E S T A B L I S H M E N T A N D S U R V I V A L O F
G R O U N D C O V E R P L A N T I N G S
O N D I S T U R B E D A R E A S I N A L B E R T A

Progress Report #3

REVEGETATION OF ROADSIDES

February 1974

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DISTURBED AREAS REVEGETATION STUDIES

REPORT #3

Introduction

This report deals with roadside revegetation and is the third in a series of reports on the revegetation of non-cultivated disturbed areas in Alberta. On roadsides, like pipelines and unlike powerlines there is no question whether or not revegetation is required. The main problem is to find out what species are best suited to the job.

A general survey of roadside vegetation was done in order to see what species it consisted of. The results of this survey were then compared to the Department of Highways and Transport's records of seeding conducted from 1963 - 1972 in order to assess the suitability of the seed mixtures used in the past.

Objectives

To determine what species form the major portion of roadside vegetation at the present time.

To see what affect the soil type and aspect[1] have on the vegetation.

Determination of the survival of the Department of Highways and Transport's roadside ground cover plantings.

To find native and naturalized species suitable for use in the various soil zones.

1. Aspect is the compass direction which a slope faces.

Methods

The study sites were located along highways and some secondary roads in order to provide as complete a coverage of the province as possible and to provide as wide a range of planting dates within each soil zone as possible. The sites were restricted to highways and major secondary roads because these are the areas where data on what species were used for seeding is available.

At each site 10 one meter square plots were located in the right-of-way. The positions of the 10 plots were chosen to include as much of the topographic and vegetational variation as possible. Within each plot a list of species present was made and the ground cover of all species covering more than one percent was estimated and recorded.

The data collected were then separated according to soil types, soil zone and aspect. The six soil zones used were based on the Alberta Soil Survey and included the brown, dark brown, thin black, black, degraded black and grey wooded soil zones. Within each zone the soils were divided into two types based on soil texture. The first group included sands and sandy loams and was called sandy soils. The second group called silty soils included loams, clay loams and silt loams. Each soil type within each soil zone was then divided into 6 groups on the basis of aspect. The first group consisted of plots located on level sites. The second group consisted of plots located on north and north-east facing slopes. Group three included east and south-east facing slopes, group four south and south-west facing slopes, and group five west and north-west facing slopes. Group six consisted of those plots which could not be classified by aspect.

For each soil type within each soil zone the data were separated into groups based on the year each site was seeded. The data was then compared to what was seeded on each soil type in those years for which data was available in order to determine the survival of the seedings. Finally the data was compared by year of planting to see if any trends in survival could be found. That is, to what extent would any species planted in a particular area tend to increase or decrease with time.

Results and Discussion - vegetation survey

Tables I - XII summarze the data gathered in the roadside survey. These tables show the relationship between soil type, soil zone and aspect. Only those species likely to be important in seeding programs and the important weed species are included. The other species were ommitted to save space and because they are of little significance to reseeding projects.

The differences of vegetation on different slopes which these data show appears to be more related to site difference than to aspect. That is, when the north slope in a soil zone and type has a high rating for a species then the south slope tends to have a high rating also. The same holds for east and west slopes. The reason for this pairing is when a site is on an east-west road most of the plots sampled on slopes will be north or south facing since they will be in the ditches, on backslopes, or on fills. Because the sites were not all done by the same crew differences between observers could account for some of the site related differences. The reason for believing these slope differences are due to the above and not due to aspect is that, were the differences due to aspect, the north and south slopes would be at opposite ends of the

scale with the east and west slopes, and the level sites falling between the north and south slopes.

Since any differences due to aspect are in this data obscured by site and observer differences no consideration of aspect will be used in the discussion. The discussion will instead be limited to soil type and soil zone differences. This is not a serious limitation since for practical reasons the seed mixture used will be the same for all aspects within a soil zone and thus will have to have in it species able to provide suitable ground cover on all slopes.

On sandy soils in the brown soil zone (Table I) Agropyron cristatum (Crested Wheat Grass) is the most important ground cover species. Bromus inermis (Smooth Brome) is the only secondary species of much importance. Melilotus spp. (Sweet Clover - includes M. alba and M. occidentalis) are the most common legumes present. Other legumes present include Medicago sativa (Alfalfa) and Vicia spp. (Wild Vetch - includes V. americana and V. sparsifolia). The most prominent weeds are Hordeum jubatum (Foxtail Barley) and Cirsium arvense (Canada Thistle). On silty soils in the brown soil zone (Table II) Bromus inermis assumes about equal importance with Agropyron cristatum as a ground cover species and on some sites Poa spp. (Bluegrasses) mainly P. pratensis (Kentucky Bluegrass) with some P. secunda (Sandberg Bluegrass) and occasional other Poa species. The legumes on silty soils are the same as those on sandy soils with Medicago sativa being as common as the Melilotus spp. In addition to Hordeum jubatum and Cirsium arvense, Taraxacum officinale (Dandelion), Sonchus arvensis (Sow Thistle) and Bromus tectorum (Cheat Grass) are the major weeds present on silty soils in the brown soil zone.

To the north and west of the brown soil zone lies the dark brown soil zone (Tables III & IV). Bromus inermis takes over from Agropyron cristatum as the major ground cover species, with A. cristatum remaining as the second most important species. Poa spp. and Festuca rubra (Red Fescue) provide significant amounts of ground cover on some sites. Melilotus spp., Medicago sativa, Trifolium hybridum (Alsike Clover) and some Vicia spp. are the most common legumes along roadsides in this soil zone. The most common weed species are Sonchus arvensis, Taraxacum officinale and Cirsium arvense along with some Hordeum jubatum and Agropyron repens (Quack Grass). The major difference between the silty and sandy soils in this soil zone is an increase in cover of most of the more common species, including weeds, on the silty soils. The one noticeable exception is Melilotus spp. which did not change in cover to any great extent.

The thin black soil zone (Tables V & VI) which forms the southern and eastern half of the black soil zone has similar roadside vegetation to the dark brown soil zone. The major differences are the decrease in importance of Agropyron cristatum and the increase in importance of Phleum pratense (Timothy). There is little difference between the sandy and silty soils in this soil zone. The only difference is an apparent increase in Festuca rubra and Poa spp. on the silty soils. In this soil zone the Poa spp. will be mainly P. pratensis with some P. interior (Interior Bluegrass), P. canbyi (Canby Bluegrass) and occasionally other species.

Within the black soil zone (Tables VII & VIII) Bromus inermis is the most important species on both sandy and silty soils. Poa spp.

mainly the same species as in the thin black soil zone form the second most important group of species. Festuca rubra, Phleum pratense and Agropyron cristatum are also important species on some sites. Both Festuca rubra and Phleum pratense are more common on silty soils than on sandy soils. The important legumes present are Trifolium hybridum, Medicago sativa, Melilotus spp., Trifolium pratense (Red Clover) and T. repens (White Clover). Both T. hybridum and T. pratense are apparently more common on silty soils than on sandy soils. Taraxacum officinale and Agropyron repens are the most common weeds present with A. repens being more common on silty than sandy soils. Other weeds present include Sonchus arvensis, Cirsium arvense, Hordeum jubatum and Plantago major (Common Plantain). Native species often present include Achillea millefolium (Yarrow), Vicia spp. including V. cracca as well as V. americana and V. sparsifolia, and Equisetum spp. (Horsetails) including E. arvense (Field horsetail), E. pratense and E. sylvaticum (Woodland Horsetail). All of which are apparently somewhat more common on silty soils than on sandy soils.

Bromus inermis is the most prominent ground cover species in the degraded black soil zone (Tables IX & X). Festuca rubra, Poa spp. and Phleum pratense are the other important grasses in providing ground cover along roadsides in this soil zone with Agropyron cristatum only occasionaly providing significant ground cover. Phleum pratense which was more common on silty soils was the only one of these species to show any differences between the silty and sandy soils. Major legume species include Medicago sativa, Trifolium hybridum, T. pratense, T. repens and at some sites Melilotus spp.. T. hybridum and T. pratense were both

more common on the silty soils. The major weed species were Taraxacum officinale, Hordeum jubatum, Agropyron repens and Sonchus arvensis. Avena fatua (Wild Oat) was also found occasionally. Of the native species found Achillea millefolium and Equisetum species were the most common. Vicia spp. and Lathyrus ochroleucus (Pea Vine) were also found occasionally.

In the grey wooded soil zone (Tables XI & XII) Bromus inermis, Festuca rubra, Poa spp. and Phleum pratense are the important grasses providing ground cover. Melilotus spp., Trifolium hybridum, T. repens and T. pratense were the most common legume species found along roadsides in the grey wooded soil sone. Taraxacum officinale was the major weed species encountered. Other weeds present included Agropyron repens, Hordeum jubatum, Sonchus arvensis and Plantago major. The most common native species present included Achillea millefolium, Equisetum spp., Salix spp.(Willows), Vicia spp., Epilobium angustifolium (Fireweed), Fragaria virginiana (Wild Strawberry), and Lathyrus ochroleucus. Within the grey wooded soil zone no important differences between the sandy and silty soils were found.

With the exception of the brown soil zone there appears to be to high a proportion of sandy soils within each soil zone. This may be due to the fact that the soil texture was sampled in the top 1 - 2" of soil. It is possible that this region of soil has been enriched with sand because of road sanding in the winter. The soil samples taken from 0 - 6" for laboratory analysis will provide a check on this. If the high porportion of sandy soils is due to road sanding enriching the surface with sand, then the laboratory samples which include material from lower

in the solum, should show a higher proportion of silty soils. The laboratory analysis of these soils will be discussed in the next report in this series.

- Survival of seedings and suitability of seed mixture

Tables XIII - XXIV summarize the data for determining the survival of the Department of Highways and Transport's seeding projects. The number of plots within each soil zone and type will be less than in the general survey because some of the sites used in the general survey came from areas where the date of planting and the seed mixture used were not available. Only the 10 species used by the Department of Highways and Transport were included in the tables. Data is given for each species only for the years it was planted. The years that a species was not planted are marked with an N even though in many cases the species was also present at these sites.

Agropyron cristatum the only species used in all 10 years of plantings was also the only species used which did consistently well on sandy soils in the brown soil zone. This is one of the best species for use in the brown and dark brown soil zones. In the thin black and black soil zones it is useful on the drier sites, but it is of little use in the degraded black and grey wooded soil zones.

Although Bromus inermis was first used in 1966 it has proved to be one of the most valuable ground cover species in all six soil zones. It provides cover on the moister sites of the brown soil zone and on the drier sites in the grey wooded soil zone. This is a common and widespread species which has invaded and provides good ground cover on many sites planted prior to 1966 when it was not included in the seed mixture.

Festuca rubra was used in 1963 and 64, and again in 1970, 71 and 72. It is of little value in the brown, dark brown, and thin black soil zones. It is useful on some sites in the black, degraded black and grey wooded soil zones, where along with Phleum pratense it provides a large amount of the ground cover on sites not dominated by Bromus inermis. Phleum pratense was used from 1967 to 1972. It is useful on similar sites to Festuca rubra but does not provide as much ground cover as that species does.

Although it was seeded in 1963 and 64 only, Poa pratensis has managed to invade and provide good ground cover on sites planted since 1964. This is especially true in the black and degraded black soil zones to which the species seems best adapted. However, it does provide good ground cover on some sites in the other soil zones including a few sites in the brown soil zone.

The Melilotus spp. were first used in 1964 and general use of them was stopped after 1966. However, after 1966 they were occasionally used on sites where erosion was thought to be a problem. Because of its rank growth, weedy tendencies and annual growth pattern it is not a particularily good species for use along roadsides. It may however, have some use as an original colonizer in areas where erosion is a problem providing it is planted with perennials which will in time choke it out.

In 1966 and 67 Medicago sativa was planted. This species does not provide much ground cover at any site but it does appear to be able to survive in each of the soil zones. This indicates that other varieties may be more useful. However, even without being able to

provide good ground cover, it could be a valuable component of roadside seeding mixtures because of its nitrogen fixing ability.

Trifolium hybridum was used in 1963 and from 1967 - 72, T. pratense was used from 1966 - 69, and T. repens was used from 1966 - 72. None of these species provide a significant amount of ground cover at any sites. They provide more ground cover in the black, degraded black and grey wooded soil zones than in the other three soil zones. Like Medicago sativa there may be other varieties better suited to provide the ground cover. Even without finding better varieties these species would be useful in seeding mixtures because of their ability to fix nitrogen when innoculated with the appropiate bacteria. The appropriate use for these and other legumes may in fact be to provide a continuous nitrogen supply for the grasses so they are better able to provide the ground cover needed to control weeds and erosion.

Only two of the species used were planted over a wide enough span of the 10 years for any survival trends to be expected to show up. The two species were Agropyron cristatum planted in all 10 years and Festuca rubra planted in the first two and last 3 years covered by the survey. No trend to increase or decrease with time was apparent for either of these species. This indicates the vegetation has either been unable to or has not had enough time to alter the habitat enough to favor or hinder either of these two species.

The seed mixture presently in use contains 40% Bromus inermis, 25% Agropyron cristatum, 15% Festuca rubra, 8% Phleum pratense, 7% Trifolium hybridum, and 5% T. repens. While this mixture has been able to control erosion on most sites it has not been able to control weeds to a desireable extent. This is particularily true of the perennial

weeds like Cirsium arvense, Taraxacum officinale, Sonchus arvensis, Agropyron repens, and Hordeum jubatum. Annual weeds such as Avena fatua, Chenopdium album (Lambs Quarters) and Thlaspi arvenses (Stinkweed, Pennycress) are in most cases well controlled by the seed mixture now in use.

The major problem with the present seed mixture (and those used in the past) is that it attempts to cover too wide a range of habitats with the same mixture. This results in only one or two species being available for each habitat. For example, in the brown soil zone only two of the species used provided much ground cover. They were Agropyron cristatum in the drier habitats and Bromus inermis in the moister habitats. The seed of the other 4 species is essentially wasted in this soil zone even though some of the plants managed to survive in some habitats. Alternatively the seed of Agropyron cristatum is wasted in the black, degraded black, and grey wooded soil zones where the Festuca rubra, Phleum pratense, Trifolium hybridum, and T. repens grow well.

In order to keep down infestations of perennial weeds a mixture of species is required because one or two species often cannot provide enough competition to keep out perennial weeds. A mixture of several species is advantageous because of the increased stability of the community formed. A one or two species community is easily invaded by weeds if the cover of one of the species is reduced due to disease or insect damage. When several species are present there is a much greater chance that the unaffected species can increase their cover to provide enough competition so that weed invasion of the stand will not take place.

Thus to be effective a roadside seeding mixture should contain several species adapted to each of the habitats of the area in which it is being used. Due to the wide range of habitats found in Alberta this will probably require the use of several seed mixtures each one designed for a specific region of the province. A good seed mixture should include several species native or naturalized to the area because they are known to be adapted to the climatic conditions and are usually able to limit the infestations of perennial as well as annual weeds.

The following list of species is recommended for consideration for inclusion in future roadside seeding mixtures. This list is based mainly on the lists of species recommended for future study in reports 1 and 2 of this series. The majority of the shrubs were rejected as being unsuitable for roadside plantings. They are unsuitable because if left uncut they provide traps for drifting snow, and when cut regularly most do not provide much competition to aid in reducing weed infestations. An asterisk preceeding a species indicates that the species was found along roadsides by the survey or was observed growing well along some roadside not covered by the survey. The lack of an asterisk does not mean that the species does not grow along roadsides, it merely indicates that the species was not found in significant quantities along roadsides during the course of this survey. The code used to indicate which soil zones a species is expected to be useful in is as follows:

Code	Soil Zone	Code	Soil Zone
Br	Brown	Bl	Black
DBr	Dark Brown	DBl	Degraded Black
TBl	Thin Black	GW	Grey Wooded

Additional species for Roadside Plantings:

	Species	Soil Zones
*	Agropyron dasystachyum	Bl, DBl, GW
*	A. smithii	Br → GW
*	A. trachycaulum	Br → GW
	Agrostis borealis	GW
*	A. gigantea	Bl, DBl, GW
	A. scabra	GW
	Arctostaphylos uva-ursi	Bl, DBl, GW
	Astragalus canadensis	TBl → GW
	Bouteloua gracilis	Br, DBr
	Bromus pumpellianus	DBl, GW
	Calamovilfa longifolia	Br, DBr
	Deschampsia caespitosa	Br → GW
*	Elymus canadensis	Br, DBr
*	E. innovatus	Bl, DBl, GW
	Festuca brachyphylla	GW
	F. ovina	DBl, GW
	F. scabrella	DBr → DBl
	Glyceria pulchella	DBl, GW
*	Hedysarum alpinum	TBl → GW
	Hierochloe odorata	TBl → GW
*	Koeleria cristata	Br, DBr, TBl
	Lathyrus ochroleucus	TBl → GW
	Lupinus argenteus	DBl, GW
	Medicago falcata	DBl, GW
*	Oryzopsis hymenoides	Br, DBr
	O. pungens	Bl, DBl, GW

	Oxytropis sericea	Br → DBl
	O. splendens	Dr, DBr, TBl
	Phleum alpinum	TBl → GW
	Poa alpina	Foothills & Mtns.
	P. ampla	Br → GW
	P. compressa	DBl, GW
	P. palustris	DBl, GW
	Potentilla tridentata	GW
*	Puccinellia distans	Br → GW
*	Stipa comata	Br, DBr
*	Stipa spartea var curtiseta	DBr → DBl
	Trifolium medium	DBl, GW
	Vaccinium myrtilloides	Bl, DBl, GW
	V. vitis - idaea	DBl, GW
*	Vicia americana	DBr → GW
*	V. cracca	TBl → GW
*	V. sparsifolia	Br → Bl

TABLE I

Roadside Right-Of-Way Vegetation

Brown Soil Zone - Sandy Soil

Species	Level 6 plots	N-slope 9 plots	E-slope 10 plots	S-slope 7 plots	W-slope 14 plots
Agropyron cristatum	4 - 1[1]	8 - 0	9 - 1	6 - 1	13 - 1
Agropyron trachycaulum	1 - 1	0 - 6	0 - 6	0 - 6	1 - 4
Bromus inermis	1 - 3	4 - 1	5 - 3	4 - 3	3 - 5
Festuca rubra	1 - 0	1 - 0	1 - 1		
Poa sp.	0 - 3	1 - 1	0 - 3	0 - 1	1 - 1
Phleum pratense			1 - 0		0 - 1
Stipa sp.		0 - 1			1 - 0
Oryzopsis hymenoides		0 - 1			
Koeleria cristata			0 - 1		0 - 3
Medicago sativa	0 - 1	0 - 1	0 - 1		0 - 1
Symphoricarpos occidentalis	0 - 1		0 - 1		
Rosa sp.	0 - 1	1 - 3	0 - 1	0 - 1	1 - 1
Hordeum jubatum	0 - 1	0 - 1	0 - 3	0 - 2	0 - 4
Cirsium arvense	0 - 3	1 - 0	0 - 2	0 - 1	0 - 2
Taraxacum officinale	0 - 1			0 - 1	
Salsola kali	0 - 1			1 - 0	
Melilotus sp.	0 - 2	0 - 2	0 - 1	0 - 1	1 - 1

1 The first number of the pair gives the number plots in which the species had a cover of greater than one percent. The second gives the number of plots in which the species was present but with a cover of less than one percent. This system is used in tables I - XXIV.

TABLE II

Roadside Right-Of-Way Vegetation

Brown Soil Zone - Silty Soil

Species	Level 32 plots	N-slope 34 plots	E-slope 25 plots	S-slope 37 plots	W-slope 23 plots	Unclassified 13 plots
Agropyron cristatum	14 - 1	13 - 11	17 - 5	15 - 11	11 - 6	4 - 0
Bromus inermis	8 - 7	21 - 5	7 - 9	22 - 9	8 - 5	8 - 1
Poa sp.	8 - 2	11 - 6	3 - 5	9 - 6	4 - 5	8 - 0
Agropyron trachycaulum	3 - 1	1 - 3	1 - 3	2 - 7	2 - 3	4 - 0
Agropyron smithii	1 - 0	2 - 2		0 - 6	1 - 5	
Festuca rubra	1 - 2	2 - 5	1 - 2	0 - 3	0 - 3	
Phleum pratense	3 - 3	1 - 0	1 - 1	2 - 3	1 - 3	
Dactylis glomerata		0 - 2			0 - 1	
Koeleria cristata		0 - 5	1 - 1	0 - 6	0 - 6	
Stipa sp.	0 - 1	0 - 1	1 - 0	1 - 2		
Medicago sativa	4 - 4	2 - 5	2 - 2	3 - 6	0 - 4	1 - 1
Trifolium hybridum	1 - 2	0 - 1				
Trifolium repens		0 - 1		0 - 1	0 - 1	
Trifolium pratense		0 - 1				
Melilotus sp.	2 - 8	3 - 9	3 - 6	2 - 10	1 - 6	
Rosa sp.	0 - 1	1 - 0		0 - 1	0 - 1	
Kochia scoparia					1 - 0	2 - 0
Setaria viridis					0 - 1	
Bromus tectorum	0 - 2	0 - 4	0 - 2	0 - 2		
Rumex sp.	1 - 0			0 - 1		
Polygonum aviculare	1 - 0					
Cirsium arvense	3 - 3	3 - 4	2 - 0	3 - 4	1 - 3	2 - 1
Salsola kali	1 - 1					
Hordeum jubatum	11 - 0	2 - 2	3 - 1	3 - 2	4 - 2	0 - 4
Sonchus arvensis	6 - 1	0 - 3	1 - 1		2 - 0	
Taraxacum officinale	3 - 5	1 - 2		2 - 2	0 - 1	3 - 0

TABLE III

Roadside Right-Of-Way Vegetation

Dark Brown Soil Zone - Sandy Soil

Species	Level 32 plots	N-slope 34 plots	E-slope 25 plots	S-slope 11 plots	W-slope 10 plot
Agropyron cristatum	2 - 4	7 - 3	7 - 0	7 - 1	4 - 2
Bromus inermis	6 - 9	11 - 4	5 - 8	8 - 2	6 - 3
Poa sp.	3 - 0	2 - 3	1 - 0	1 - 2	2 - 0
Festuca rubra	7 - 1	3 - 2	3 - 1	1 - 3	2 - 2
Agropyron sp.	1 - 1	1 - 0	0 - 1		2 - 2
Phleum pratense	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Koeleria cristata		0 - 1			
Dactylis glomerata				1 - 0	
Stipa sp.	0 - 1				0 - 2
Trifolium hybridum	2 - 4	0 - 5	2 - 1	1 - 0	1 - 0
Medicago sativa	0 - 7	1 - 5	2 - 8	0 - 5	1 - 3
Trifolium pratense	0 - 4		0 - 1		0 - 2
Melilotus sp.	0 - 6	1 - 6	3 - 7	2 - 6	3 - 4
Rosa sp.	1 - 4	2 - 8	0 - 1	1 - 5	1 - 4
Symphoricarpos albus	0 - 2			0 - 1	0 - 1
Elaeagnus commutata	0 - 4	1 - 1	0 - 1	0 - 1	
Sonchus arvensis	1 - 4	0 - 6	0 - 4	1 - 3	1 - 2
Taraxacum officinale	0 - 7	1 - 1	0 - 4	0 - 2	0 - 4
Cirsium arvense	0 - 3	0 - 3	0 - 3	1 - 4	
Hordeum jubatum	0 - 1	0 - 2	1 - 1	0 - 1	0 - 1
Chrysanthemum leucanthemum		0 - 1			
Agropyron repens			2 - 1	0 - 1	0 - 1
Salsola kali			0 - 1		

TABLE IV

Roadside Right-Of-Way Vegetation

Dark Brown Soil Zone - Silty Soil

Species	Level 23 plots	N-slope 26 plots	E-slope 13 plots	S-slope 25 plots	W-slpoe 13 plots	Unclassified 4 plots
Agropyron cristatum	11 - 2	8 - 2	12 - 1	9 - 5	10 - 2	1 - 0
Bromus inermis	12 - 5	19 - 6	4 - 5	16 - 6	3 - 6	1 - 0
Poa sp.	5 - 5	6 - 6	2 - 2	8 - 3	2 - 0	0 - 1
Festuca rubra	5 - 8	8 - 6	1 - 1	7 - 3		
Phleum pratense	1 - 1	0 - 4	1 - 2	0 - 3	0 - 1	
Agropyron sp.	5 - 2	1 - 2	1 - 1	1 - 5	1 - 2	3 - 0
Dactylis glomerata					0 - 2	
Stipa sp.	0 - 1					
Koeleria cristata	0 - 1					
Medicago sativa	0 - 9	3 - 14	0 - 4	2 - 9	0 - 2	
Trifolium hybridum	0 - 7	1 - 5		0 - 5	0 - 1	
Trifolium pratense		1 - 0				
Trifolium repens		0 - 3				
Melilotus sp.	2 - 7	4 - 7	0 - 1	3 - 6	2 - 3	
Symphoricarpos albus	0 - 3	0 - 4	0 - 2	1 - 2	2 - 3	
Rosa sp.	1 - 5	0 - 6	0 - 3	1 - 6	0 - 3	
Agropyron repens		0 - 2		2 - 1	0 - 1	
Setaria viridis				2 - 0		
Hordeum jubatum	0 - 2	1 - 1	0 - 2	2 - 1	0 - 1	
Thlaspi arvense	0 - 1					
Cirsium arvense	0 - 6	0 - 8	1 - 1	2 - 6	0 - 2	1 - 2
Taraxacum officinale	4 - 9	5 - 10	0 - 4	3 - 12	0 - 7	1 - 0
Sonchus arvensis	0 - 2	0 - 4	0 - 1	1 - 5		

TABLE V

Roadside Right-Of-Way Vegetation

Thin Black Soil Zone - Sandy Soil

Species	Level 27 plots	N-slope 10 plots	E-slope 17 plots	S-slope 8 plots	W-slope 21 plots
Bromus inermis	16 - 11	5 - 4	13 - 4	5 - 3	15 - 6
Agropyron cristatum	3 - 6	3 - 1	3 - 4	1 - 2	4 - 8
Festuca rubra	3 - 11	4 - 3	1 - 6	2 - 3	3 - 8
Poa sp.	7 - 6	4 - 2	2 - 2	0 - 4	3 - 4
Phleum pratense	3 - 10	0 - 3	3 - 6	0 - 4	1 - 9
Agropyron sp.	2 - 4	0 - 3	0 - 1		0 - 6
Koeleria cristata	0 - 1				0 - 1
Elymus innovatus		0 - 1			0 - 1
Stipa sp.					0 - 1
Medicago sativa	5 - 9	1 - 4	4 - 6	1 - 1	5 - 6
Trifolium hybridum	2 - 14	0 - 5	1 - 10	0 - 4	0 - 9
Trifolium repens	0 - 3		0 - 2		0 - 1
Trifolium pratense	0 - 8	0 - 1	1 - 5	0 - 2	0 - 3
Melilotus sp.	1 - 12	0 - 5	2 - 4	0 - 4	2 - 6
Rosa sp.	0 - 5	0 - 4	0 - 2	0 - 4	0 - 2
Thlaspi arvense	0 - 4			0 - 2	0 - 1
Agropyron repens	0 - 1		2 - 1		1 - 0
Chenopodium album			0 - 2		
Plantago major			0 - 1		
Taraxacum officinale	2 - 12	0 - 8	0 - 7	0 - 6	0 - 9
Sonchus arvensis	0 - 6	0 - 2	1 - 3	1 - 2	1 - 5
Cirsium arvense	0 - 11	0 - 6	0 - 8	0 - 6	0 - 3
Hordeum jubatum	0 - 6	0 - 2	0 - 2	0 - 1	0 - 6

TABLE VI

Roadside Right-Of-Way Vegetation

Thin Black Soil Zone - Silty Soil

Species	Level 23 plots	N-slope 13 plots	E-slope 10 plots	S-slope 16 plots	W-slope 10 plots	Unclassified 1 plot
Bromus inermis	11 - 12	7 - 6	8 - 2	9 - 6	8 - 2	1 - 0
Festuca rubra	4 - 5	4 - 1	3 - 1	6 - 1	1 - 2	1 - 0
Agropyron cristatum	6 - 5	2 - 1	2 - 3	2 - 5	3 - 6	0 - 1
Poa sp.	7 - 5	8 - 1	2 - 4	5 - 1	3 - 1	
Phleum pratense	4 - 8	3 - 2	1 - 6	3 - 3	0 - 5	
Agropyron sp.	0 - 2		0 - 2	0 - 3	0 - 2	
edicago sativa	3 - 5	1 - 4	1 - 3	2 - 5	0 - 4	0 - 1
Trifolium pratense	0 - 4	0 - 4	0 - 1	0 - 4		
Trifolium hybridum	1 - 11	0 - 4	0 - 4	1 - 4	0 - 6	
Melilotus sp.	1 - 6	1 - 5	0 - 2	0 - 4	0 - 1	0 - 1
Rosa sp.	0 - 2	0 - 1		0 - 3	0 - 1	
Thlaspi arvense	0 - 1					
Sonchus arvensis	0 - 3	0 - 1	0 - 1	0 - 1		
Chenopodium album	0 - 1	0 - 1		0 - 1	0 - 1	
Hordeum jubatum	1 - 3	0 - 2	0 - 1			
Agropyron repens	1 - 1	1 - 0	0 - 1	1 - 2	1 - 1	
Taraxacum officinale	1 - 16	1 - 9	0 - 8	1 - 8	0 - 5	0 - 1
Cirsium arvense	0 - 12	0 - 8	0 - 4	1 - 6	0 - 6	0 - 1

TABLE VII

Roadside Right-Of-Way Vegetation

Black Soil Zone - Sandy Soil

Species	Level 25-plots	N-slope 21-plots	E-slope 20-plots	S-slope 30-plots	W-slope 16-plots	Unclassified 10-plots
Bromus inermis	13 - 4	16 - 5	9 - 7	22 - 3	11 - 4	10 - 0
Festuca rubra	8 - 4	5 - 7	4 - 2	8 - 5	5 - 3	0 - 3
Poa sp.	6 - 7	1 - 4	11 - 6	11 - 4	6 - 4	2 - 0
Phleum pratense	3 - 1	1 - 1	0 - 2	0 - 6	0 - 5	1 - 2
Agropyron cristatum	0 - 3	6 - 3	3 - 1	12 - 6	1 - 1	2 - 0
Agropyron smithii	1 - 1	1 - 2	0 - 2	0 - 3		0 - 1
Agropyron trachycaulum	1 - 1	1 - 1	0 - 1		0 - 1	
Trifolium hybridum	4 - 4	3 - 0	3 - 7	5 - 2	1 - 7	
Trifolium pratense	3 - 8	2 - 3	0 - 2	1 - 5	0 - 4	
Trifolium repens	2 - 3	0 - 4		2 - 2	0 - 1	1 - 0
Medicago sativa	2 - 4	5 - 5	1 - 4	2 - 7	0 - 5	
Melilotus sp.	1 - 4	2 - 3	1 - 5	6 - 2	0 - 5	
Rosa sp.	0 - 4	0 - 1	1 - 2	0 - 3	0 - 2	
Taraxacum officinale	6 -10	4 - 9	0 -11	3 -14	0 - 9	0 - 4
Agropyron repens	1 - 4	0 - 1	3 - 6	3 - 4	2 - 4	3 - 0
Cirsium arvense	0 - 1	0 - 1	0 - 8	1 - 6	0 - 9	0 - 1
Sonchus arvensis	0 - 3	0 - 7	0 - 7	1 - 5	0 - 7	0 - 3
Hordeum jubatum	1 - 0	0 - 1	0 - 3	0 - 1	0 - 2	
Plantago major		0 - 1	0 - 1	0 - 1	0 - 1	

TABLE VIII

Roadside Right-Of-Way Vegetation

Black Soil Zone - Silty Soil

Species	Level 55-plots	N-slope 33-plots	E-slope 35-plots	S-slope 22-plots	W-slope 37-plots	Unclassified 6-plots
Bromus inermis	22 - 12	14 - 13	18 - 11	15 - 2	19 - 12	3 - 1
Poa sp.	21 8	13 - 5	18 - 8	12 - 2	16 - 10	
Festuca rubra	11 - 7	8 - 8	9 - 5	6 - 6	14 - 6	2 - 0
Phleum pratense	7 - 13	5 - 8	5 - 6	3 - 10	5 - 8	0 - 1
Agropyron cristatum	7 - 4	6 - 7	4 - 6	6 - 5	1 - 5	0 - 1
Agropyron sp.	3 - 1	0 - 1			0 - 1	
Agropyron dasystachyum	1 - 1	0 - 1	2 - 1	2 - 0	2 - 2	
Puccinellia sp.	1 - 0		1 - 0			
Agrostis gigantea	1 - 0					
Elymus innovatus			0 - 1			
Trifolium hybridum	9 - 19	4 - 14	12 - 13	3 - 7	7 - 18	
Trifolium pratense	5 - 12	4 - 10	1 - 16	1 - 5	4 - 6	
Trifolium repens	0 - 8	0 - 7	0 - 3	0 - 1	1 - 4	0 - 1
Medicago sativa	2 - 13	0 - 7	0 - 15	1 - 7	0 - 13	1 - 0
Melilotus sp.	4 - 8	0 - 5	0 - 9	0 - 5	0 - 10	1 - 0
Rosa sp.	1 - 2	0 - 6	0 - 2	1 - 3	0 - 2	0 - 1
Plantago major	0 - 5	0 - 1	0 - 4		0 - 6	
Taraxacum officinale	4 - 33	5 - 15	6 - 22	2 - 12	4 - 26	1 - 1
Agropyron repens	13 - 13	7 - 9	10 - 9	4 - 2	15 - 7	
Sonchus arvensis	2 - 15	0 - 8	0 - 15	1 - 8	0 - 10	0 - 1
Cirsium arvense	2 - 13	0 - 12	0 - 14	1 - 7	0 - 17	1 - 0
Hordeum jubatum	1 - 3	0 - 1	0 - 2		1 - 3	0 - 2

TABLE IX

Roadside Right-Of-Way Vegetation

Degraded Black Soil Zone - Sandy Soil

Species	Level 20-plots	N-slope 25-plots	E-slope 18-plots	S-slope 25-plots	W-slope 11-plots
Bromus inermis	10 - 5	19 - 3	14 - 4	15 - 8	6 - 3
Festuca rubra	5 - 4	10 - 5	3 - 6	5 - 8	4 - 3
Poa pratensis	3 - 5	3 - 5	3 - 3	6 - 6	2 - 2
Phleum pratense	2 - 6	3 - 6	0 - 5	4 - 6	4 - 1
Agropyron cristatum	1 - 2	1 - 3	0 - 2	2 - 2	1 - 2
Agropyron smithii	0 - 1	1 - 0		1 - 1	
Puccinellia sp.		0 - 1			
Agropyron trachycaulum		0 - 1		0 - 1	
Elymus innovatus		1 - 0		0 - 1	
Trifolium hybridum	3 - 3	2 - 13	2 - 7	5 - 7	1 - 4
Trifolium pratense	0 - 7	5 - 9	0 - 9	4 - 9	5 - 3
Trifolium repens	3 - 1	4 - 2	3 - 0	3 - 3	2 - 2
Medicago sativa	2 - 4	1 - 4	6 - 8	5 - 8	1 - 5
Melilotus sp	0 - 2	2 - 10	1 - 9	3 - 13	1 - 5
Rosa sp.	0 - 5	0 - 7	0 - 1	0 - 3	0 - 1
Taraxacum officinale	7 - 8	6 - 14	7 - 8	8 - 14	3 - 6
Thlaspi arvense	0 - 1			0 - 1	0 - 1
Chenopodium album	0 - 1			0 - 2	
Agropyron repens	4 - 0	2 - 0	2 - 0	1 - 5	
Cirsium arvense	0 - 3		0 - 1		
Sonchus arvensis	0 - 1	0 - 2	1 - 5	0 - 3	0 - 2
Plantago major	0 - 1	0 - 3	0 - 5	0 - 4	0 - 2
Hordeum jubatum		1 - 4	1 - 6	1 - 4	1 - 0
Polygonum aviculare		0 - 1		0 - 1	0 - 1

TABLE X

Roadside Right-Of-Way Vegetation

Degraded Black Soil Zone - Silty Soil

Species	Level 50-plots	N-slope 21-plots	E-slope 11-plots	S-slope 26-plots	W-slope 15-plots
Bromus inermis	24 - 17	11 - 8	7 - 1	16 - 8	5 - 9
Festuca rubra	15 - 10	4 - 10	2 - 1	10 - 5	4 - 0
Poa pratensis	9 - 10	3 - 2	1 - 3	0 - 2	3 - 4
Phleum pratense	15 - 16	5 - 8	3 - 2	5 - 12	0 - 1
Agropyron cristatum	1 - 12	2 - 4	1 - 4	3 - 5	0 - 3
Agropyron smithii	2 - 1	0 - 1			
Agropyron trachycaulum	3 - 4		1 - 0	1 - 1	1 - 0
Agrostis gigantea	1 - 0				
Elymus innovatus	1 - 2				0 - 1
Trifolium pratense	9 - 23	7 - 6	2 - 5	10 - 8	4 - 2
Trifolium hybridum	13 - 13	1 - 6	1 - 6	6 - 8	3 - 6
Trifolium repens	6 - 7	4 - 7	1 - 0	2 - 7	2 - 2
Medicago sativa	6 - 10	0 - 5	1 - 8	4 - 12	5 - 5
Melilotus sp.	1 - 11	0 - 8	0 - 5	1 - 12	1 - 6
Rosa sp.	0 - 9	0 - 1	0 - 1	0 - 2	0 - 1
Taraxacum officinale	6 - 35	1 - 14	3 - 7	2 - 20	5 - 8
Hordeum jubatum	5 - 13	2 - 5	0 - 2	1 - 4	1 - 4
Cirsium arvense	0 - 4			0 - 2	0 - 2
Plantago major	0 - 8	0 - 3		0 - 5	0 - 3
Agropyron repens	3 - 4	3 - 3	0 - 2	2 - 1	1 - 2
Chenopodium album	0 - 3	0 - 2		0 - 2	
Thlaspi arvense	0 - 1	0 - 2		0 - 1	
Polygonum aviculare	0 - 2				
Sonchus arvensis	0 - 1		0 - 2	0 - 4	0 - 4

TABLE XI

Roadside Right-Of-Way Vegetation

Grey Wooded Soil Zone -Sandy Soil

Species	Level 47-plots	N-slope 44-plots	E-slope 44-plots	S-slope 43-plots	W-slope 40-plots
Bromus inermis	16 - 13	17 - 8	23 - 8	14 - 15	28 - 2
Festuca rubra	6 - 14	12 - 9	6 - 11	9 - 9	7 - 8
Poa sp.	9 - 13	5 - 12	2 - 11	6 - 11	1 - 11
Agropyron cristatum	1 - 4	3 - 5	3 - 6	2 - 6	0 - 4
Phleum pratense	9 - 8	7 - 11	0 - 9	3 - 13	0 - 10
Elymus innovatus	0 - 6	1 - 6	0 - 3	0 - 1	0 - 1
Agropyron smithii	1 - 2			0 - 3	0 - 2
Agrostis gigantea		0 - 2			
Agropyron trachycaulum		0 - 4	1 - 0	0 - 2	1 - 3
Trifolium hybridum	7 - 17	3 - 15	5 - 15	7 - 10	1 - 22
Trifolium repens	3 - 8	1 - 8	2 - 3	6 - 10	1 - 1
Medicago sativa	1 - 3	0 - 2	1 - 7	1 - 7	2 - 5
Melilotus sp.	1 - 9	2 - 17	4 - 17	8 - 17	5 - 22
Rosa sp.	2 13	0 - 9	1 - 11	1 - 7	1 - 5
Taraxacum officinale	7 - 23	4 - 27	8 - 21	5 - 26	2 - 23
Sonchus arvensis	0 - 2	0 - 4	0 - 4	1 - 5	0 - 3
Hordeum jubatum	0 - 4	1 - 5	1 - 8	1 - 8	0 - 3
Agropyron repens	3 - 1	1 - 1	3 - 2	2 - 1	3 - 0
Cirsium arvense	0 - 3	0 - 2		0 - 3	0 - 1
Plantago major		0 - 5	0 - 3	0 - 5	0 - 2
Trifolium pratense	3 - 14	2 - 21	2 - 12	3 - 14	3 - 7

TABLE XII

Roadside Right-Of-Way Vegetation

Grey Wooded Soil Zone - Silty Soil

Species	Level 65-plots	N-slope 34-plots	E-slope 34-plots	S-slope 28-plots	W-slope 33-plots
Bromus inermis	23 - 15	11 - 9	11 - 8	11 - 10	10 - 7
Festuca rubra	18 - 14	13 - 7	2 - 10	6 - 6	3 - 13
Phleum pratense	8 - 12	3 - 5	1 - 5	2 - 7	2 - 7
Poa sp.	5 - 15	7 - 5	3 - 10	6 - 3	2 - 7
Agropyron cristatum	2 - 4	3 - 1	0 - 4	2 - 0	0 - 2
Elumus innovatus	0 - 5		0 - 3	0 - 1	0 - 5
Agropyron trachycaulum	4 - 6	1 - 2	1 - 4	0 - 3	0 - 6
Agropyron smithii	2 - 4	0 - 2	0 - 2	0 - 3	0 - 3
Agrostis gigantea	0 - 3		0 - 1		0 - 1
Trifolium hybridium	7 - 21	1 - 9	8 - 4	2 - 7	0 - 9
Trifolium pratense	8 - 19	4 - 9	4 - 8	3 - 7	3 - 6
Trifolium repens	3 - 8	3 - 6	3 - 2	4 - 2	0 - 2
Medicago sativa	1 - 15	0 - 7	0 - 4	1 - 4	0 - 3
Melilotus sp.	0 - 15	3 - 6	4 - 12	2 - 7	2 - 13
Rosa sp.	0 - 22	1 - 9	0 - 9	1 - 9	0 - 7
Taraxacum officinale	11 - 39	1 - 19	4 - 15	2 - 15	2 - 15
Hordeum jubatum	0 - 6	0 - 4	2 - 4	0 - 3	2 - 3
Sonchus arvensis	0 - 4	0 - 1	0 - 1	0 - 1	0 - 2
Plantago major	0 - 11	0 - 2	0 - 3	0 - 2	0 - 2
Agropyron repens	3 - 2	3 - 2	2 - 1	3 - 2	3 - 2
Cirsium arvense	0 - 2	0 - 1	0 - 1	0 - 3	0 - 1

TABLE XIV

Survival of Roadside Seedings

Brown Soil Zone - Sandy Soils

Year	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Number of Plots		6	4		2		18	16		
Poa pratensis		-	N		N		N	N		
Melilotus spp.		-	1-0		N		N	N		
Medicago sativa		N	N		-		N	N		
Festuca rubra		-	N		N		N	-		
Agropyron cristatum		6-0	4-0		1-1		14-4	15-0		
Bromus inermis		N	N		2-0		11-5	1-5		
Trifolium hybridum		N	N		-		-	-		
T. pratense		N	N		-		-	N		
T. repens		N	N		-		-	-		
Phleum pratense		N	N		-		-	0-1		

TABLE XV

Survival of Roadside Seedings

Dark Brown Soil Zone - Silty Soils

Year	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Number of Plots		10	15	6	10		10	1	7	
Poa pratensis		3-2	N	N	N		N	N	N	
Melilotus spp.		0-3	-[1]	3-3	N		N	N	N	
Medicago sativa		N	N	N	3-2		N	N	N	
Festuca rubra		4-0	N	N	N		N	-	1-0	
Agropyron cristatum		8-1	7-0	6-0	4-3		1-2	-	4-0	
Bromus inermis		N	N	N	6-2		3-5	1-0	6-1	
Trifolium hybridum		N	N	N	2-2		0-4	0-1	-	
T. pratense		N	N	N	1-3		-	N	N	
T. repens		N	N	N	-		-	-	-	
Phleum pratense		N	N	N	2-3		0-1	-	1-0	

1 Only 5 of the 15 plots were located in areas where Melilotus spp. were planted.

TABLE XVI

Survival of Roadside Seedings

Dark Brown Soil Zone - Sandy Soils

Year	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Number of Plots			35	4				9	3	
Poa pratensis			N	N				N	N	
Melilotus spp.			6-16	1-3				N	N	
Medicago sativa			N	N				N	N	
Festuca rubra			N	N				2-1	-	
Agropyron cristatum			13-4	3-1				2-2	2-1	
Bromus inermis			N	N				6-3	2-1	
Trifolium hybridum			N	N				1-2	-	
T. pratense			N	N				N	N	
T. repens			N	N				-	-	
Phleum pratense			N	N				-	-	

TABLE XVII

Survival of Roadside Seedings

Thin Black Soil Zone - Silty Soils

Year	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Number of Plots	11	12		10	11	4		19	6	
Poa pratensis	-	4-2		N	N	N		N	N	
Melilotus spp.	N	0-2		-	N	N		N	N	
Medicago sativa	N	N		1-3	0-3	N		N	N	
Festuca rubra	6-0	5-2		N	N	N		5-4	-	
Agropyron cristatum	0-3	2-3		2-4	2-0	0-1		6-7	4-2	
Bromus inermis	N	N		7-3	4-7	2-2		13-6	5-1	
Trifolium hybridum	0-1	N		1-3	0-2	0-4		1-8	0-6	
T. pratense	N	N		0-3	0-1	0-3		N	N	
T. repens	N	N		-	-	0-1		0-4	-	
Phleum pratense	N	N		N	2-5	0-1		4-10	-	

TABLE XIII

Survival of Roadside Seedings

Brown Soil Zone - Silty Soils

Year	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Number of Plots	[1]	4	6		8	10	12	24	8	
Poa pratensis		3-0	N[2]		N	N	N	N	N	
Melilotus spp.		-[3]	-		N	N	N	N	N	
Medicago sativa		N	N		2-0	N	N	N	N	
Festuca rubra		-	N		N	N	N	1-2	-	
Agropyron cristatum		-	6-0		-	8-2	1-3	17-0	-	
Bromus inermis		N	N		3-0	7-1	6-0	13-8	-	
Trifolium hybridum		N	N		-	-	-	2-1	-	
T. pratense		N	N		-	-	-	N	N	
T. repens		N	N		-	-	1-1	0-1	-	
Phleum pratense		N	N		-	1-1	1-1	1-3	2-0	

1 The Blank indicates no data for that year for planting in that soil zone and type.

2 N indicates this species was not planted in the areas studied for that year of seeding.

3 - indicates the species was planted but was not found during the survey.

TABLE XVIII

Survival of Roadside Seedings

Thin Black Soil Zone - Sandy Soil

Year	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Number of Plots	9	18	10		9	26		1	10	
Poa pratensis	7-2	3-4	N		N	N		N	N	
Melilotus spp.	N	1-7	0-6		N	N		N	N	
Medicago sativa	N	N	N		0-3	N		N	N	
Festuca rubra	2-1	4-7	N		N	N		-	0-10	
Agropyron cristatum	1-1	2-4	6-4		2-3	0-3		0-1	3-5	
Bromus inermis	N	N	N		6-3	18-8		0-1	7-3	
Trifolium hybridum	0-2	N	N		0-3	1-11[1]		0-1	0-8	
T. pratense	N	N	N		-	1-6[1]		N	N	
T. repens	N	N	N		-	-[1]		0-1	0-1	
Phleum pratense	N	N	N		0-2	3-7[1]		0-1	7-2	

[1] Only 17 of the 26 plots were located in areas where these 4 species were planted.

TABLE XIX

Survival of Roadside Seedings

Black Soil Zone - Silty Soils

Year	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Number of Plots	13	10	22	24	2	23	16	15	12	34
Poa pratensis	11-1	7-2	N	N	N	N	N	N	N	N
Melilotus spp.	N	0-1	0-2	1-10	N	N	N	N	N	N
Medicago sativa	N	N	N	N	-	N	N	N	N	N
Festuca rubra	6-2	2-2	N	N	N	N	N	—	5-4	10-5
Agropyron cristatum	1-0	1-0	4-3	4-3	-	7-4	1-3	1-1	2-4	1-7
Bromus inermis	N	N	N	N	N	20-3	13-2	5-3	1-4	8-8
Trifolium hybridum	2-6	N	N	N	-	7-11	0-10	11-0	4-5	3-14
T. pratense	N	N	N	N	-	5-9	5-5	N	N	N
T. repens	N	N	N	N	-	0-6	0-6	-	0-3	1-5
Phleum pratense	N	N	N	N	-	3-7	7-5	-	1-2	6-8

TABLE XX

Survival of Roadside Seedings

Black Soil Zone - Sandy Soils

Year	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Number of Plots	7	9	28	6	18	27	4	5	8	10
Poa pratensis	5-0	3-6	N	N	N	N	N	N	N	N
Melilotus spp.	N	2-4	0-1	0-4	N	N	N	N	N	N
Medicago sativa	N	N	N	N	5-6	N	N	N	N	N
Festuca rubra	2-1	-	N	N	N	N	N	-	7-0	3-2
Agropyron cristatum	-	3-1	2-2	1-1	6-4	6-4[1]	-	1-0	-	4-0
Bromus inermis	N	N	N	N	9-1[2]	22-4	2-0	5-0	2-4	10-0
Trifolium hybridum	2-3	N	N	N	1-2	2-3	0-1	-	5-2	-
T. pratense	N	N	N	N	0-2	4-3	-	N	N	N
T. repens	N	N	N	N	1-2	2-5	-	2-0	-	1-0
Phleum pratense	N	N	N	N	-	1-2	-	-	0-2	0-1

1 Only 17 of the 27 plots were located in areas planted with Agropyron cristatum.

2 Only 10 of the 18 plots were located in areas planted with Bromus inermis.

TABLE XXI

Survival of Roadside Seedings

Degraded Black Soil Zone - Silty Soils

Year	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Number of Plots	6			11	16	13	14	13		18
Poa pratensis	0-1			N	N	N	N	N		N
Melilotus spp.	N			0-5	0-3	N	0-5	N		N
Medicago sativa	N			2-4	2-9	N	N	N		N
Festuca rubra	2-1			N	N	N	N	5-3		6-5
Agropyron cristatum	1-1			1-1	3-2	0-2	2-7	0-3		1-5
Bromus inermis	N			5-5	11-4	6-2[1]	7-6	6-4		7-9
Trifolium hybridum	3-0			2-5	0-9	2-3	1-4	2-6		2-4
T. pratense	N			4-5	4-7	6-7	4-5	N		N
T. repens	N			1-0	3-3	1-6	2-3	1-6		6-2
Phleum pratense	N			N	0-4	5-5	4-3	4-3		2-11

1 Only 9 of the 13 plots were located in areas where Bromus inermis was planted.

TABLE XXII

Survival of Roadside Seedings

Degraded Black Soil Zone - Sandy Soils

Year	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Number of Plots	14	10		9	4	7	14	7	2	2
Poa pratensis	4-2	3-2		N	N	N	N	N	N	N
Melilotus spp.	N	0-5		1-6	0-1	N	N	N	N	N
Medicago sativa	N	N		1-3	0-1	N	N	N	N	N
Festuca rubra	8-2	5-2		N	N	N	N	-	0-2	0-2
Agropyron cristatum	0-1	1-1		-	-	1-0	0-6	-	1-1	-
Bromus inermis	N	N		6-1	2-2	1-0[1]	11-3	7-0	0-1	0-1
Trifolium hybridum	1-3	N		2-4	-	1-3	1-6	0-1	-	1-0
T. pratense	N	N		3-3	1-1	0-4	1-8	N	N	N
T. repens	N	N		1-1	3-1	1-0	4-3	1-0	-	1-0
Phleum pratense	N	N		N	0-1	3-3	7-5	0-2	-	0-1

1 Only one of the 7 plots was located in an area where Bromus inermis was planted.

TABLE XXIII

Survival of Roadside Seedings

Grey Wooded Soil Zone - Silty Soils

Year	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Number of Plots	6	3		10	9	6	15	13	16	15
Poa pratensis	2-1	0-3		N	N	N	N	N	N	N
Melilotus spp.	N	0-1		1-4	0-1[1]	N	N	N	N	N
Medicago sativa	N	N		0-1	0-3	N	N	N	N	N
Festuca rubra	1-5	0-1		N		N	N	4-1	8-3	8-4
Agropyron cristatum	-	0-1		0-2	-	0-1	1-1	6-2	0-1	0-2
Bromus inermis	N	N		6-0	4-2	1-1	11-4	4-5	5-6	3-6
Trifolium hybridum	0-4	N		1-1	0-2	0-2	0-5	0-3	1-4	1-5
T. pratense	N	N		1-3	0-5	3-2	3-3	N	N	N
T. repens	N	N		0-3	2-1	-	1-3	-	5-5	1-1
Phleum pratense	N	N		N	0-1[2]	0-3	0-3	2-3	2-3	4-4

1 Only 6 of the 9 plots were located in areas where Melilotus spp. were planted.

2 Only 3 of the 9 plots were located in areas were Phleum pratense was seeded.

TABLE XXIV

Survival of Roadside Seedings

Grey Wooded Soil Zone - Sandy Soils

Year	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Number of Plots	4	7		20	21	4	15	2	19	25
Poa pratensis	2-1	4-3		N	N	N	N	N	N	N
Melilotus spp.	N	2-2		5-9	1-7	N	2-3	N	N	N
Medicago sativa	N	N		0-2	0-4	N	N	N	N	N
Festuca rubra	0-2	2-3		N	N	N	N	-	6-6	11-3
Agropyron cristatum	-	0-2		3-4	2-3	0-1	1-5	-	0-4	2-3
Bromus inermis	N	N		12-6	11-7	0-2	9-5	2-0	8-7	8-6
Trifolium hybridum	2-1	N		0-6	1-9	0-1	3-6	0-2	1-5	4-11
T. pratense	N	N		3-9	3-11	1-2	0-3	N	N	N
T. repens	N	N		1-5	1-6	-	0-1	-	3-6	1-4
Phleum pratense	N	N		N	0-2	0-2	5-4	0-2	2-6	4-8