrass	00	00	00	00	00	00	0	0.0
205	Bentgrass	03	02	04	05	02	16	32	84.2
205	Salal	00	00	00	00	00	00	0	0.0
205	Scotch broom	00	00	01	00	02	03	6	15.8
205	Red alder	00	00	00	00	00	00	0	0.0
205	E. Blackberry	00	00	00	00	00	00	0	0.0
205	Total vegetation	03	02	05	05	04	19	38	100.0

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
205	Bare soil/litter	07	08	05	05	06	31	62	
206	Red fescue	00	00	00	00	00	00	0	0.0
206	P. ryegrass	00	00	00	00	00	00	0	0.0
206	Bentgrass	04	03	04	06	07	24	48	96.0
206	Salal	00	00	00	00	00	00	0	0.0
206	Scotch broom	01	00	00	00	00	01	2	4.0
206	Red alder	00	00	00	00	00	00	0	0.0
206	E. Blackberry	00	00	00	00	00	00	0	0.0
206	Total vegetation	05	03	04	06	07	25	50	100.0
206	Bare soil/litter	05	07	06	04	03	25	50	
207	Red fescue	00	00	00	00	00	00	0	0.0
207	P. ryegrass	00	01	00	00	00	01	2	3.0
207	Bentgrass	08	06	05	06	04	29	58	90.6
207	Salal	00	00	00	00	00	00	0	0.0
207	Scotch broom	00	00	01	00	02	03	6	9.4
207	Red alder	00	00	00	00	00	00	0	0.0
207	E. Blackberry	00	00	00	00	00	00	0	0.0
207	Total vegetation	08	06	06	06	06	32	64	100.0
207	Bare soil/litter	02	04	04	04	04	18	36	
208	Red fescue	00	02	00	01	00	03	06	10.0
208	P. ryegrass	01	00	01	00	00	02	4	6.7
208	Bentgrass	05	05	05	04	05	24	48	80.0
208	Salal	00	00	00	00	00	00	0	0.0
208	Scotch broom	00	00	00	00	00	00	0	0.0
208	Red alder	00	01	00	00	00	01	2	3.3
208	E. Blackberry	00	00	00	00	00	00	0	0.0
208	Total vegetation	06	08	06	05	05	30	60	100.0
208	Bare soil/litter	04	02	04	05	05	20	40	
Block III									
301	Red fescue	01	00	00	00	00	01	2	4.2

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
301	P. ryegrass	00	00	01	00	00	01	2	4.2
301	Bentgrass	06	05	04	03	03	21	42	87.4
301	Salal	00	00	00	00	00	00	0	0.0
301	Scotch broom	00	00	00	00	01	01	2	4.2
301	Red alder	00	00	00	00	00	00	0	0.0
301	E. Blackberry	00	00	00	00	00	00	0	0.0
301	Total vegetation	07	05	05	03	04	24	48	100.0
301	Bare soil/litter	03	05	05	07	06	26	52	
302	Red fescue	00	00	00	00	00	00	0	0.0
302	P. ryegrass	00	00	02	00	00	02	4	6.9
302	Bentgrass	07	07	03	04	02	23	46	79.3
302	Salal	00	00	00	00	00	00	0	0.0
302	Scotch broom	00	00	01	01	02	04	8	13.8
302	Red alder	00	00	00	00	00	00	0	0.0
302	E. Blackberry	00	00	00	00	00	00	0	0.0
302	Total vegetation	07	07	06	05	04	29	58	100.0
302	Bare soil/litter	03	03	04	05	06	21	42	
303	Red fescue	00	00	01	00	00	01	2	5.9
303	P. ryegrass	00	00	00	00	00	00	00	0.0
303	Bentgrass	04	03	02	03	02	14	28	82.3
303	Salal	00	00	00	00	00	00	0	0.0
303	Scotch broom	00	00	00	01	01	02	4	11.8
303	Red alder	00	00	00	00	00	00	0	0.0
303	E. Blackberry	00	00	00	00	00	00	0	0.0
303	Total vegetation	04	03	03	04	03	17	34	100.0
303	Bare soil/litter	06	07	07	06	07	33	66	
304	Red fescue	00	00	01	00	00	01	2	3.0
304	P. ryegrass	00	00	00	01	00	01	2	3.0
304	Bentgrass	08	07	05	06	03	29	58	88.0
304	Salal	00	00	00	00	00	00	0	0.0

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
304	Scotch broom	00	00	00	01	00	01	2	3.0
304	Red alder	00	00	01	00	00	01	2	3.0
304	E. Blackberry	00	00	00	00	00	00	0	0.0
304	Total vegetation	08	07	07	08	03	33	66	100.0
304	Bare soil/litter	02	03	03	02	07	17	34	
305	Red fescue	00	00	00	00	00	00	0	0.0
305	P. ryegrass	00	01	00	00	00	01	2	3.4
305	Bentgrass	08	06	06	05	02	27	54	93.2
305	Salal	00	00	00	00	00	00	0	0.0
305	Scotch broom	00	00	00	01	00	01	2	3.4
305	Red alder	00	00	00	00	00	00	0	0.0
305	E. Blackberry	00	00	00	00	00	00	00	0.0
305	Total vegetation	08	07	06	06	02	29	58	100.0
305	Bare soil/litter	02	03	04	04	08	21	42	
306	Red fescue	00	00	00	00	00	00	0	0.0
306	P. ryegrass	00	01	00	00	00	01	2	5.9
306	Bentgrass	04	05	03	02	02	16	32	94.1
306	Salal	00	00	00	00	00	00	0	0.0
306	Scotch broom	00	00	00	00	00	00	0	0.0
306	Red alder	00	00	00	00	00	00	0	0.0
306	E. Blackberry	00	00	00	00	00	00	0	0.0
306	Total vegetation	04	06	03	02	02	17	34	100.0
306	Bare soil/litter	06	04	07	08	08	33	66	
307	Red fescue	01	00	00	00	00	01	2	2.9
307	P. ryegrass	00	01	00	00	01	02	4	5.7
307	Bentgrass	09	08	06	04	05	32	64	91.4
307	Salal	00	00	00	00	00	00	0	0.0
307	Scotch broom	00	00	00	00	00	00	0	0.0
307	Red alder	00	00	00	00	00	00	0	0.0
307	E. Blackberry	00	00	00	00	00	00	0	0.0

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
307	Total vegetation	10	09	06	04	06	35	70	100.0
307	Bare soil/litter	00	01	04	06	04	15	30	
308	Red fescue	00	00	01	01	00	02	4	4.7
308	P. ryegrass	01	00	00	02	00	03	6	6.9
308	Bentgrass	08	06	09	07	05	35	70	81.4
308	Salal	00	00	00	00	00	00	0	0.0
308	Scotch broom	00	00	00	00	01	01	2	2.3
308	Red alder	00	00	00	00	00	00	0	0.0
308	E. Blackberry	00	02	00	00	00	02	4	4.7
308	Total vegetation	09	08	10	10	06	43	86	100.0
308	Bare soil/litter	01	02	00	00	04	07	14	

Five randomly selected line-point samplings were conducted in each experimental unit. A line-point transect was 5 meter long with a point dropped at 0.5 m intervals. Percent cover was calculated as the total number hits per species divided by the total number of points. Percent composition was calculated as the number of hits per species divided by the total vegetation hits per experimental unit.

Table A4. Line-point sampling, percent cover, percent composition data from WESTFERT fertilization study on cutover salal and blackberry cover.

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
Block I									
101	Red fescue	00	01	00	00	00	01	2	2.9
101	P. ryegrass	02	01	02	02	02	09	18	26.5
101	Bentgrass	00	00	00	00	00	0	0	0.0
101	Reed canarygrass	00	00	00	00	00	00	0	0.0
101	Salal	01	01	00	00	01	03	6	8.8
101	Bracken fern	00	00	00	00	00	00	0	0.0
101	Sword fern	00	00	00	00	00	00	0	0.0
101	Red alder	00	00	00	00	00	00	0	0.0
101	Thimbleberry	00	00	00	00	00	00	0	0.0
101	H. Blackberry	00	00	00	00	00	00	0	0.0
101	E. Blackberry	05	03	06	02	05	21	42	61.8
101	Total vegetation	08	06	08	04	08	34	68	100.0
101	Bare soil/litter	02	04	02	06	02	16	32	
102	Red fescue	01	00	01	00	01	03	6	6.8
102	P. ryegrass	01	03	02	01	00	07	14	15.9
102	Bentgrass	00	00	00	00	00	00	0	0.0
102	Reed canarygrass	00	00	00	00	00	00	0	0.0
102	Salal	00	00	02	01	00	03	6	6.8
102	Bracken fern	00	00	00	00	02	02	4	4.5
102	Sword fern	00	00	00	00	00	00	0	0.0
102	Red alder	00	00	00	00	00	00	0	0.0
102	Thimbleberry	00	00	00	00	00	00	0	0.0
102	H. Blackberry	00	00	00	00	00	00	0	0.0
102	E. Blackberry	05	07	04	06	07	29	58	66.0
102	Total vegetation	07	10	09	08	10	44	88	100.0
102	Bare soil/litter	03	00	01	02	00	06	12	
103	Red fescue	01	03	02	02	00	08	16	16.7

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
103	P. ryegrass	02	01	01	01	02	07	14	14.6
103	Bentgrass	00	00	00	00	00	0	0	0.0
103	Reed canarygrass	00	00	00	00	00	00	0	0.0
103	Salal	02	03	04	00	03	12	24	25.0
103	Bracken fern	00	00	00	02	00	02	4	4.1
103	Sword fern	00	00	00	00	00	00	0	0.0
103	Red alder	00	00	00	00	00	00	0	0.0
103	Thimbleberry	00	00	00	00	00	00	0	0.0
103	H. Blackberry	00	00	00	00	00	00	0	0.0
103	E. Blackberry	04	03	03	05	04	19	38	39.6
103	Total vegetation	09	10	10	10	09	48	96	100.0
103	Bare soil/litter	01	00	00	00	01	02	4	
104	Red fescue	02	00	04	00	04	10	20	22.2
104	P. ryegrass	00	00	00	00	00	00	0	0.0
104	Bentgrass	00	00	00	00	00	00	0	0.0
104	Reed canarygrass	00	00	00	00	00	00	0	0.0
104	Salal	01	04	01	03	04	13	26	28.9
104	Bracken fern	00	00	00	00	00	00	0	0.0
104	Sword fern	00	00	00	00	00	00	0	0.0
104	Red alder	00	00	00	00	00	00	0	0.0
104	Thimbleberry	00	00	00	00	00	00	0	0.0
104	H. Blackberry	00	00	00	00	00	00	0	0.0
104	E. Blackberry	06	05	03	07	01	22	44	48.9
104	Total vegetation	09	09	08	10	09	45	90	100.0
104	Bare soil/litter	01	01	02	00	01	05	10	
105	Red fescue	00	00	00	00	00	00	0	0.0
105	P. ryegrass	00	00	00	00	00	00	0	0.0
105	Bentgrass	00	00	00	00	00	00	00	0.0
105	Reed canarygrass	00	00	00	00	00	00	0	0.0

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
105	Salal	01	00	03	01	02	07	14	17.0
105	Bracken fern	00	00	00	00	00	00	0	0.0
105	Sword fern	00	00	00	00	00	00	0	0.0
105	Red alder	00	00	00	00	00	00	0	0.0
105	Thimbleberry	02	07	05	00	00	14	28	34.2
105	H. Blackberry	01	00	00	00	00	01	2	2.4
105	E. Blackberry	04	02	02	06	05	19	38	46.4
105	Total vegetation	08	09	10	07	07	41	82	100.0
105	Bare soil/litter	02	01	00	03	03	09	18	
106	Red fescue	00	00	00	00	00	00	0	0.0
106	P. ryegrass	00	01	02	00	00	03	6	7.9
106	Bentgrass	00	00	00	00	00	00	0	0.0
106	Reed canarygrass	00	00	00	00	00	00	00	0.0
106	Salal	03	00	00	03	04	10	20	26.3
106	Bracken fern	01	00	03	01	00	05	10	13.2
106	Sword fern	00	00	00	00	00	00	0	0.0
106	Red alder	00	00	00	00	00	00	0	0.0
106	Thimbleberry	00	00	00	00	00	00	0	0.0
106	H. Blackberry	00	00	00	00	00	00	0	0.0
106	E. Blackberry	05	07	04	04	00	20	40	52.6
106	Total vegetation	09	08	09	08	04	38	76	100.0
106	Bare soil/litter	01	02	01	02	06	12	24	
107	Red fescue	00	00	00	00	00	00	0	0.0
107	P. ryegrass	00	00	00	00	00	00	0	0.0
107	Bentgrass	00	00	00	00	00	00	0	0.0
107	Reed canarygrass	00	00	00	00	00	00	0	0.0
107	Salal	00	00	03	00	00	03	6	6.6
107	Bracken fern	00	00	00	01	00	01	2	2.2
107	Sword fern	00	00	00	00	00	00	00	0.0
107	Red alder	00	00	00	00	00	00	0	0.0

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
107	Thimbleberry	00	00	00	00	00	00	0	0.0
107	H. Blackberry	02	03	00	00	00	05	10	11.2
107	E. Blackberry	07	05	07	08	09	36	76	80.0
107	Total vegetation	09	08	10	09	09	45	12	100.0
107	Bare soil/litter	05	05	03	04	05	22	44	
108	Red fescue	00	00	00	00	00	00	00	0.0
108	P. ryegrass	01	00	03	02	01	07	14	15.9
108	Bentgrass	00	00	00	00	00	00	00	0.0
108	Reed canarygrass	00	00	00	00	00	00	0	0.0
108	Salal	05	00	03	04	02	14	28	31.8
108	Bracken fern	00	00	00	00	00	00	0	0.0
108	Sword fern	00	00	00	00	00	00	0	0.0
108	Red alder	00	00	00	00	00	00	0	0.0
108	Thimbleberry	00	04	00	00	00	04	8	9.1
108	H. Blackberry	02	00	00	01	01	04	8	9.1
108	E. Blackberry	00	05	02	02	06	15	30	34.1
108	Total vegetation	08	09	08	09	10	44	88	100.0
108	Bare soil/litter	01	01	00	01	01	04	8	
Block II									
201	Red fescue	00	00	00	00	00	00	00	0.0
201	P. ryegrass	00	00	02	00	00	02	4	4.3
201	Bentgrass	00	00	00	00	00	00	00	0.0
201	Reed canarygrass	00	00	00	00	00	00	0	0.0
201	Salal	01	00	01	03	00	05	10	10.9
201	Bracken fern	00	00	00	00	00	00	0	0.0
201	Sword fern	00	00	00	00	00	00	0	0.0
201	Red alder	00	00	00	00	00	00	0	0.0
201	Thimbleberry	00	00	00	01	02	03	6	6.5
201	H. Blackberry	00	00	00	00	00	00	0	0.0
201	E. Blackberry	08	07	07	06	08	36	72	78.3

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
201	Total vegetation	09	07	10	10	10	46	92	100.0
201	Bare soil/litter	01	03	00	00	00	04	8	
202	Red fescue	00	00	01	00	00	01	2	2.9
202	P. ryegrass	03	00	00	00	00	03	6	8.3
202	Bentgrass	00	00	00	00	00	00	0	0.0
202	Reed canarygrass	00	00	00	00	00	00	0	0.0
202	Salal	01	00	00	02	00	03	6	8.3
202	Bracken fern	00	00	00	00	00	00	0	0.0
202	Sword fern	00	00	00	00	00	00	0	0.0
202	Red alder	00	00	00	00	00	00	0	0.0
202	Thimbleberry	00	00	00	00	00	00	0	0.0
202	H. Blackberry	00	00	00	00	00	00	0	0.0
202	E. Blackberrry	04	07	08	04	06	29	58	80.5
202	Total vegetation	08	07	09	06	06	36	72	100.0
202	Bare soil/litter	02	03	01	04	04	14	28	
203	Red fescue	00	00	00	00	00	00	0	0.0
203	P. ryegrass	00	00	03	00	00	03	6	6.3
203	Bentgrass	00	00	00	00	00	00	00	0.0
203	Reed canarygrass	00	00	00	00	00	00	0	0.0
203	Salal	04	02	02	06	01	15	30	31.3
203	Bracken fern	00	00	00	00	00	00	0	0.0
203	Sword fern	00	00	00	00	00	00	0	0.0
203	Red alder	00	00	00	00	00	00	0	0.0
203	Thimbleberry	03	00	03	00	01	07	14	14.5
203	H. Blackberry	00	00	00	00	00	00	0	0.0
203	E. Blackberry	02	07	02	04	08	23	46	47.9
203	Total vegetation	09	09	10	10	10	48	96	100.0
203	Bare soil/litter	01	01	00	00	00	02	4	
204	Red fescue	00	00	00	01	00	01	2	2.1
204	P. ryegrass	02	00	05	01	02	10	20	20.8

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
204	Bentgrass	00	00	00	00	00	00	0	0.0
204	Reed canarygrass	00	00	00	00	00	00	0	0.0
204	Salal	00	03	01	06	05	15	30	31.3
204	Bracken fern	00	00	00	00	00	00	0	0.0
204	Sword fern	00	00	00	00	00	00	0	0.0
204	Red alder	00	00	00	00	00	00	0	0.0
204	Thimbleberry	00	04	00	00	00	04	8	8.3
204	H. Blackberry	00	00	00	00	00	00	0	0.0
204	E. Blackberry	08	02	03	02	03	18	36	37.5
204	Total vegetation	10	09	09	10	10	48	96	100.0
204	Bare soil/litter	00	01	01	00	00	02	4	
205	Red fescue	01	00	01	00	01	03	6	6.4
205	P. ryegrass	02	02	00	06	01	11	22	23.4
205	Bentgrass	00	00	00	00	00	00	00	0.0
205	Reed canarygrass	00	00	00	00	00	00	0	0.0
205	Salal	02	00	00	00	00	02	4	4.3
205	Bracken fern	00	00	00	00	00	00	0	0.0
205	Sword fern	00	00	00	00	01	01	2	2.1
205	Red alder	00	00	00	00	00	00	0	0.0
205	Thimbleberry	00	00	00	00	00	00	0	0.0
205	H. Blackberry	00	00	00	00	00	00	0	0.0
205	E. Blackberry	04	07	08	04	07	30	60	63.8
205	Total vegetation	09	09	09	10	10	47	94	100.0
205	Bare soil/litter	01	01	01	00	00	03	6	
206	Red fescue	00	00	00	00	00	00	0	0.0
206	P. ryegrass	00	01	00	00	00	01	2	2.5
206	Bentgrass	00	00	00	00	00	00	0	0.0
206	Reed canarygrass	00	00	00	00	00	00	0	0.0
206	Salal	00	00	00	03	00	03	6	7.5
206	Bracken fern	05	02	00	00	03	10	20	25.0

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
206	Sword fern	00	00	00	00	00	00	0	0.0
206	Red alder	00	00	00	00	00	00	0	0.0
206	Thimbleberry	00	00	00	00	00	00	0	0.0
206	H. Blackberry	00	00	00	00	00	00	0	0.0
206	E. Blackberry	03	06	08	07	02	26	52	65.0
206	Total vegetation	08	09	08	10	05	40	80	100.0
206	Bare soil/litter	02	01	02	00	05	10	20	
207	Red fescue	00	00	00	00	00	00	0	0.0
207	P. ryegrass	00	03	00	04	02	09	18	18.8
207	Bentgrass	00	00	00	00	00	00	0	0.0
207	Reed canarygrass	00	00	00	00	00	00	0	0.0
207	Salal	00	00	00	00	00	00	0	0.0
207	Bracken fern	00	00	00	00	00	00	0	0.0
207	Sword fern	00	00	00	00	00	00	0	0.0
207	Red alder	00	00	00	00	00	00	0	0.0
207	Thimbleberry	00	00	00	00	00	00	0	0.0
207	H. Blackberry	00	00	00	00	00	00	0	0.0
207	E. Blackberry	10	06	09	06	08	39	78	81.2
207	Total vegetation	10	09	09	10	10	48	96	100.0
207	Bare soil/litter	00	01	01	00	00	02	4	
208	Red fescue	00	00	00	00	00	00	00	0.0
208	P. ryegrass	00	00	00	00	00	00	0	0.0
208	Bentgrass	00	00	00	00	01	01	2	2.1
208	Reed canarygrass	00	00	00	00	00	00	0	0.0
208	Salal	00	00	00	00	00	00	0	0.0
208	Bracken fern	00	00	01	00	00	01	2	2.1
208	Sword fern	00	00	00	00	00	00	0	0.0
208	Red alder	00	00	00	00	00	00	0	0.0
208	Thimbleberry	00	00	00	00	00	00	0	0.0
208	H. Blackberry	00	00	00	00	00	00	0	0.0

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
208	E. Blackberry	09	10	09	10	08	46	92	95.8
208	Total vegetation	09	10	10	10	09	48	96	100.0
208	Bare soil/litter	01	00	00	00	01	02	4	
Block III									
301	Red fescue	00	00	00	00	00	00	0	0.0
301	P. ryegrass	00	00	00	00	00	00	0	0.0
301	Bentgrass	00	00	00	00	00	00	0	0.0
301	Reed canarygrass	00	00	00	00	00	00	0	0.0
301	Salal	00	00	00	00	00	00	0	0.0
301	Bracken fern	00	00	00	00	00	00	0	0.0
301	Sword fern	00	00	00	01	00	01	2	2.0
301	Red alder	00	00	00	00	00	00	0	0.0
301	Thimbleberry	00	00	00	00	00	00	0	0.0
301	H. Blackberry	00	00	00	00	00	00	0	0.0
301	E. Blackberry	10	10	10	09	10	49	98	98.0
301	Total vegetation	10	10	10	10	10	50	100	100.0
301	Bare soil/litter	00	00	00	00	00	00	0	
302	Red fescue	00	00	00	00	00	00	0	0.0
302	P. ryegrass	00	01	00	00	00	01	2	2.2
302	Bentgrass	00	00	00	00	00	00	0	0.0
302	Reed canarygrass	00	00	00	00	00	00	0	0.0
302	Salal	00	00	00	00	00	00	0	0.0
302	Bracken fern	00	00	00	02	00	02	4	4.3
302	Sword fern	00	00	00	00	00	00	0	0.0
302	Red alder	00	00	00	00	00	00	0	0.0
302	Thimbleberry	00	00	00	00	00	00	0	0.0
302	H. Blackberry	00	00	00	00	00	00	0	0.0
302	E. Blackberry	09	08	09	07	10	43	86	93.5
302	Total vegetation	09	09	09	09	10	46	92	100.0
302	Bare soil/litter	01	01	01	01	00	04	8	

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
303	Red fescue	01	00	00	01	00	02	4	4.1
303	P. ryegrass	01	00	06	00	03	10	20	20.4
303	Bentgrass	00	00	00	00	00	00	00	0.0
303	Reed canarygrass	00	00	00	00	00	00	0	0.0
303	Salal	02	02	00	00	03	07	14	14.3
303	Bracken fern	00	00	00	00	00	00	0	0.0
303	Sword fern	00	00	00	00	00	00	0	0.0
303	Red alder	00	01	00	00	00	01	2	2.1
303	Thimbleberry	00	00	00	00	00	00	0	0.0
303	H. Blackberry	00	00	00	00	00	00	0	0.0
303	E. Blackberry	06	07	04	08	04	29	58	59.1
303	Total vegetation	10	10	10	09	10	49	98	100.0
303	Bare soil/litter	00	00	00	01	00	01	2	
304	Red fescue	00	00	00	01	00	01	2	2.0
304	P. ryegrass	02	00	03	04	00	09	18	18.0
304	Bentgrass	00	00	00	00	00	00	0	0.0
304	Reed canarygrass	00	00	00	00	00	00	0	0.0
304	Salal	00	00	00	00	00	00	0	0.0
304	Bracken fern	00	00	00	00	00	00	0	0.0
304	Sword fern	00	00	00	00	00	00	0	0.0
304	Red alder	00	00	00	00	00	00	0	0.0
304	Thimbleberry	00	00	00	00	00	00	0	0.0
304	H. Blackberry	00	00	00	00	00	00	0	0.0
304	E. Blackberry	08	10	07	05	10	40	80	80.0
304	Total vegetation	10	10	10	10	10	50	100	100.0
304	Bare soil/litter	00	00	00	00	00	00	0	
305	Red fescue	00	00	00	00	02	02	4	4.0
305	P. ryegrass	05	01	06	00	03	15	30	30.0
305	Bentgrass	00	00	00	00	00	00	0	0.0
305	Reed canarygrass	00	00	00	00	00	00	0	0.0

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	*Percent Composition
		1	2	3	4	5			
305	Salal	00	00	00	00	00	00	0	0.0
305	Bracken fern	00	00	00	00	00	00	0	0.0
305	Sword fern	00	00	00	00	00	00	0	0.0
305	Red alder	00	00	00	00	00	00	0	0.0
305	Thimbleberry	00	00	00	00	00	00	0	0.0
305	H. Blackberry	00	00	00	00	00	00	0	0.0
305	E. Blackberry	05	09	04	10	05	33	66	66.0
305	Total vegetation	10	10	10	10	10	50	100	100.0
305	Bare soil/litter	00	00	00	00	00	00	0	
306	Red fescue	00	00	00	00	00	00	0	0.0
306	P. ryegrass	00	01	00	03	00	04	8	8.2
306	Bentgrass	00	00	00	00	00	00	0	0.0
306	Reed canarygrass	00	00	00	00	00	00	0	0.0
306	Salal	00	00	00	00	00	00	0	0.0
306	Bracken fern	00	00	00	00	00	00	0	0.0
306	Sword fern	00	00	00	00	00	00	0	0.0
306	Red alder	00	00	00	00	00	00	0	0.0
306	Thimbleberry	06	02	02	07	00	17	34	34.7
306	H. Blackberry	00	00	00	00	00	00	0	0.0
306	E. Blackberry	04	07	08	00	09	28	56	57.1
306	Total vegetation	10	10	10	10	09	49	98	100.0
306	Bare soil/litter	00	00	00	00	01	01	2	
307	Red fescue	00	00	00	00	00	00	0	0.0
307	P. ryegrass	00	00	00	00	01	01	2	2.0
307	Bentgrass	00	00	00	00	00	00	0	0.0
307	Reed canarygrass	00	00	00	00	00	00	0	0.0
307	Salal	03	00	02	03	00	08	16	16.0
307	Bracken fern	00	00	00	00	00	00	0	0.0
307	Sword fern	00	00	00	00	00	00	0	0.0
307	Red alder	00	00	00	00	00	00	0	0.0

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
307	Thimbleberry	00	03	00	00	02	05	10	10.0
307	H. Blackberry	00	00	00	00	00	00	0	0.0
307	E. Blackberry	07	07	08	07	07	36	72	72.0
307	Total vegetation	10	10	10	10	10	50	100	100.0
307	Bare soil/litter	00	00	00	00	00	00	0	
308	Red fescue	00	00	00	01	00	01	2	2.1
308	P. ryegrass	00	00	00	02	00	02	4	4.1
308	Bentgrass	00	00	00	00	00	00	0	0.0
308	Reed canarygrass	00	00	00	00	00	00	0	0.0
308	Salal	01	00	00	02	00	03	6	6.1
308	Bracken fern	00	00	00	00	00	00	0	0.0
308	Sword fern	00	00	00	00	00	00	0	0.0
308	Red alder	00	00	00	00	00	00	0	0.0
308	Thimbleberry	00	00	00	00	00	00	0	0.0
308	H. Blackberry	00	00	00	00	00	00	0	0.0
308	E. Blackberry	09	10	10	05	09	43	86	87.7
308	Total vegetation	10	10	10	10	09	49	98	100.0
308	Bare soil/litter	00	00	00	00	01	01	2	

Five randomly selected line-point samplings were conducted in each experimental unit. A line-point transect was 5 meter long with a point dropped at 0.5 m intervals. Percent cover was calculated as the total number hits per species divided by the total number of points. Percent composition was calculated as the number of hits per species divided by the total vegetation hits per experimental unit.

Table A5. Line-point sampling, percent cover and percent composition data from I90SPEC (Tinkham) species overseeding study on cutover roadside grass and red alder cover.

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
Block I									
101	Red fescue	00	00	00	01	00	01	2	2.0
101	Hard fescue	00	00	00	00	00	00	0	0.0
101	Bentgrass	10	10	10	09	09	48	96	96.0
101	Orchardgrass	00	00	00	00	00	00	0	0.0
101	White clover	00	00	00	00	00	00	0	0.0
101	False dandelion	00	00	00	00	00	00	0	0.0
101	Red alder	00	00	00	00	00	00	0	0.0
101	Blackberry	00	00	00	00	01	01	2	2.0
101	Total vegetation	10	10	10	10	10	50	100	100.0
101	Bare soil/litter	00	00	00	00	00	00	0	
102	Red fescue	03	02	03	01	03	00	0	0.0
102	Hard fescue	00	00	00	00	00	00	0	0.0
102	Bentgrass	04	02	03	01	03	50	100	100.0
102	Orchardgrass	00	00	00	00	00	00	0	0.0
102	White clover	00	00	00	00	00	00	0	0.0
102	False dandelion	00	00	00	00	00	00	0	0.0
102	Red alder	00	00	00	00	00	00	0	0.0
102	Blackberry	00	00	00	00	00	00	0	0.0
102	Total vegetation	07	04	06	02	06	50	100	100.0
102	Bare soil/litter	03	06	04	08	04	00	0	
103	Red fescue	00	03	04	03	02	12	24	24.0
103	Hard fescue	00	00	00	00	00	00	0	0.0
103	Bentgrass	10	07	06	07	08	38	76	76.0
103	Orchardgrass	00	00	00	00	00	00	0	0.0
103	White clover	00	00	00	00	00	00	0	0.0
103	False dandelion	00	00	00	00	00	00	0	0.0

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
103	Red alder	00	00	00	00	00	00	0	0.0
103	Blackberry	00	00	00	00	00	00	0	0.0
103	Total vegetation	10	10	10	10	10	50	100	100.0
103	Bare soil/litter	00	00	00	00	00	00	0	
104	Red fescue	03	01	02	03	01	10	20	21.3
104	Hard fescue	00	00	00	00	00	00	0	0.0
104	Bentgrass	07	09	08	06	07	37	74	78.7
104	Orchardgrass	00	00	00	00	00	00	0	0.0
104	White clover	00	00	00	00	00	00	0	0.0
104	False dandelion	00	00	00	00	00	00	0	0.0
104	Red alder	00	00	00	00	00	00	0	0.0
104	Blackberry	00	00	00	00	00	00	0	0.0
104	Total vegetation	10	10	10	09	08	47	94	100.0
104	Bare soil/litter	00	00	00	01	02	03	6	
105	Red fescue	04	03	05	00	04	16	32	32.0
105	Hard fescue	00	00	00	00	00	00	0	0.0
105	Bentgrass	06	07	05	09	06	33	66	66.0
105	Orchardgrass	00	00	00	01	00	01	2	2.0
105	White clover	00	00	00	00	00	00	0	0.0
105	False dandelion	00	00	00	00	00	00	0	0.0
105	Red alder	00	00	00	00	00	00	0	0.0
105	Blackberry	00	00	00	00	00	00	0	0.0
105	Total vegetation	10	10	10	10	10	50	100	100.0
105	Bare soil/litter	00	00	00	00	00	00	0	
106	Red fescue	00	01	03	00	03	07	14	14.9
106	Hard fescue	00	00	00	00	00	00	0	0.0
106	Bentgrass	09	09	06	10	06	40	80	85.1
106	Orchardgrass	00	00	00	00	00	00	0	0.0
106	White clover	00	00	00	00	00	00	0	0.0

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
106	False dandelion	00	00	00	00	00	00	0	0.0
106	Red alder	00	00	00	00	00	00	0	0.0
106	Blackberry	00	00	00	00	00	00	0	0.0
106	Total vegetation	09	10	09	10	09	47	94	100.0
106	Bare soil/litter	01	00	01	00	01	03	6	
107	Red fescue	00	00	00	00	00	00	0	0.0
107	Hard fescue	00	00	00	00	00	00	0	0.0
107	Bentgrass	10	10	10	10	10	50	100	100.0
107	Orchardgrass	00	00	00	00	00	00	0	0.0
107	White clover	00	00	00	00	00	00	0	0.0
107	False dandelion	00	00	00	00	00	00	0	0.0
107	Red alder	00	00	00	00	00	00	0	0.0
107	Blackberry	00	00	00	00	00	00	0	0.0
107	Total vegetation	10	10	10	10	10	50	100	100.0
107	Bare soil/litter	00	00	00	00	00	00	0	
108	Red fescue	00	01	01	00	02	04	8	8.5
108	Hard fescue	00	00	00	00	00	00	0	0.0
108	Bentgrass	08	06	08	08	08	38	76	80.9
108	Orchardgrass	02	03	00	00	00	05	10	10.6
108	White clover	00	00	00	00	00	00	0	0.0
108	False dandelion	00	00	00	00	00	00	0	0.0
108	Red alder	00	00	00	00	00	00	0	0.0
108	Blackberry	00	00	00	00	00	00	0	0.0
108	Total vegetation	10	10	09	08	10	47	94	100.0
108	Bare soil/litter	00	00	01	02	00	03	6	
Block II									
201	Red fescue	05	01	06	02	01	15	30	31.2
201	Hard fescue	00	00	00	00	00	00	0	0.0
201	Bentgrass	05	07	03	08	09	32	64	66.7
201	Orchardgrass	00	00	01	00	00	01	2	2.1

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
201	White clover	00	00	00	00	00	00	0	0.0
201	False dandelion	00	00	00	00	00	00	0	0.0
201	Red alder	00	00	00	00	00	00	0	0.0
201	Blackberry	00	00	00	00	00	00	0	0.0
201	Total vegetation	10	08	10	10	10	48	96	100.0
201	Bare soil/litter	00	02	00	00	00	02	04	
202	Red fescue	04	04	05	05	09	27	54	54.0
202	Hard fescue	00	00	00	00	00	00	0	0.0
202	Bentgrass	06	04	05	05	01	21	42	42.0
202	Orchardgrass	00	02	00	00	00	02	4	4.0
202	White clover	00	00	00	00	00	00	0	0.0
202	False dandelion	00	00	00	00	00	00	0	0.0
202	Red alder	00	00	00	00	00	00	0	0.0
202	Blackberry	00	00	00	00	00	00	0	0.0
202	Total vegetation	10	10	10	10	10	50	100	100.0
202	Bare soil/litter	00	00	00	00	00	00	0	
203	Red fescue	02	01	02	01	04	10	20	20.4
203	Hard fescue	00	00	00	00	00	00	0	0.0
203	Bentgrass	07	09	08	09	06	39	78	79.6
203	Orchardgrass	00	00	00	00	00	00	0	0.0
203	White clover	00	00	00	00	00	00	0	0.0
203	False dandelion	00	00	00	00	00	00	0	0.0
203	Red alder	00	00	00	00	00	00	0	0.0
203	Blackberry	00	00	00	00	00	00	0	0.0
203	Total vegetation	09	10	10	10	10	49	98	100.0
203	Bare soil/litter	01	00	00	00	00	01	2	
204	Red fescue	01	00	00	03	01	05	10	14.3
204	Hard fescue	00	00	00	00	00	00	0	0.0
204	Bentgrass	06	07	06	03	05	27	54	77.1
204	Orchardgrass	00	01	00	00	02	03	6	8.6

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
204	White clover	00	00	00	00	00	00	0	0.0
204	False dandelion	00	00	00	00	00	00	0	0.0
204	Red alder	00	00	00	00	00	00	0	0.0
204	Blackberry	00	00	00	00	00	00	0	0.0
204	Total vegetation	07	08	06	06	08	35	70	100.0
204	Bare soil/litter	03	02	04	04	02	15	30	
205	Red fescue	06	06	02	03	06	23	46	54.7
205	Hard fescue	00	01	00	00	00	01	2	2.4
205	Bentgrass	04	02	06	04	02	18	36	42.9
205	Orchardgrass	00	00	00	00	00	00	0	0.0
205	White clover	00	00	00	00	00	00	0	0.0
205	False dandelion	00	00	00	00	00	00	0	0.0
205	Red alder	00	00	00	00	00	00	0	0.0
205	Blackberry	00	00	00	00	00	00	0	0.0
205	Total vegetation	10	09	08	07	08	42	84	100.0
205	Bare soil/litter	00	01	02	03	02	08	16	
206	Red fescue	00	03	01	03	02	09	18	23.1
206	Hard fescue	00	00	00	00	00	00	0	0.0
206	Bentgrass	08	05	07	05	05	30	60	76.9
206	Orchardgrass	00	00	00	00	00	00	0	0.0
206	White clover	00	00	00	00	00	00	0	0.0
206	False dandelion	00	00	00	00	00	00	0	0.0
206	Red alder	00	00	00	00	00	00	0	0.0
206	Blackberry	00	00	00	00	00	00	0	0.0
206	Total vegetation	08	08	08	08	07	39	78	100.0
206	Bare soil/litter	02	02	02	02	03	11	22	
207	Red fescue	05	04	03	05	07	24	48	48.0
207	Hard fescue	00	00	00	00	00	00	0	0.0
207	Bentgrass	05	06	07	05	03	26	52	52.0
207	Orchardgrass	00	00	00	00	00	00	0	0.0

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
207	White clover	00	00	00	00	00	00	0	0.0
207	False dandelion	00	00	00	00	00	00	0	0.0
207	Red alder	00	00	00	00	00	00	0	0.0
207	Blackberry	00	00	00	00	00	00	0	0.0
207	Total vegetation	10	10	10	10	10	50	100	100.0
207	Bare soil/litter	00	00	00	00	00	00	0	
208	Red fescue	02	04	02	04	03	15	30	35.7
208	Hard fescue	00	00	00	01	00	01	2	2.4
208	Bentgrass	07	04	05	05	05	26	52	61.9
208	Orchardgrass	00	00	00	00	00	00	0	0.0
208	White clover	00	00	00	00	00	00	0	0.0
208	False dandelion	00	00	00	00	00	00	0	0.0
208	Red alder	00	00	00	00	00	00	0	0.0
208	Blackberry	00	00	00	00	00	00	0	0.0
208	Total vegetation	09	08	07	10	08	42	08	100.0
208	Bare soil/litter	01	02	03	00	02	08	16	
Block III									
301	Red fescue	06	04	07	06	05	28	56	59.6
301	Hard fescue	00	00	00	00	00	00	0	0.0
301	Bentgrass	04	05	02	04	04	19	38	40.4
301	Orchardgrass	00	00	00	00	00	00	0	0.0
301	White clover	00	00	00	00	00	00	0	0.0
301	False dandelion	00	00	00	00	00	00	0	0.0
301	Red alder	00	00	00	00	00	00	0	0.0
301	Blackberry	00	00	00	00	00	00	0	0.0
301	Total vegetation	10	09	09	10	09	47	94	100.0
301	Bare soil/litter	00	01	01	00	01	03	6	
302	Red fescue	03	03	00	04	00	10	20	23.5
302	Hard fescue	00	01	00	01	00	02	4	0.0
302	Bentgrass	06	04	07	05	08	30	60	76.5

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
302	Orchardgrass	00	00	00	00	00	00	0	0.0
302	White clover	00	00	00	00	00	00	0	0.0
302	False dandelion	00	00	00	00	00	00	0	0.0
302	Red alder	00	00	00	00	00	00	0	0.0
302	Blackberry	00	00	00	00	00	00	0	0.0
302	Total vegetation	09	08	07	10	08	42	68	100.0
302	Bare soil/litter	01	02	03	00	02	08	16	
303	Red fescue	01	00	00	01	00	5	10	11.3
303	Hard fescue	00	00	00	00	01	04	08	9.3
303	Bentgrass	07	08	06	06	08	35	70	79.5
303	Orchardgrass	00	00	00	00	00	00	0	0.0
303	White clover	00	00	00	00	00	00	0	0.0
303	False dandelion	00	00	00	00	00	00	0	0.0
303	Red alder	00	00	00	00	00	00	0	0.0
303	Blackberry	00	00	00	00	00	00	0	0.0
303	Total vegetation	08	08	06	07	09	44	88	100.0
303	Bare soil/litter	02	02	04	03	01	12	24	
304	Red fescue	01	00	00	00	02	03	6	8.3
304	Hard fescue	00	00	00	00	00	00	0	0.0
304	Bentgrass	06	08	06	08	05	33	66	91.7
304	Orchardgrass	00	00	00	00	00	00	0	0.0
304	White clover	00	00	00	00	00	00	0	0.0
304	False dandelion	00	00	00	00	00	00	0	0.0
304	Red alder	00	00	00	00	00	00	0	0.0
304	Blackberry	00	00	00	00	00	00	0	0.0
304	Total vegetation	07	08	06	08	07	36	72	100.0
304	Bare soil/litter	03	02	04	02	03	14	28	
305	Red fescue	00	00	01	00	02	03	6	6.0
305	Hard fescue	00	00	00	00	00	00	0	0.0
305	Bentgrass	09	10	06	08	08	41	82	82.0

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
305	Orchardgrass	00	00	00	00	00	00	0	0.0
305	White clover	00	00	00	00	00	00	0	0.0
305	False dandelion	00	00	00	00	00	00	0	0.0
305	Red alder	00	00	00	00	00	00	0	0.0
305	Blackberry	01	00	03	02	00	06	12	12.0
305	Total vegetation	10	10	10	10	10	50	100	100.0
305	Bare soil/litter	00	00	00	00	00	00	0	
306	Red fescue	00	02	03	04	02	11	22	23.4
306	Hard fescue	00	00	00	00	00	00	0	0.0
306	Bentgrass	10	07	07	05	07	36	72	76.6
306	Orchardgrass	00	00	00	00	00	00	0	0.0
306	White clover	00	00	00	00	00	00	0	0.0
306	False dandelion	00	00	00	00	00	00	0	0.0
306	Red alder	00	00	00	00	00	00	0	0.0
306	Blackberry	00	00	00	00	00	00	0	0.0
306	Total vegetation	10	09	10	09	09	47	94	100.0
306	Bare soil/litter	00	01	00	01	01	03	6	
307	Red fescue	01	02	00	00	02	05	0	10.6
307	Hard fescue	00	02	00	00	00	02	6	4.3
307	Bentgrass	09	06	08	09	08	40	80	85.1
307	Orchardgrass	00	00	00	00	00	00	0	0.0
307	White clover	00	00	00	00	00	00	0	0.0
307	False dandelion	00	00	00	00	00	00	0	0.0
307	Red alder	00	00	00	00	00	00	0	0.0
307	Blackberry	00	00	00	00	00	00	0	0.0
307	Total vegetation	10	10	08	09	10	47	94	100.0
307	Bare soil/litter	00	00	02	01	00	03	6	
308	Red fescue	00	01	02	00	02	05	10	11.1
308	Hard fescue	00	05	01	06	00	12	24	26.7
308	Bentgrass	09	02	06	02	08	27	54	60.0

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
308	Orchardgrass	00	00	01	00	00	01	2	2.2
308	White clover	00	00	00	00	00	00	0	0.0
308	False dandelion	00	00	00	00	00	00	0	0.0
308	Red alder	00	00	00	00	00	00	0	0.0
308	Blackberry	00	00	00	00	00	00	0	0.0
308	Total vegetation	09	08	10	08	10	45	90	100.0
308	Bare soil/litter	01	02	00	02	00	05	10	

[1] Five randomly selected line-point samplings were conducted in each experimental unit. A line-point transect was 5 meter long with a point dropped at 0.5 m intervals. Percent cover was calculated as the total number hits per species divided by the total number of hits. Percent composition was calculated as the number of hits per species divided by the total vegetation hits per experimental unit.

Table A6. Line-point sampling, percent cover and percent composition dta from SCOTSPEC species overseeding study on cutover roadside bentgrass cover.

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
Block I									
101	Red fescue	00	00	00	00	00	00	0	0.0
101	Hard fescue	00	00	00	00	00	00	0	0.0
101	Per. ryegrass	00	00	00	00	00	00	0	0.0
101	Bentgrass	07	08	08	09	10	42	84	89.4
101	Scotch broom	01	01	02	00	00	04	8	8.5
101	False dandelion	00	00	00	01	00	01	2	2.1
101	Blackberry	00	00	00	00	00	00	0	0.0
101	Total vegetation	08	09	10	10	10	47	94	100.0
101	Bare soil/litter	02	01	00	00	00	03	6	
102	Red fescue	00	00	00	00	00	00	0	0.0
102	Hard fescue	00	00	00	00	00	00	0	0.0
102	Per. ryegrass	00	00	00	00	00	00	0	0.0
102	Bentgrass	04	07	07	10	10	38	76	90.5
102	Scotch broom	03	00	01	00	00	04	8	9.5
102	False dandelion	00	00	00	00	00	00	0	0.0
102	Blackberry	00	00	00	00	00	00	0	0.0
102	Total vegetation	07	07	08	10	10	42	84	100.0
102	Bare soil/litter	03	03	02	00	00	08	16	
103	Red fescue	00	00	00	00	00	00	0	0.0
103	Hard fescue	00	00	00	00	00	00	0	0.0
103	Per. ryegrass	00	00	00	00	00	00	0	0.0
103	Bentgrass	10	07	06	07	08	38	76	84.4
103	Scotch broom	00	02	00	01	02	05	10	11.2
103	False dandelion	00	00	02	00	00	02	4	4.4
103	Blackberry	00	00	00	00	00	00	0	0.0
103	Total vegetation	10	09	08	08	10	45	90	100.0
103	Bare soil/litter	00	01	02	02	00	05	10	

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
104	Red fescue	00	00	00	01	00	01	2	2.2
104	Hard fescue	00	00	00	00	00	00	0	0.0
104	Per. ryegrass	00	00	00	00	00	00	0	0.0
104	Bentgrass	06	09	08	06	07	36	72	78.2
104	Scotch broom	04	00	01	03	00	08	16	17.4
104	False dandelion	00	00	00	00	01	01	2	2.2
104	Blackberry	00	00	00	00	00	00	0	0.0
104	Total vegetation	10	09	09	10	08	46	92	100.0
104	Bare soil/litter	00	01	01	00	02	04	8	
105	Red fescue	00	00	00	00	00	00	0	0.0
105	Hard fescue	00	00	00	00	00	00	0	0.0
105	Per. ryegrass	00	00	00	00	00	00	0	0.0
105	Bentgrass	10	10	06	06	04	36	72	78.3
105	Scotch broom	00	00	01	03	03	07	14	15.2
105	False dandelion	00	00	01	00	02	03	6	6.5
105	Blackberry	00	00	00	00	00	00	0	0.0
105	Total vegetation	10	10	08	09	09	46	92	100.0
105	Bare soil/litter	00	00	02	01	01	04	8	
106	Red fescue	00	00	00	00	00	00	0	0.0
106	Hard fescue	00	00	00	00	00	00	0	0.0
106	Per. ryegrass	00	00	00	00	00	00	0	0.0
106	Bentgrass	09	10	08	05	03	35	70	81.4
106	Scotch broom	01	00	00	05	01	07	14	16.3
106	False dandelion	00	00	00	00	01	01	2	2.3
106	Blackberry	00	00	00	00	00	00	0	0.0
106	Total vegetation	10	10	08	10	05	43	86	100.0
106	Bare soil/litter	01	00	01	00	01	03	6	
107	Red fescue	00	00	01	02	00	03	6	7.9
107	Hard fescue	00	00	00	00	00	00	0	0.0
107	Per. ryegrass	00	00	00	00	00	00	0	0.0

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
107	Bentgrass	09	10	07	01	04	31	64	81.6
107	Scotch broom	00	00	00	01	01	02	4	5.3
107	False dandelion	00	00	00	00	01	01	2	2.6
107	Blackberry	00	00	00	01	00	01	2	2.6
107	Total vegetation	09	10	08	05	06	38	76	100.0
107	Bare soil/litter	01	00	02	05	04	12	24	
108	Red fescue	00	00	01	00	00	01	2	2.4
108	Hard fescue	00	00	00	00	00	00	0	0.0
108	Per. ryegrass	00	00	00	00	00	00	0	0.0
108	Bentgrass	10	08	08	04	02	32	64	76.2
108	Scotch broom	00	02	00	03	01	06	12	14.3
108	False dandelion	00	00	00	00	03	03	6	7.1
108	Blackberry	00	00	00	00	00	00	0	0.0
108	Total vegetation	10	10	09	07	06	42	94	100.0
108	Bare soil/litter	00	00	01	03	04	03	6	
Block II									
201	Red fescue	00	00	00	00	00	00	0	0.0
201	Hard fescue	00	00	00	00	00	00	0	0.0
201	Per. ryegrass	00	00	00	00	00	00	0	0.0
201	Bentgrass	10	10	09	05	04	38	76	95.0
201	Scotch broom	00	00	00	01	01	02	4	5.0
201	False dandelion	00	00	00	00	00	00	0	0.0
201	Blackberry	00	00	00	00	00	00	0	0.0
201	Total vegetation	10	10	09	06	05	40	80	100.0
201	Bare soil/litter	00	00	01	04	05	10	20	
202	Red fescue	00	00	01	00	00	01	2	2.5
202	Hard fescue	00	00	00	00	00	00	0	0.0
202	Per. ryegrass	00	00	00	00	00	00	0	0.0
202	Bentgrass	09	09	07	05	05	35	70	87.5
202	Scotch broom	00	00	00	03	00	03	6	7.5

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
202	False dandelion	00	00	01	00	00	01	2	2.5
202	Blackberry	00	00	00	00	00	00	0	0.0
202	Total vegetation	09	09	09	08	05	40	80	100.0
202	Bare soil/litter	01	01	01	02	05	10	20	
203	Red fescue	00	02	00	01	00	03	6	7.3
203	Per. ryegrass	00	00	00	00	00	00	0	0.0
203	Hard fescue	00	00	00	00	00	00	0	0.0
203	Bentgrass	10	06	08	04	04	32	64	78.1
203	Scotch broom	00	00	01	02	00	03	6	7.3
203	False dandelion	00	00	00	01	02	03	6	7.3
203	Blackberry	00	00	00	00	00	00	0	0.0
203	Total vegetation	10	08	09	08	06	41	82	100.0
203	Bare soil/litter	00	02	01	02	04	09	18	
204	Red fescue	00	00	04	02	00	06	12	15.8
204	Hard fescue	00	00	00	00	00	00	0	0.0
204	Per. ryegrass	00	00	00	00	00	00	0	0.0
204	Bentgrass	09	08	04	03	04	28	54	73.7
204	Scotch broom	00	00	01	00	02	03	6	7.9
204	False dandelion	00	00	00	01	00	01	2	2.6
204	Blackberry	00	00	00	00	00	00	0	0.0
204	Total vegetation	09	08	09	06	06	38	70	100.0
204	Bare soil/litter	01	02	01	04	04	12	24	
205	Red fescue	00	00	00	00	00	00	0	0.0
205	Hard fescue	00	00	00	00	00	00	0	0.0
205	Per. ryegrass	00	00	00	00	00	00	0	0.0
205	Bentgrass	08	08	07	05	02	30	60	83.3
205	Scotch broom	00	00	00	02	00	02	4	5.6
205	False dandelion	00	00	00	01	03	04	8	11.1
205	Blackberry	00	00	00	00	00	00	0	0.0
205	Total vegetation	08	08	07	08	05	36	72	100.0

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
205	Bare soil/litter	02	02	03	02	05	14	28	
206	Red fescue	00	00	00	01	00	01	2	2.8
206	Hard fescue	00	00	00	00	00	00	0	0.0
206	Per. ryegrass	00	00	00	00	00	00	0	0.0
206	Bentgrass	08	08	06	07	05	34	68	94.4
206	Scotch broom	00	00	00	00	01	01	2	2.8
206	False dandelion	00	00	00	00	00	00	0	0.0
206	Blackberry	00	00	00	00	00	00	0	0.0
206	Total vegetation	08	08	06	08	06	36	78	100.0
206	Bare soil/litter	02	02	04	02	04	14	28	
207	Red fescue	00	00	00	00	00	00	0	0.0
207	Hard fescue	00	00	00	00	00	00	0	0.0
207	Per. ryegrass	00	00	00	00	00	00	0	0.0
207	Bentgrass	07	09	08	05	05	34	68	87.2
207	Scotch broom	00	00	01	01	03	05	10	12.8
207	False dandelion	00	00	00	00	00	00	0	0.0
207	Blackberry	00	00	00	00	00	00	0	0.0
207	Total vegetation	07	09	09	06	08	39	78	100.0
207	Bare soil/litter	03	01	01	04	02	11	22	
208	Red fescue	00	00	00	00	00	00	0	0.0
208	Hard fescue	00	00	00	00	00	00	0	0.0
208	Per. ryegrass	00	00	00	00	00	00	0	0.0
208	Bentgrass	07	10	07	05	05	34	68	87.2
208	Scotch broom	01	00	00	00	02	03	6	7.8
208	False dandelion	00	00	00	02	00	02	4	5.0
208	Blackberry	00	00	00	00	00	00	0	0.0
208	Total vegetation	08	10	07	07	07	39	78	100.0
208	Bare soil/litter	02	00	03	03	03	11	22	
Block III									
301	Red fescue	00	00	02	01	00	03	6	7.6

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
301	Hard fescue	00	00	00	00	00	00	0	0.0
301	Per. ryegrass	00	00	00	00	00	00	0	0.0
301	Bentgrass	07	08	08	07	04	34	68	87.2
301	Scotch broom	00	00	00	00	00	00	0	0.0
301	False dandelion	00	00	00	00	01	01	2	2.6
301	Blackberry	00	00	00	00	01	01	2	2.6
301	Total vegetation	07	08	10	08	06	39	78	100.0
301	Bare soil/litter	03	02	00	02	04	11	22	
302	Red fescue	00	00	01	02	01	04	8	10.8
302	Hard fescue	00	00	00	00	00	00	0	0.0
302	Per. ryegrass	00	00	00	00	00	00	0	0.0
302	Bentgrass	06	08	08	06	03	31	62	83.8
302	Scotch broom	01	00	00	00	00	01	2	2.7
302	False dandelion	00	00	00	00	01	01	2	2.7
302	Blackberry	00	00	00	00	00	00	0	0.0
302	Total vegetation	07	08	09	08	05	37	74	100.0
302	Bare soil/litter	03	02	01	02	05	13	26	
303	Red fescue	00	01	00	00	01	02	4	6.2
303	Hard fescue	00	00	00	00	00	00	0	0.0
303	Per. ryegrass	00	00	00	00	00	00	0	0.0
303	Bentgrass	08	09	06	04	03	30	60	93.8
303	Scotch broom	00	00	00	00	00	00	0	0.0
303	False dandelion	00	00	00	00	00	00	0	0.0
303	Blackberry	00	00	00	00	00	00	0	0.0
303	Total vegetation	08	10	06	04	04	32	62	100.0
303	Bare soil/litter	02	00	04	06	06	18	38	
304	Red fescue	00	00	00	00	00	00	0	0.0
304	Hard fescue	00	00	00	00	00	00	0	0.0
304	Per. ryegrass	00	00	00	00	00	00	0	0.0
304	Bentgrass	07	07	04	06	02	26	52	76.5

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
304	Scotch broom	00	01	03	00	02	06	12	17.6
304	False dandelion	00	00	00	01	01	02	4	5.9
304	Blackberry	00	00	00	00	00	00	0	0.0
304	Total vegetation	07	08	07	07	05	34	68	100.0
304	Bare soil/litter	03	02	03	03	05	16	32	
305	Red fescue	00	00	00	00	00	00	0	0.0
305	Hard fescue	00	00	00	00	00	00	0	0.0
305	Per. ryegrass	00	00	00	00	00	00	0	0.0
305	Bentgrass	10	09	06	05	02	32	64	82.1
305	Scotch broom	00	00	00	02	01	03	6	7.7
305	False dandelion	00	00	00	01	02	03	6	7.7
305	Blackberry	00	00	00	00	01	01	2	2.5
305	Total vegetation	10	09	06	08	06	39	78	100.0
305	Bare soil/litter	00	01	04	02	04	11	22	
306	Red fescue	00	00	00	00	00	00	0	0.0
306	Hard fescue	00	00	00	00	00	00	0	0.0
306	Per. ryegrass	00	00	00	00	00	00	0	0.0
306	Bentgrass	08	09	08	06	05	36	72	97.3
306	Scotch broom	00	00	00	00	00	00	0	0.0
306	False dandelion	00	00	00	01	00	01	2	2.7
306	Blackberry	00	00	00	00	00	00	0	0.0
306	Total vegetation	08	09	08	07	05	37	74	100.0
306	Bare soil/litter	02	01	02	03	05	13	26	
307	Red fescue	00	00	00	00	00	00	0	0.0
307	Hard fescue	00	00	00	00	00	00	0	0.0
307	Per. ryegrass	00	00	00	00	00	00	0	0.0
307	Bentgrass	09	06	08	09	05	37	74	90.2
307	Scotch broom	01	01	00	00	01	03	6	7.4
307	False dandelion	00	01	00	00	00	01	2	2.4
307	Blackberry	00	00	00	00	00	00	0	0.0

Plot No.	Species	Number hits/line[1]					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
307	Total vegetation	10	08	08	09	06	41	82	100.0
307	Bare soil/litter	00	02	02	01	04	09	18	
308	Red fescue	00	00	00	00	00	00	0	0.0
308	Hard fescue	00	00	00	00	00	00	0	0.0
308	Per. ryegrass	00	00	00	00	00	00	0	0.0
308	Bentgrass	10	10	06	04	06	36	72	92.3
308	Scotch broom	00	00	00	01	00	01	2	2.6
308	False dandelion	00	00	00	02	00	02	4	5.1
308	Blackberry	00	00	00	00	00	00	0	0.0
308	Total vegetation	10	10	06	07	06	39	78	100.0
308	Bare soil/litter	00	00	04	03	04	11	22	

Five randomly selected line-point samplings were conducted in each experimental unit. A line-point transect was 5 meter long with a point dropped at 0.5 m intervals. Percent cover was calculated as the total number hits per species divided by the total number of hits. Percent composition was calculated as the number of hits per species divided by the total vegetation hits per experimental unit.

Table A7. Line-point sampling, percent cover and percent composition data from WESTSPEC species overseeding study on cutover salal and blackberry cover.

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
Block I									
101	Red fescue	00	00	00	00	00	00	0	0.0
101	P. ryegrass	01	00	02	00	00	03	6	6.3
101	Tall fescue	00	01	00	00	00	01	2	2.0
101	Bentgrass	00	00	00	00	00	00	0	0.0
101	Reed canarygrass	00	00	00	00	00	00	0	0.0
101	Salal	00	02	00	02	03	07	14	14.6
101	Bracken fern	00	00	00	00	00	00	0	0.0
101	Sword fern	00	00	00	00	00	00	0	0.0
101	Red alder	00	00	00	00	00	00	0	0.0
101	Thimbleberry	00	00	00	00	00	00	0	0.0
101	E. Blackberry	00	00	00	00	00	00	0	0.0
101	H. Blackberry	08	07	08	07	07	37	74	77.1
101	Total vegetation	09	10	10	09	10	48	96	100.0
101	Bare soil/litter	01	00	00	01	00	02	4	
102	Red fescue	00	00	00	00	00	00	0	0.0
102	P. ryegrass	00	00	02	00	00	02	4	4.8
102	Tall fescue	00	00	00	00	00	00	0	0.0
102	Bentgrass	00	00	00	00	00	00	0	0.0
102	Reed canarygrass	00	00	00	00	00	00	0	0.0
102	Salal	03	00	04	05	06	18	36	42.9
102	Bracken fern	00	00	00	00	00	00	0	0.0
102	Sword fern	00	00	00	00	00	00	0	0.0
102	Red alder	00	00	00	00	00	00	0	0.0
102	Thimbleberry	00	00	00	00	00	00	0	0.0
102	E. Blackberry	00	00	00	00	00	00	0	0.0
102	H. Blackberry	04	07	03	05	03	22	44	52.3
102	Total vegetation	07	07	09	10	09	42	84	100.0

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
102	Bare soil/litter	03	00	01	02	00	06	12	
103	Red fescue	02	02	00	02	01	07	14	14.9
103	P. ryegrass	01	02	01	04	00	08	16	17.1
103	Tall fescue	00	00	00	00	00	00	0	0.0
103	Bentgrass	00	00	00	00	00	00	0	0.0
103	Reed canarygrass	00	00	00	00	00	00	0	0.0
103	Salal	00	03	00	03	00	06	12	12.8
103	Bracken fern	03	00	04	01	04	12	24	25.5
103	Sword fern	00	00	00	00	00	00	0	0.0
103	Red alder	00	00	00	00	00	00	0	0.0
103	Thimbleberry	01	00	00	01	03	05	10	10.6
103	E. Blackberry	00	00	00	00	00	00	0	0.0
103	H. Blackberry	02	03	04	00	00	09	18	19.1
103	Total vegetation	09	10	09	10	08	47	94	100.0
103	Bare soil/litter	01	00	01	00	02	04	8	
104	Red fescue	02	00	03	00	01	06	12	12.0
104	P. ryegrass	02	03	02	00	04	11	22	22.0
104	Tall fescue	00	00	00	00	00	00	0	0.0
104	Bentgrass	00	00	00	01	00	01	2	2.0
104	Reed canarygrass	00	00	00	00	00	00	0	0.0
104	Salal	06	02	00	06	02	16	32	32.0
104	Bracken fern	00	00	00	00	00	00	0	0.0
104	Sword fern	00	00	00	00	00	00	0	0.0
104	Red alder	00	00	00	00	00	00	0	0.0
104	Thimbleberry	00	04	00	01	03	08	16	16.0
104	E. Blackberry	00	00	00	00	00	00	0	0.0
104	H. Blackberry	00	01	05	02	00	08	16	16.0
104	Total vegetation	10	10	10	10	10	50	100	100.0
104	Bare soil/litter	00	00	00	00	00	00	0	

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
105	Red fescue	00	00	00	00	02	02	4	4.2
105	P. ryegrass	00	03	00	04	01	08	16	16.7
105	Tall fescue	00	00	00	00	00	00	0	0.0
105	Bentgrass	00	00	00	00	00	00	0	0.0
105	Reed canarygrass	00	00	00	00	00	00	0	0.0
105	Salal	01	00	04	02	06	13	26	27.1
105	Bracken fern	01	02	00	00	01	04	8	8.3
105	Sword fern	00	01	00	00	00	01	2	2.1
105	Red alder	00	00	00	00	00	00	0	0.0
105	Thimbleberry	05	02	03	00	00	10	20	20.8
105	E. Blackberry	00	00	00	00	00	00	0	0.0
105	H. Blackberry	03	02	02	03	00	10	20	20.8
105	Total vegetation	10	10	09	09	10	48	96	100.0
105	Bare soil/litter	02	01	00	03	03	09	18	
106	Red fescue	00	01	00	00	00	01	2	2.0
106	P. ryegrass	03	00	03	00	02	08	16	16.0
106	Tall fescue	00	00	00	00	00	00	0	0.0
106	Bentgrass	00	00	00	00	00	00	0	0.0
106	Reed canarygrass	00	01	00	00	00	01	2	2.0
106	Salal	05	02	03	06	02	18	36	36.0
106	Bracken fern	00	02	00	02	01	05	10	10.0
106	Sword fern	01	00	00	00	00	01	2	2.0
106	Red alder	00	00	00	00	00	00	0	0.0
106	Thimbleberry	00	03	00	02	03	08	16	16.0
106	E. Blackberry	00	00	00	00	00	00	0	0.0
106	H. Blackberry	01	01	04	00	02	08	16	16.0
106	Total vegetation	10	10	10	10	10	50	100	100.0
106	Bare soil/litter	00	00	00	00	00	00	00	
107	Red fescue	00	00	00	04	00	04	8	8.1
107	P. ryegrass	03	00	05	02	00	10	20	20.4

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
107	Tall fescue	00	00	00	00	00	00	0	0.0
107	Bentgrass	00	00	00	00	00	00	0	0.0
107	Reed canarygrass	00	00	00	00	00	00	0	0.0
107	Salal	00	04	01	00	02	07	14	14.3
107	Bracken fern	00	00	00	00	00	00	0	0.0
107	Sword fern	00	00	00	00	00	00	0	0.0
107	Red alder	00	00	00	00	00	00	0	0.0
107	Thimbleberry	00	00	00	04	00	04	8	8.2
107	E. Blackberry	00	00	01	00	00	01	2	2.0
107	H. Blackberry	07	05	03	00	08	23	46	46.9
107	Total vegetation	10	09	10	10	10	49	98	100.0
107	Bare soil/litter	00	01	00	00	00	01	2	
108	Red fescue	02	02	01	00	01	06	12	12.5
108	P. ryegrass	00	00	03	00	02	05	10	10.4
108	Tall fescue	00	00	00	00	00	00	0	0.0
108	Bentgrass	00	01	00	00	00	01	2	2.1
108	Reed canarygrass	00	00	00	00	00	00	0	0.0
108	Salal	00	04	00	04	02	10	20	20.8
108	Bracken fern	00	00	00	00	00	00	0	0.0
108	Sword fern	00	00	00	00	00	00	0	0.0
108	Red alder	00	00	00	00	00	00	0	0.0
108	Thimbleberry	05	00	02	03	02	12	24	25.0
108	E. Blackberry	00	00	00	00	00	00	00	0.0
108	H. Blackberry	03	03	04	02	02	14	28	29.2
108	Total vegetation	10	10	10	09	09	48	96	100.0
108	Bare soil/litter	00	00	00	01	01	02	4	
Block II									
201	Red fescue	00	00	00	00	00	00	0	0.0
201	P. ryegrass	04	04	02	01	02	13	26	26.0
201	Tall fescue	00	02	00	00	00	02	4	4.0

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
201	Bentgrass	00	00	00	00	00	00	0	0.0
201	Reed canarygrass	00	00	00	00	00	00	0	0.0
201	Salal	06	04	08	09	08	35	70	70.0
201	Bracken fern	00	00	00	00	00	00	0	0.0
201	Sword fern	00	00	00	00	00	00	0	0.0
201	Red alder	00	00	00	00	00	00	0	0.0
201	Thimbleberry	00	00	00	00	00	00	0	0.0
201	E. Blackberry	00	00	00	00	00	00	0	0.0
201	H. Blackberry	00	00	00	00	00	00	0	0.0
201	Total vegetation	10	10	10	10	10	50	100	100.0
201	Bare soil/litter	01	03	00	00	00	04	8	
202	Red fescue	00	00	01	00	00	00	0	0.0
202	P. ryegrass	00	02	02	00	02	06	12	12.0
202	Tall fescue	01	00	00	00	00	01	2	2.0
202	Bentgrass	00	00	00	00	00	00	0	0.0
202	Reed canarygrass	00	00	01	00	00	01	2	2.0
202	Salal	08	08	04	07	05	32	64	64.0
202	Bracken fern	00	00	00	00	00	00	0	0.0
202	Sword fern	00	00	00	00	00	00	0	0.0
202	Red alder	00	00	00	00	00	00	0	0.0
202	Thimbleberry	02	00	02	03	03	10	20	20.0
202	E. Blackberry	00	00	00	00	00	00	0	0.0
202	H. Blackberry	00	00	00	00	00	00	0	0.0
202	Total vegetation	10	10	10	10	10	50	100	100.0
202	Bare soil/litter	00	00	00	00	00	00	0	
203	Red fescue	04	05	01	04	05	19	38	38.8
203	P. ryegrass	03	05	01	03	01	13	26	26.5
203	Tall fescue	00	00	00	00	00	00	0	0.0
203	Bentgrass	00	00	00	00	00	00	0	0.0
203	Reed canarygrass	00	00	00	00	00	00	0	0.0

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
203	Salal	02	00	05	01	02	10	20	20.4
203	Bracken fern	00	00	00	00	00	00	0	0.0
203	Sword fern	00	00	01	00	00	01	2	2.0
203	Red alder	00	00	00	00	00	00	0	0.0
203	Thimbleberry	01	00	00	01	00	02	4	4.1
203	E. Blackberry	00	00	00	00	00	00	0	0.0
203	H. Blackberry	00	00	02	00	02	04	8	8.2
203	Total vegetation	10	10	10	09	10	49	98	100.0
203	Bare soil/litter	00	00	00	01	00	01	2	
204	Red fescue	03	02	02	03	01	11	22	22.0
204	P. ryegrass	00	02	01	03	00	06	12	12.0
204	Tall fescue	00	00	00	00	00	00	0	0.0
204	Bentgrass	00	00	00	00	00	00	0	0.0
204	Reed canarygrass	00	00	00	00	00	00	0	0.0
204	Salal	00	01	02	00	04	07	14	14.0
204	Bracken fern	00	00	00	00	00	00	0	0.0
204	Sword fern	00	01	00	00	00	01	2	2.0
204	Red alder	01	00	00	00	00	01	2	2.0
204	Thimbleberry	00	00	00	00	00	00	0	0.0
204	E. Blackberry	00	00	00	00	00	00	0	0.0
204	H. Blackberry	06	04	05	04	05	24	48	48.0
204	Total vegetation	10	10	10	10	10	50	100	100.0
204	Bare soil/litter	00	01	01	00	00	02	4	
205	Red fescue	01	00	02	00	00	03	6	6.0
205	P. ryegrass	07	02	03	04	04	20	40	40.0
205	Tall fescue	00	00	00	00	00	00	0	0.0
205	Bentgrass	01	02	00	01	00	04	8	8.0
205	Reed canarygrass	00	00	00	00	00	00	0	0.0
205	Salal	00	00	01	00	01	02	4	4.0
205	Bracken fern	00	00	00	00	00	00	0	0.0

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
205	Sword fern	00	00	00	00	00	00	0	0.0
205	Red alder	00	00	00	00	00	00	0	0.0
205	Thimbleberry	01	06	04	05	05	21	42	42.0
205	E. Blackberry	00	00	00	00	00	00	0	0.0
205	H. Blackberry	00	00	00	00	00	00	0	0.0
205	Total vegetation	10	10	10	10	10	50	100	100.0
205	Bare soil/litter	00	00	00	00	00	00	0	
206	Red fescue	00	03	01	00	02	06	12	12.8
206	P. ryegrass	00	02	03	04	01	10	20	21.3
206	Tall fescue	00	00	00	00	00	00	0	0.0
206	Bentgrass	02	00	00	00	01	03	6	6.4
206	Reed canarygrass	00	00	00	00	00	00	0	0.0
206	Salal	02	00	00	03	00	05	10	10.6
206	Bracken fern	00	00	00	00	00	00	0	0.0
206	Sword fern	00	00	00	00	00	00	0	0.0
206	Red alder	00	00	00	00	00	00	0	0.0
206	Thimbleberry	03	00	04	00	00	07	14	14.9
206	E. Blackberry	00	00	00	00	00	00	0	0.0
206	H. Blackberry	03	04	02	03	04	16	32	34.0
206	Total vegetation	10	09	10	10	08	47	94	100.0
206	Bare soil/litter	02	01	02	00	05	10	20	
207	Red fescue	03	00	02	00	06	11	22	22.4
207	P. ryegrass	01	03	05	06	03	18	36	36.8
207	Tall fescue	00	00	00	00	00	00	0	0.0
207	Bentgrass	00	00	00	00	00	00	0	0.0
207	Reed canarygrass	00	00	00	00	00	00	0	0.0
207	Salal	00	04	03	00	01	08	16	16.4
207	Bracken fern	01	00	00	00	00	01	2	2.0
207	Sword fern	02	00	00	00	00	02	4	4.1
207	Red alder	00	00	00	00	00	00	0	0.0

Plot No.	Species	Number of hits/line					Total Hits	Percent Cover	Percent Composition
		1	2	3	4	5			
207	Thimbleberry	02	00	00	01	00	03	6	6.1
207	E. Blackberry	00	00	00	00	00	00	0	0.0
207	H. Blackberry	00	03	00	03	00	06	12	12.2
207	Total vegetation	09	10	10	10	10	49	98	100.0
207	Bare soil/litter	00	01	01	00	00	02	4	
208	Red fescue	00	02	00	00	02	04	8	8.2
208	P. ryegrass	02	05	03	04	03	17	34	34.7
208	Tall fescue	00	00	00	00	00	00	0	0.0
208	Bentgrass	00	00	00	00	00	00	0	0.0
208	Reed canarygrass	00	00	00	00	00	00	0	0.0
208	Salal	08	02	06	03	04	23	46	46.9
208	Bracken fern	00	00	00	00	00	00	0	0.0
208	Sword fern	00	00	00	00	00	00	0	0.0
208	Red alder	00	00	00	00	00	00	0	0.0
208	Thimbleberry	00	00	00	00	00	00	0	0.0
208	E. Blackberry	00	00	00	00	00	00	0	0.0
208	H. Blackberry	00	01	01	03	00	05	10	10.2
208	Total vegetation	10	10	10	10	09	49	98	100.0
208	Bare soil/litter	01	00	00	00	01	02	4	

Five randomly selected line-point samplings were conducted in each experimental unit. A line-point transect was 5 meter long with a point dropped at 0.5 m intervals. Percent cover was calculated as the total number hits per species divided by the total number of points. Percent composition was calculated as the number of hits per species divided by the total vegetation hits per experimental unit.