

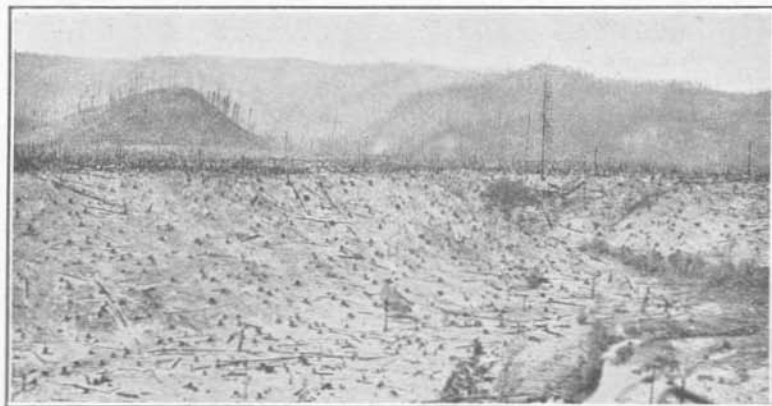
UNIVERSITY OF IDAHO  
AGRICULTURAL EXPERIMENT STATION  
*Sandpoint Substation*

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# Reseeding Burned-Over Lands In Northern Idaho

*By*  
J. H. CHRIST



Valuable grazing land destroyed by fire

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# Reseeding Burned-Over Lands in Northern Idaho<sup>1</sup>

By J. H. CHRIST\*

THE forested area of northern Idaho is beset annually with forest fires of varying proportions. Most of the damage comes within the boundaries of the national forests or in the heavier timber owned by the state or private individuals. Another phase of fire damage comes in the burning-over of logged-off localities which are being turned to agricultural development (See cover illustration). These logged-off lands are important to the adjacent settlers because of the grazing the land affords for the livestock. Loss of the forage on these lands limits to a marked degree the livestock operations of the men who depend on the uncleared land for their summer range and on the cleared land for the forage crops with which to winter their stock. The principal use of the summer range is for beef and dairy cattle and, to a minor extent, for sheep.

Since the earliest days of logging in northern Idaho, the logged-off land has produced abundant hay crops. Domestic hay and clovers have followed the roads and trails of the loggers and developed rapidly after the disposal of the slash by broadcast burning. The spread of cultivated forage plants has been so rapid and complete that on a great many acres they present the appearance of being specially seeded. This has not been the case, however, as very little of the logged land has been seeded by the men taking off the timber. Only a few native grasses and browse plants are able to survive a severe fire. The migration of native plants which follows fires does not furnish a sufficient amount of grazing to be of extended value. The use of these lands, however, with the normal cover they produce, is vitally important to the farmers adjacent thereto.

While the bulk of the valuable agricultural land once forested has been taken over by farmers, there still remains a large amount of marginal land adjacent to these areas, which, because of the topography and type of soil, is valuable only for grazing or timber production purposes. Under present conditions, the farmer's primary concern is its availability for grazing. Since it takes years for heavily-burned land to become reestablished under natural conditions to desirable forage plants, the question of what plants to use and how best to establish the seedings quickly and economically is of primary consideration.

<sup>1</sup> The writer wishes to acknowledge the assistance and cooperation of the following parties, who gave their time and the use of land by which the results presented herein were obtained: W. F. Thomas, H. R. Davis, E. C. Larson, R. N. Irving, O. F. Page, Humbird Lumber Company of Sandpoint, and W. A. Ashley.

\*Superintendent, Sandpoint Substation.

The cattle industry is the one that makes most general demand on grazing in northern Idaho. Large bands of migratory sheep are in the area during the summer months, but these are held primarily on national forest lands. Cattle (11)<sup>2</sup> obtain best grazing on grass



Fig. 1.—A mixed grass and clover seeding. Planting was done the fall previous and immediately following the fire.



Fig. 2.—An adjacent unseeded area showing the sparse growth that is often found the year following a forest fire.

ranges, using browse but little when plenty of grass is available. Horses, even more than cattle, prefer grass pasturage. Sheep are particularly fond of browse and make more use of it than do other forms of livestock, but they too like tender grass pasturage. Later in

<sup>2</sup> Numbers in parentheses throughout this Bulletin refer to Literature Cited, page 26.

the season, after grass becomes coarser, there is more of a tendency for sheep to use the browse.

There are a few species of plants that will withstand the effects of severe surface fires. The most important of these are pinegrass<sup>3</sup>, Scouler's willow, ninebark, sticky laurel, red laurel, thimble berry, snowberry, maple, ocean spray, mountain ash, rose, spiraea, yarrow, goldenrod, dogbane, and wild hollyhock. These plants start growth in varying quantity shortly after the fires, and if not thickened by the natural migration of other plants to the areas are thin in stand and form a poor ground cover (See Figs. 1 and 2). The cases are rare where this is the only succession following a fire, for under ordinary conditions there is a heavy seeding of plant species dispersed by the wind or other natural means.

While the number of migrating species that enter burned areas is large, only a comparatively few are present in sufficient quantity to dominate the natural seedings. Those found in greatest abundance are: fireweed, willow, fern, bull thistle, muletail, and wild lettuce. Lower forms of plant life like the mosses and liverworts also are found abundantly. While the fireweed and the willow (5, 20) are important browse plants the highest percentage of the others have poor forage value and are not eaten with avidity by livestock having access to them.

A heavy growth of these plants may be produced the first year following the fire in case of an early summer burn, but more often the heaviest accession is not found until the second year. From the peak of this transitory plant formation there is a gradual decrease of the annual species and the biennials or short-lived perennials and an increase in the more permanent browse plants, the grasses, and perennial herbs. This change, while gradual, is quite noticeable and after five to eight years again furnishes good native grazing. Forest tree species also make their entrance on these lands and with the development of seedlings there is a lessening of the browse and other plants until the area approaches the climax type of vegetation adapted to the area.

While the changes are slow, it is essential to know that the grazing afforded in the first stage by the transitory plants is usually low in quality and not capable of supporting either heavy or valuable conditions (Figs. 3 and 4). The second stage, consisting of heavy browse and perennial grasses and herbs, (21) is much more valuable and from that point gradually decreases with the development of the forest cover.

#### Review of Information Relating to Problem

The literature on the subject of reseeding burned-over land is very meager. This is especially to be wondered at when one considers

<sup>3</sup> A list of the common and scientific names of species of plants mentioned in this publication is given on page 25.

that the policy of clearing forests and the establishment of agricultural areas has been a problem confronting the earliest settlers in forested regions. Numerous publications are available on the value of various forage crops and their adaptation under cultivated conditions. These treat primarily the crops that are available commercially.



Fig. 3.—A heavy stand of meadow fescue showing a complete suppression of migrating plants.



Fig. 4.—An adjacent unseeded area showing the growth of migrating plants, principally fireweed, thistle and muletail.

Recently Forsling and Dayton (7) summarized the work of the United States Forest Service and other agencies in their use of commercial as well as native plants in the reestablishment of better forage conditions on over-grazed areas in western forest and range lands.

In a study by Ingram (10), evidence was presented showing how the establishment of forage on burned-over lands was valuable in reducing the fire risk in such areas. This conclusion was reached after observation of many areas in the Douglas fir region of the Oregon and Washington coast. He states, "The study is conclusive that introduced forage plants give greater variety in the diet and are necessary to secure the closest and evenest use of the vegetation. This is important as a means of attaining the maximum fire protection which grazing will afford. There is, however, a question as to the competitive effect of grass seeding on the germination and survival of Douglas fir seedlings. Grass certainly eliminates, for a time at least, a large percentage of competing shrub and herbaceous vegetation which would otherwise occupy the ground after the burn." Pearson (14) in a discussion on grazing and reforestation states, "That browsing by livestock is capable of destroying or seriously injuring young forest growth is no longer questioned by foresters."

An abstract of the work done by Kienholz (12) in the Douglas fir region of western Washington shows that severely burned areas showed less vegetation than those moderately burned. Herbaceous species present in the original stand were most abundant on areas recently burned. Shrubby species present in the original stand started less rapidly and became more abundant as the elapsed period increased. Weeds started slowly but very rapidly attained a dominant position in the older plats. The vegetation following fires was deemed to be in an unstable condition with rarely any one species completely dominant.

Hanson (8) states that in the revegetation of waste range land in Colorado the more satisfactory forages for use in swales and meadows are timothy, Kentucky bluegrass, Canada bluegrass, white clover, and alsike clover. He says further, "It is a waste of seed to sow on unprepared soil. The plants already growing there are making such complete use of the soil that additional seedings stand no chance."

Engbretson and Hyslop (6) recommend the use of English ryegrass, orchard grass, tall oatgrass, timothy, Kentucky bluegrass, red-top, alsike clover, and white clover in mixture for seeding burned-over pasture land in the coast counties in Oregon.

According to McDole and Christ (13), land that has been logged and reseeded to grass and clover fits well into the development of farm lands in the northern Idaho area. The use of these lands for the grazing of livestock permits a decay of the stumps which adds to the ease of clearing when this land is put to more intensive use by the farmers.

The United States Forest Service (22) made 24 seeding experiments on burned-over areas in Montana and Idaho national forests in 1910 and 1911. This resulted in 4 successful seedings, 8 partial successes and 12 failures. The reason for most of the failures was attributed to drouth and competition from native vegetation. The

grasses used in these experiments were timothy, Kentucky bluegrass, reedtop, orchard grass, bromegrass, red clover, white clover, and alsike clover. Timothy and alsike clover were the predominating plants of the successful seedings in the early phase of this comparison, but in later years Kentucky bluegrass showed more favorably than at the start.

### Description of Area

The experimental work of testing various grasses and legumes for seeding on burned-over land has been done within a 20-mile radius of Sandpoint. There is a wide soil variation in this locality, but climatic conditions are fairly uniform. Since precipitation is often the limiting factor in forage establishment and development, the record of normal monthly precipitation at Sandpoint (3) for a 20-year period follows: January, 3.34 inches; February, 2.71; March, 2.23; April, 1.91; May, 2.07; June, 1.62; July, 0.73; August, 1.21; September, 1.78; October, 2.27; November, 3.64; December, 3.72; and the normal annual, 27.23 inches. The elevations between which most of the agricultural areas are found vary from 2000 to 2500 feet. Soils range for the most part from the alluvial types along stream bottoms, to residual granitic, basaltic, and similar types of the higher ranges. Glaciated prairie soils are found adjacent to forested areas. In the northern portion extensive areas of peat and muck are found.

The region is well adapted for growing temperate forage crops. Clover and timothy were used by the earliest settlers for hay crops. Other long-lived grasses have even greater productivity than timothy. Of the legumes, alfalfa and sweet clover are well adapted and commonly surpass the yield of the more common clovers.

### *Life Zones*

The agriculture of the timbered sections of northern Idaho lies within the confines of the transition and Canadian life zones (17). While the Hudsonian and Arctic zones are present in the more mountainous districts, they are not used agriculturally except for the migratory grazing of sheep and cattle. The characteristic tree of the transition zone is the western yellow pine, and the chief shrubs are ninebark, red laurel, rose, service berry, and ocean spray. Herbs most commonly found are slender wheatgrass, bunch wheatgrass, bunch fescue, Idaho fescue, western fescue, cinquefoil, strawberry, and pinegrass. The Canadian zone is represented by the western white pine, white fir, western hemlock, western larch, western cedar, and lodgepole pine. The common shrubs are the thimble berry, myrtle, Utah honeysuckle, dogwood, sticky currant, elderberry, snow-berry, and maple. There are many species of herbs in this zone but the most common are butterweed, goldenrod, and Macoun's reedgrass. Between these two zones are various intergrading areas. The Douglas fir is a common tree in these formations. Other plants are



alder, syringa, willow, pink spiraea, white spiraea, cascara, buck-thorn, Oregon grape, and a great number of lesser species.

#### *Relation of Climate to Plant Growth*

The mature forest trees that are growing in any particular area are quite definite in determining the adaptation of the land to forage development. The growth of climax species bears a definite relationship to moisture and other climatic factors. In northern Idaho the forests are coniferous species, which are represented in agricultural areas by pure and mixed stands of western yellow pine, Douglas fir, western larch, white fir, western cedar, hemlock, and western white pine. While spruce, alpine fir, and a few others are found at higher elevations, they are not usually found in localities devoted to agriculture. Lodgepole pine, a tree common to much of the area, is found principally on varying slopes and in valleys, but it is not considered a climax species in this area as it seldom maintains over a long period and may be superseded by the other species mentioned above.

In the Sandpoint area there appears to be no definite relation between the soil type and the forest species it sustains. There is, however, a definite relationship between forest species and the moisture supply. Under the more arid condition of decreased rainfall or by reason of the coarseness of the soil particles which permits rapid drainage, the yellow pine finds particular adaptation. Stands of this timber are found on most of the soil types and through a wide range of elevation. Grading into the yellow pine areas is the Douglas fir, in many cases under as arid a condition as the yellow pine. Under slightly more moist conditions appear the larch and the white fir. The presence of white pine indicates a still more moist phase; and under the conditions of a plentiful moisture supply, cedar and hemlock are the predominating species. While this order holds true over much of the forested area, there is a wide variation in the combinations that are found. Douglas fir in particular is able to reproduce and develop under a wide variety of conditions, from the dry to the very moist. Many of the others will be found under conditions not entirely characteristic of their particular adaptation.

The study of the type of forest vegetation that precedes agricultural development will, in a large measure, indicate what can be expected of forage in the locality concerned. Under conditions which are suitable for yellow pine forests, one can expect only the more drouth-resistant species of forage to be able to develop to greatest production. The grasses which are shown to have a high degree of drouth resistance are the wheat grasses, bromes, certain species of the fescues, alfalfa, and the sweet clovers. Under conditions slightly more moist, as represented by the growth of fir and larch, one can expect a wider variety of plants, which includes the bluegrasses, timothy, orchard grass, and the common clovers. The white pine areas permit the use of practically all the grasses and clovers; and the

typical cedar and hemlock swamps indicate that the best adapted plants there will be redtop, reed canary, alsike clover, and other species that withstand high moisture conditions.

Consideration of these points indicates that it is impossible to expect a site to produce forage in excess of that which the climate



Fig. 5.—Showing site of plat seedings on land which formerly supported a heavy growth of western white pine and western cedar.



Fig. 6.—Showing site of plat seedings on land which formerly supported a growth of western yellow pine and Douglas fir.

will afford, and that a careful choice of species is necessary to meet the particular adaptation under which they are to be grown.

Recognition is also made of the change in habitat factors that comes when fire destroys the native cover. Coarse soils that might support the more arid phases of plant life have been built up by the deposition

of duff and its disintegrating products until the area supports plants of a higher moisture requirement than would be expected. Naturally when this cover is destroyed and the accumulation of litter and duff is lost it is to be expected that the soil will not support a related group of forage plants that were indicated by the original stand of timber. While such conditions are not now general there is reason to anticipate such performance.

### Outline of Investigation

Particular attention was directed to the problem of reseeding burned-over lands in 1926, following a severe fire season in the Edgemere section of Bonner county. This fire was so wide-spread and the effect so devastating to the farmers in that locality that phases of investigation were outlined and put into effect the following spring. Since the start of the work there numerous other seedings have been made by the Experiment Station. Many other areas seeded by individuals have been surveyed. The plan of the investigation in 1927 was to make comparative seedings of the most important grasses and legumes which could be readily obtained from seedmen. These were established on various soil types, slopes, and exposures (Figs. 5 and 6). The forages used in the Edgemere seedings were perennial ryegrass, slender wheatgrass, crested wheatgrass, meadow fescue, orchard grass, bromegrass, tall meadow oatgrass, timothy, Kentucky bluegrass, redtop, red clover, alsike clover, white clover, and white sweet clover. Plats were staked one rod by eight rods, or one-twentieth acre, for each seeding. The plats conformed to the contour of the land. In the Edgemere area, mixtures were put out on the snow and on honey-combed land the forepart of March and the last of March, respectively, to find the value of this type of seeding. The variety seedings were made on April 23, 1927, and consisted of one pound of seed for each unit area for the crops of perennial ryegrass, slender wheat, crested wheat, meadow fescue, orchard grass, bromegrass, tall oat, red clover, and white sweet clover. The others were seeded at the rate of one-half pound per plat. At the time these seedings were made, the staked areas were gone over and all unburned material that could be readily removed by hand was taken off. Plantings were made by hand and no effort was made to cover the seed.

In the Wrencoë district, a similar series was laid out and planted. This area had burned severely in a fire in 1924 and since that time had been left to the native succession of plants that follow a fire. While this had not formed a complete cover, there was a scattering stand of grass, clover, and browse, and it was thought at the time that possibly some of the varieties might establish themselves. On September 3, 1927, another series of plats were staked and seeded on an east slope at the mouth of Pack river. These followed a heavy burn that season and were seeded immediately following a rain that stopped the progress of the fire. On October 3, 1928, general variety seed-

ings were also made on upper Grouse creek following a heavy fire. In addition to the plat seedings, numerous other seedings were made on burned areas in which only a few species of grasses were used.

Owing to the condition of the land on which the seedings were made and the inaccessibility of the areas, it is impossible to present yields of the plats at this time. Many of the areas were examined from two to four times a year and records were kept of the appearance of the individual species. From this it will be seen that the results must be deduced from the observations made. These results are presented in the following discussion.

#### Time of Seeding

Time of seeding apparently is not a decisive factor in obtaining a stand of forage under burned-over conditions, provided there is a plentiful supply of moisture. When comparisons were made no perceptible differences were found among seedings made on the snow, on honey-combed ground after the snow had left, in the late spring, or in the fall following the fire. There are, however, certain advantages to be gained by seeding at certain times. Seeding on the snow can be done at any time before spring opens, which permits the operator to utilize time that might be more important at later dates. It is likewise easier to see how the seed is being distributed and to avoid bare areas. It is claimed that the alternate freezing and thawing which produces a honey-combed condition has a decided effect on covering seed. If this is the case, applying seed on the snow would get that benefit. This condition of honey-combing is not present each year, so the value to be derived may not be constant. Spring sowing in March or April after the snow has gone will show the areas that can be best seeded. Forest fires often do not burn completely over the entire surface, and it is a waste of seed to apply it to places where the original plants have not been completely killed or when there is heavy duff. Spring seedings are able to become sufficiently well established to withstand summer drouth, provided they are done while spring rains are in prospect. Some coverage of seed evidently is furnished by the beating of the rain on the surface, and germinating seed becomes well rooted before the drier weather of summer.

Fall seedings are desirable for a number of reasons, and this time is that most frequently used. Fall rains in September and early October are usually sufficient to establish a moisture contact between the surface and subsurface soil layers. When this is obtained, there is small possibility that the germinating plants will be lost. Many farmers do not wait for the rains but seed directly on the ashes left from the fire. The writer does not know of any cases where these seedings have acted detrimentally to the success of the stand. Late fall seedings have not been so successful in all tests. These face the possibility of an early freeze-up after the plants have germinated, and if this occurs with a slight snow cover or low temperature, the survival of plants is

small. Seeding done at so late a date that there is a small chance of immediate germination should carry through in as good condition as seedings made on the snow. One of the primary advantages of fall seeding is that grazing on these areas is afforded the year following, while on spring seedings grazing should be withheld until fall or the year following. Sometimes there is an advantage in the purchase of seed in the summer as the dealers often are willing to make marked reductions in seed prices in order to clean up the carry-over they otherwise might have.

It is essential that seedings on burned land be done the fall of the fire or the spring following. Almost without exception, seedings made the second year after the fire are either failures or are so poor that the benefit obtained does not justify the expense. This is because of the rapid migration of the seed of wind-blown plants, such as fireweed, muletail, thistles, and other plants of like description as well as the mosses. Forage seedlings cannot establish readily in competition with the higher plants, and the mosses make such a dense layer that the seed is held on the surface and penetration of the germinating seedlings is very slight. If it is possible to prepare a seed bed by tillage so that the migrating cover is overthrown, then there would be a better likelihood of establishing seedings on the older burns; but as this is difficult to accomplish, the only alternative is to allow the area to reestablish with the native succession which follows the destruction of the original crop. While these plants may not approach the palatability or the cover that can be obtained in special seedings, they will eventually furnish normal grazing conditions.

### Method of Seeding

Seeding on burned land usually is done by hand. Because of the debris left by the fire and the old snags, stumps, and thickets, it is not often possible to use horse-drawn equipment for seeding. When an area is available where a drill equipped with a grass seeding attachment can be used, a better distribution of seed can be obtained than when done by hand. Hand seeding is done with the cyclone or tube type seeder, and occasionally a man is found who is proficient with out-and-out hand seeding. On level areas or those of a gentle slope, one man often is able to cover 15 to 20 acres per day. On more rugged areas progress is slower, and these are difficult to cover completely. Often the planter is content to seed only the areas which are more easily approached.

Considerable publicity has been given the use of the airplane (23) for making forage seedings. It is claimed that the cost of seeding by airplane can be reduced to less than 50 cents an acre. Where the area of fire has been uniform, with the land laying in one body and under a single or group ownership that makes the proposition feasible, undoubtedly the method has certain advantages. The amount of seed per acre can be accurately regulated and an even seeding can be

obtained by an experienced operator. In seedings made by airplane, an elevation of about 500 feet is used. At this height a swath of about 150 feet is covered. Unevenness of the terrain would have little effect on this method of seeding; and on large areas where seeding must be completed within a limited time, the operation could be shortened. It is reported that as much as 560 acres can be seeded daily under favorable flying conditions.

#### *Covering the Seed*

The conditions that are found following a fire usually preclude any tillage treatment that will cover the seed. Because of the impracticability of going over the land with horse-drawn implements, almost all reseeding operations depend on natural conditions such as rain and frost for seed coverage. When the condition of the land is open enough for the use of harrows or brush drags, a more even stand and better germination can be obtained by light coverage of the seed. Lack of seed coverage with the larger-seeded species of forage probably is the reason why better success was not attained with these types in the seeding done by this Station. Where large bands of sheep are available, it has been recommended that they be driven over newly seeded areas to press the seed in the soil. In the Sandpoint territory, sheep are not available for this purpose. Early seedings of small-seeded grasses and legumes usually establish readily, and it is hardly necessary to go to the extra effort of harrowing or dragging these areas.

#### *Inoculation*

Inoculation of legume seed with nitrogen fixing organisms is a worthwhile practice. This is especially true where these legumes are to be put on the land for the first time. In older farming sections, plants of red, white, and alsike clovers are found growing under native conditions, but in new localities where these plants are not so common, inoculation of the seed should be performed. With sweet clover and alfalfa, it is essential that they be treated as the organism that performs the fixation of nitrogen on these plants is rarely present.

#### **Forage Species**

Table I presents various phases of agronomic data on the performance of a number of grass varieties at the Sandpoint Substation for the 1933 season. These plantings were made in 1931 in 20-foot rows spaced 4 feet apart. Under such growth conditions it was thought that each species would have maximum opportunity for growth and development. It has been shown that there is little difference in the actual date that the species start growth in the spring. Therefore the phrase that a grass "starts growth early in the spring" means little. The idea to be conveyed in a discussion of grasses is that one species comes to a more rapid early season growth than another. Under conditions at Sandpoint the grasses which have made rapid early

TABLE 1

Agronomic Data of Grass Species at the Sandpoint Substation for 1933. (1931 Plantings)

	Date Grth. starting in spring	Rapidity of early growth	Date in boot	Date headed	Date in bloom	Date seed ripe	Average height	Acre average hay yield (tons)	Acre seed yield in pounds	Condition of aftermath
Timothy	3-29	Moderate	6-13	7-1	7-6	8-10	41	1.45	257	Medium
Huron Timothy	3-29	Moderate	6-13	7-1	7-6	8-10	43	1.89	285	Medium
Tall Meadow Oatgrass	3-31	Fast	5-25	6-13	6-21	7-7	58	2.18	461	Heavy
Smooth Bromegrass	3-29	Fast	5-31	6-21	6-30	7-26	50	4.76	1663	Medium
Slender Wheatgrass	4-6	Moderate	6-14	7-10	7-11	7-26	42	1.52	640	Medium
Crested Wheatgrass	4-6	Moderate	6-2	6-23	7-6	8-10	38	2.18	863	Medium
Violet Wheatgrass	4-6	Moderate	6-10	6-12	6-14	7-26	36	1.16	863	Medium
Meadow Fescue	3-31	Fast	6-7	6-19	6-23	7-14	40	1.20	416	Medium
Sheep Fescue	3-31	Moderate	5-23	5-31	6-13	7-7	20	.14	3*	Poor
Orchard Grass	3-31	Fast	5-25	6-8	6-14	7-14	48	3.30	572	Heavy
Kentucky Bluegrass	3-29	Slow	5-21	5-28	6-14	7-7	30	.65	131	Poor
Canada Bluegrass	3-29	Slow	6-5	7-2	7-4	7-29	25	1.89	528	Poor
Redtop	3-29	Slow	6-13	7-6	7-7	8-8	33	2.07	352	Poor
English Ryegrass	3-29	Slow	5-31	6-14	6-19	7-24	17	.40	160	Medium
Italian Ryegrass	3-29	Slow	5-31	6-14	6-19	7-24	19	.33	85	Medium
Reed Canary Grass	3-29	Fast	6-14	6-26	6-26	7-14	60	5.55	223	Heavy

\*Seed lost by shattering.

season development are tall meadow oatgrass, smooth bromegrass, meadow fescue, orchard grass, and reed canary grass. After the removal of the hay crop many grasses do not recover sufficiently early to furnish much late season pasturage. Grasses that have furnished a heavy late growth are tall meadow oatgrass, orchard grass, and reed canary grass.

Table II shows the yields obtained at Sandpoint with various common grasses. The average yield gave greatest production to tall oatgrass, meadow fescue, slender wheatgrass, and reed canary grass. Under cultivated conditions it is possible to obtain a good stand of the large-seeded species much more readily than under the conditions that obtain following a fire. For that reason, several of these species have not given such favorable results under the latter condition.

**TABLE II**  
**Yield of Grasses at the Sandpoint Substation 1924-1930, Inclusive**

	1924	1925	1927	1928	1929	1930	Average Tons
Timothy	1002	2982	4138	3180	1154	1740	1.18
Orchard grass	2134	3418	3223	2614	741	1479	1.13
Smooth bromegrass	1742	4661	5009	3093	827	870	1.35
Tall oatgrass	2962	4225	5140	3877	850	870	1.49
Slender wheatgrass	2483	3964	4922	2962	1416	1218	1.41
English ryegrass	2701	1481	1786	588	828	552	.66
Italian ryegrass	3180	1307	1045	392	847	609	.62
Meadow fescue	2875	4182	4467	3398	1089	1566	1.47
Sheep fescue	653	2265	4617	1698	1002	1914	1.01
Kentucky bluegrass	523	2657	3615	1550	1067	870	.86
Redtop	1133	3049	4095	3746	1002	1305	1.19
Reed canary grass	.....	3119	4356	3031	1742	1392	1.36
Crested wheatgrass	.....	.....	3485	4182	1046	1479	1.27

Leguminous forages are superior in yield to the grasses but are not as commonly used in seeding as the major species. This is because of danger of bloat to livestock grazing the seeded areas, and the higher cost of the seed. Table III presents the average yield of a number of common legumes. Alfalfa gave the highest yield at Sandpoint, with white sweet clover ranking next.

**TABLE III**  
**Yield of Legumes at Sandpoint Substation, Average of Seven Years, 1923-1929, Inclusive**

	Tons per Acre
White sweet clover	3.15
Yellow sweet clover	2.49
Grimm alfalfa	3.22
Medium red clover	2.35
Mammoth red clover	2.78
Alsike clover	2.01
White clover*	1.46

\*Six-year average.



### Forages Adapted for Reseeding Purposes

The following paragraphs give a brief description of the more common forage species that are available for reseeding purposes. These have all been under observation in plat work at the Sandpoint Substation, but the list was reduced for the experiments on burned-



Fig. 7.—An extensive timothy seeding made in 1928. In 1932 there was very slight encroachment of other vegetation.



Fig. 8.—A heavy stand of sweet clover. The original seeding made in 1928 at rate of 2 pounds per acre.

over land. Sufficient information is available, however, so that a good concept can be given of the probable performance of these forages. This particularly refers to Italian ryegrass, Canada bluegrass, sheep fescue, reed canary grass, and yellow sweet clover. For a more

extended discussion of each of the forages, the reader is referred to the literature cited (1).

#### *Perennial and Italian Rye-Grass*

Perennial and Italian rye-grass (18) are easily established grasses. The forage produced is abundant and palatable to livestock. The primary objection to the grasses is the short length of life. Ordinarily the production is reduced over half by the third year, and by the fourth or fifth years only a scattering of plants is found. The seeding of the plants is heavy, but the maintenance of stand is poor and they are soon crowded out by the more aggressive plants that migrate to these areas. When used, the rate of seeding is from 15 to 20 pounds per acre.

#### *Kentucky Bluegrass*

Kentucky bluegrass (18) is an important sod-forming species which meets wide usage. Under Sandpoint conditions, this grass is not as important as a number of others. Unless on very favorable sites, the seasonal production is greatly lowered during July and August, and the fall rains do not come early enough to stimulate any quantity of fall production. This grass is very aggressive and when planted in mixture with other species will, in a few years, crowd out more valuable types. The rate of seeding is from 10 to 15 pounds per acre, and usually it takes several years for this grass to become sufficiently established to produce any large quantity of forage. After it becomes heavily sodded, production decreases. In a number of cases coming under observation, livestock preferred the larger-leaved grasses to the Kentucky bluegrass.

#### *Canada Bluegrass*

Canada bluegrass (18) has a wide distribution over northern Idaho, but very seldom has it been specially seeded. This species will occupy drier sites than the Kentucky bluegrass, and it seems to be less desirable to livestock. The sod is about as dense in one as the other. It is a very aggressive plant but does not spread as rapidly as the preceding species. It, too, will gradually eliminate other competing forages. The rate of seeding is from 10 to 15 pounds per acre.

#### *Timothy*

Timothy (18) is one of the most popular crops for seeding on new land in the Sandpoint area, and one of the most quickly established (Fig. 7). It is usually seeded in combination with clover. While the timothy will be crowded out eventually, it maintains high production over a long period, and because of its high value for livestock and the cheapness of the seed, is widely used. Evidence at hand shows that fields of timothy have maintained for a period of 20 years or more. Under most conditions it is usually choked out by the blue-grasses after a period of 7 to 10 years. It ordinarily does not furnish

a large amount of pasturage during the heat of the summer months, and is somewhat later than certain other species in starting heavy production in the early spring. While the value of timothy has been greatly discounted for hay purposes for cattle and sheep in preference to the leguminous crops, its value as a pasture plant is most important. The rate of seeding is from 6 to 8 pounds per acre.

#### *Orchard Grass*

Orchard grass (18) is a desirable species for reseeding burned-over land. It has not been used to a wide extent in the Sandpoint area; but judging from observations made it could be a primary species in this type of seeding. Orchard grass is readily established, and when not grazed too closely, forms large circular bunches. Seed-producing qualities are good, and an open stand will thicken with the natural reseeding. On the plats where this grass was used in the reseeding experiments it was cropped so closely by the livestock that it had little opportunity to thicken or reseed. Production starts early in the spring and holds better in the summer than timothy. In case the area is not subject to close grazing, there is a tendency for the grass to become coarse and harsh. The rate of seeding is from 10 to 15 pounds per acre.

#### *Bromegrass*

Bromegrass (19) is a drouth-resisting, sod-forming species. Where used on a well-prepared seed bed it is a valuable plant, but where it has been used in reseeding experiments, the stands obtained have been poor. This probably is a result of the large seed which does not get well enough covered to enable the plant to withstand summer conditions. Even on the most favorable sites the stands secured were light. The grass is very palatable and is closely grazed. Due to the severe grazing, there was little opportunity for the crop to thicken as it became older. Bromegrass makes a rapid early growth in the spring and produces well during the summer months. The rate of seeding is from 15 to 20 pounds per acre, and with good stands the production is heavy for four or five years, after which it becomes root-bound and the yields decrease.

#### *Tall Meadow Oatgrass*

Tall meadow oatgrass (18) is one of the group of bunch grasses. It is a species that makes a heavy early spring growth and furnishes considerable pasturage at that period. Due to the character of the seed, it is difficult to plant, and, as in the case of bromegrass, does not become easily established even when seeded in large quantities. Were it not for these characteristics, undoubtedly tall oatgrass would be extensively used, as heavy production in the early spring and rapid growth of aftermath in the mid-summer make it highly commendable. When not closely pastured, the stalks become coarse and are not readily consumed by livestock. The rate of seeding is 20 to 25 pounds per acre.

*Slender Wheatgrass*

Slender wheatgrass (19) is a species of bunchgrass that has given good returns in the more arid sections. It is well adapted for dry gravelly sites, but in the more moist locations has not done as well as other species of grasses. This, too, has large seed and is not readily established under natural conditions. When orchard grass and timothy are available livestock prefer them to the wheat grasses. Under native conditions, the clumps usually are separated quite widely and do not grow to a solid cover. In our experience, even when not closely grazed, the plants did not thicken in stand or did not develop a heavy bunching habit on burned-over land. The rate of seeding is 15 to 20 pounds per acre.

*Crested Wheatgrass*

Crested wheatgrass (25) is another bunch grass very similar in habit to slender wheatgrass. This is not used extensively but grows best under the same conditions as the foregoing species. Crested wheatgrass makes rapid growth earlier in the spring than slender wheatgrass. Yields under Sandpoint conditions are somewhat higher for crested wheatgrass. As the seeds of these two wheat grasses are nearly the same size, the same difficulty is experienced in obtaining a stand. The palatability of the two is similar. The rate of seeding is 15 to 20 pounds per acre.

*Meadow Fescue*

Meadow fescue (18) is one of the more important grasses for re-seeding purposes. In general habit, it is similar to timothy, but it starts heavy production earlier in the spring and continues later in the summer. The quality of the grass is good and is relished by livestock. The plant is long lived and has good seeding habits. The seed is medium in size and establishes readily. Due to heavy grazing, meadow fescue plants were given little opportunity to reseed when cattle had access to the areas. The rate of seeding is 10 to 15 pounds per acre.

*Sheep Fescue*

Sheep fescue (18) is a bunch grass similar in habit to our native Idaho fescue and western fescue. These two latter species are commonly found in the more open dry prairies and are also associated with the yellow pine. Sheep fescue does not give a heavy production, but is adapted to less moist situations than many of our other grasses. In the spring it is quite palatable to livestock, but by the time seed ripens in early summer the plants are wiry and are scarcely touched. The seeding habits of the plant are excellent and usually produce a fairly heavy cover. The rate of seeding is 12 to 15 pounds per acre.

*Redtop*

Redtop (18) is a sod-forming grass that is quite generally distributed. It is particularly well adapted to wet conditions, standing

more water than many other forage species. Under dry conditions, also, it produces fairly heavy crops. It is not an especially palatable forage and livestock will graze on practically all other kinds before availing themselves of the redtop. It comes to maximum production later in the season than most other species of forage. The seed is very small and a good stand is secured with little difficulty. The rate of seeding is 6 to 8 pounds per acre, and it usually takes several years before a planting comes to peak production. The plant is aggressive and few others can compete with it.

#### *Reed Canary Grass*

Reed canary grass (14) is a long-lived, sod-forming grass. It finds its special habitat in low, swampy, or overflow areas but like redtop shows a good degree of drouth resistance. This species was not used in the reseeding experiments because the seed at the time of the start of this work was difficult to obtain and high in price. Since that time supplies have become more plentiful and the price has been reduced markedly. Reed canary grass is one of the earliest species to start heavy spring growth. It produces a heavy crop of forage throughout the season, and, while the growth is coarse, it is well liked by livestock. The seed is medium in size and the rate of seeding is from 5 to 10 pounds per acre. Thin seedings usually require several years before they come to maximum production, but heavier seedings attain good production the second year. Under low-land conditions this grass will dominate other forages.

#### *Red Clover*

Red clover (16) is one of the commonly-used clovers in the logged-over sections. While the plant is usually considered a short-lived perennial, cases are known where with timothy it has maintained fair stands for 15 years. Ordinarily the stand will be reduced considerably by the end of the third year. Red clover produces good yields of highly palatable forage. When extensive areas are seeded with this or the other common clovers predominating, there is always danger of bloat to livestock. For that reason pasture seedings should contain a major percentage of grass species. This clover is readily established following a fire and produces well except under the more arid conditions. The rate of seeding is 10 to 12 pounds per acre.

#### *Alsike Clover*

Alsike clover (15) has been the most used legume for seedings on the logged-over lands. The common seedings are alsike and timothy. The cost of seed per pound averages less than red clover. A smaller quantity of seed is required per unit area and, therefore, constitutes the most economical legume. Alsike clover succeeds under a wide range of conditions from the very moist to the drier phases such as are favored by red clover. The seed is easily established and the reseeding habits of the plant are excellent. For this reason, alsike

maintains over a long period of years and competes satisfactorily with any but the sod-forming species of grasses. The rate of seeding is 6 to 8 pounds per acre.

#### *White Clover*

White clover (24) is found widely distributed along roads and trails in the logging areas. The plant is not of great importance for grazing under Sandpoint conditions. This is due primarily to the small production which it gives. Compared to the other clovers, the seed of this species is high in cost. Under Sandpoint conditions, it makes a dense low growth and spreads rapidly. It is easily established and produces an abundance of seed. It withstands close grazing and does well on a wide variety of soils, but more especially on those that are well supplied with moisture throughout the season. The rate of seeding is 6 to 8 pounds per acre.

#### *White and Yellow Sweet Clovers*

White and yellow sweet clovers (9) are forages that have not been given much prominence heretofore in reseeding investigations. The Sandpoint studies on burned-over lands have considered the use entirely of the white sweet clover. This plant is one of the few forages tested that has given a marked increase in stand as time progressed (Fig. 8). The stand of plants the first two years was scattering, but the reseeding of these plants in all cases, including the more arid sites, increased rapidly in succeeding years. In seeding this clover, unscarified seed was used, and the germination and development of plants was as heavy the second year as the first. Because of the close grazing that was given the sweet clover plots, the reseeding was not as heavy as it would have been under more controlled conditions. For this reason the yellow species of this clover probably would be better able to cope with a condition of close cropping by livestock. Normally, the yellow sweet clover does not produce as heavily as the white, but because of its lower and more decumbent habit, it is more able to develop in face of the heavy demand put on it by livestock. Good stands of sweet clover resist the encroachment of other vegetation for a long time. The rate of seeding for these clovers is 12 to 15 pounds per acre.

#### *Alfalfa*

Alfalfa (2) has been used in only a few places for reseeding work. Most farmers prefer to plant it for hay production purposes on cultivated land. Alfalfa is well adapted for upland seeding over most of the timbered localities. When in good stands the production is high and it is one of the most important forage crops. As with the common clovers, there is always the danger of bloat to livestock that have access to it. The plants are long-lived, but as the stands become older they are thinned to wide distances, and under that condition the

forage becomes coarse. The rate of seeding is 8 to 12 pounds per acre.

### Forage Mixtures

Forage species are seldom seeded pure. It is usually desirable to make combination seedings since periods of peak production of the various kinds come at different times in the season. Some forages start earlier in the season than others, and some continue throughout the heat of summer when others are more or less at a standstill in production. The highest type mixture of plants is one that furnishes a constant supply of nutritious pasturage throughout the season. The different combinations that can be made is wide and many mixtures have been recommended by experiment station investigators and others to meet specific conditions. A choice of forages for re-seeding burned-over land must meet three essential qualifications: first, maximum production; second, a combination low in cost, either in the price of the seed or the small amount necessary to secure good results; and, third, seed readily obtainable. Timothy and alsike clover has been a standard combination for seeding this type of land; and after considering the results which have been obtained, it is apparent that the use of this combination deserves considerable merit. The seed of these plants is stocked by all dealers, and the cost of seed per acre is low. From a consideration of production, several other desirable grasses have a greater producing ability than timothy. From the results of investigation at Sandpoint, orchard grass and meadow fescue could be well used for this type of seeding. These two grasses are as readily established as timothy, will extend the grazing period, and in addition are as long lived and are higher in productivity.

The advantage of using a legume with a grass seeding is given in Table IV, in which a seeding of timothy alone and another of timothy and clover are compared. The reduction in yield as the seedings grow older is fairly constant, but the effect of adding the clover to the timothy is shown by the maintained increased yield.

**TABLE IV**  
Yield of Timothy, and Timothy and Clover at Sandpoint,  
1927-1931, Inclusive

Year	Timothy (lb.)	Timothy and clover (lb.)
1927 .....	4216	7836
1928 .....	4560	6400
1929 .....	2480	4800
1930 .....	1880	3060
1931 .....	1200	1840
Average .....	2867	4787

### Amount of Seed to Use

The amount of seed to use in reseeded operations depends on several factors. It is usually recommended that for combination

seedings of forages the rate should be reduced to two-thirds the amount of that used in a straight seeding. On range land such a plan would present a fairly high acre cost for seed. On small acreages this expense may be justified, but few operators can afford to apply a heavy rate of seeding to large areas. It is not a question of the value of the heavy seeding; for it is well known that the heavy seeding gives quicker, more even coverage and greater production; but a question of limited means for seed purchase. Most farmers are content to make the lighter seedings to establish the forage on the land and check the ingress of less desirable plants. Dependence is then placed upon time to thicken the stands so that eventually the area will come to heavier production. Many operators seed as little as three or four pounds of a forage mixture per acre. This is a very scant seeding, for several years must elapse before the land will support a high grazing capacity. It seems desirable that for more immediate use of the pasturage the rate of seeding should be between 10 and 15 pounds per acre with the mixtures combining forages having small and medium-sized seed.

#### Seed Costs

Seed costs have varied so widely in the past few years that no attempt will be made to give a comparison in prices of the various kinds. The legumes are substantially higher in value than the grasses, with the exception of the sweet clovers, which are usually about one-half or one-third the price of alfalfa or red clover. Alsike is normally the cheapest of the common clovers, and white clover is the most expensive. Grimm alfalfa usually exceeds the price of the red clovers, and the common alfalfa is usually less. Timothy is the cheapest of the grasses and on a price basis usually is followed by the ryegrasses, slender wheatgrass, bromegrass, redbud, meadow fescue, and orchard grass. The bluegrasses are priced in the top brackets of the common field grasses. For seedings requiring large amounts of seed, wholesale quotations usually can be obtained that will supply the seed much cheaper than at retail prices.

#### Management of Seedings

The length of usefulness of a stand of grass depends upon many factors. Productivity of the soil is of major consideration, for without good fertility the grass rapidly decreases in yield and grazing capacity. The addition of clover to a grass seeding assists in holding a portion of the original fertility by the addition of nitrogen from the decaying parts of the plant and by the growth of nitrogen-fixing bacteria on the roots. Nitrogen is the element most commonly found in low quantities in forest soils. The intensity of the grazing of an area also has much to do with the maintenance of stand. Under close cropping conditions there is not the opportunity for the plants to either reseed or to develop normal root growth. Light seedings necessarily do not give the production of heavier seedings and when



they are closely grazed they deteriorate quicker than do the heavier stands. Brush, forbs and other forest growth eventually enter seedings and as these develop there is a lessening in the stand of the grasses and clovers. Under controlled management, seedings are frequently found that have been grazed for 15 to 20 years. In cases of overstocking, forage seedings may be ruined by the third or fourth year and the areas then grow up rapidly to weeds of poor grazing value.

### Common and Scientific Names of Plants

White fir .....	<i>Abies grandis</i>
Alpine fir .....	<i>Abies lasiocarpa</i>
Maple .....	<i>Acer glabrum douglasii</i>
Yarrow .....	<i>Achillea millefolium lanulosa</i>
Crested wheatgrass .....	<i>Agropyron cristatum</i>
Bunch wheatgrass .....	<i>Agropyron spicatum</i>
Slender wheatgrass .....	<i>Agropyron tenerum</i>
Violet wheatgrass .....	<i>Agropyron violaceum</i>
Redtop .....	<i>Agrostis alba</i>
Service berry .....	<i>Amelanchier</i> spp.
Dogbane .....	<i>Apocynum pumilum</i>
Alder .....	<i>Alnus tenuifolia</i>
Smooth bromegrass .....	<i>Bromus inermis</i>
Macoun's reedgrass .....	<i>Calamagrostis macouniana</i>
Pinegrass .....	<i>Calamagrostis rubescens</i>
Red laurel .....	<i>Ceanothus sanguineus</i>
Sticky laurel .....	<i>Ceanothus velutinus</i>
Fireweed .....	<i>Chamaenerion angustifolium</i>
Bull thistle .....	<i>Cirsium lanceolatum</i>
Dogwood .....	<i>Cornus stolonifera</i>
Orchard grass .....	<i>Dactylis glomerata</i>
Muletail .....	<i>Erigeron canadensis</i>
Meadow fescue .....	<i>Festuca elatior</i>
Idaho fescue .....	<i>Festuca idahoensis</i>
Western fescue .....	<i>Festuca occidentalis</i>
Sheep fescue .....	<i>Festuca ovina</i>
Bunch fescue .....	<i>Festuca scabrella</i>
Strawberry .....	<i>Fragaria</i> spp.
Ocean spray .....	<i>Holodiscus discolor</i>
Wild lettuce .....	<i>Lactuca scariola integrata</i>
Western larch .....	<i>Larix occidentalis</i>
Italian ryegrass .....	<i>Lolium multiflorum</i>
English or perennial ryegrass .....	<i>Lolium perenne</i>
Utah honeysuckle .....	<i>Lonicera utahensis</i>
Oregon grape .....	<i>Mahonia repens</i>
Alfalfa .....	<i>Medicago sativa</i>
White sweet clover .....	<i>Melilotus alba</i>
Yellow sweet clover .....	<i>Melilotus officinalis</i>
Ninebark .....	<i>Opulaster pauciflorus</i>
Myrtle .....	<i>Pachistima myrsinites</i>
Reed canary grass .....	<i>Phalaris arundinacea</i>
Syringa .....	<i>Philadelphus lewisii</i>
Timothy .....	<i>Phleum pratense</i>
Spruce .....	<i>Picea engelmanni</i>
Lodgepole pine .....	<i>Pinus contorta</i>

Western white pine.....	<i>Pinus monticola</i>
Western yellow pine.....	<i>Pinus ponderosa</i>
Canada bluegrass.....	<i>Poa compressa</i>
Kentucky bluegrass.....	<i>Poa pratensis</i>
Cinquefoil.....	<i>Potentilla</i> spp.
Douglas fir.....	<i>Pseudotsuga mucronata</i>
Fern.....	<i>Pteridium aquilinum pubescens</i>
Buckthorn.....	<i>Rhamnus alnifolia</i>
Cascara.....	<i>Rhamnus purshiana</i>
Sticky currant.....	<i>Ribes viscosissimum</i>
Rose.....	<i>Rosa</i> spp. (mostly <i>R. nutkana</i> )
Thimble berry.....	<i>Rubus parviflora</i>
Scouler's willow.....	<i>Salix scouleriana</i>
Elderberry.....	<i>Sambucus glauca</i>
Butterweed.....	<i>Senecio triangularis</i>
Goldenrod.....	<i>Solidago</i> spp. (mostly <i>S. elongata</i> )
Mountain ash.....	<i>Sorbus sitchensis</i>
Wild hollyhock.....	<i>Sphaeralcea acerifolia</i>
White spiraea.....	<i>Spiraea corymbosa</i>
Pink spiraea.....	<i>Spiraea menziesii</i>
Snowberry.....	<i>Symphoricarpos alba</i>
Western cedar.....	<i>Thuja plicata</i>
Alsike clover.....	<i>Trifolium hybridum</i>
Red clover.....	<i>Trifolium pratense</i>
White clover.....	<i>Trifolium repens</i>
Western hemlock.....	<i>Tsuga heterophylla</i>

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### Summary

Burned forest land can be seeded the fall of the fire, on the snow, on honeycombed land, or in the early spring. Seedings made later than the year following the fire have not been successful.

Fall seedings permit grazing the year following. Livestock should be withheld from spring seedings until late summer.

No tillage treatments are necessary to get a coverage of the small seeded grasses and legumes, the beating of the rain and the action of frost furnish sufficient coverage to assure germination and survival of the forage seeds.

Heavy seedings prevent the rapid encroachment of weeds and browse. Light seedings are more easily destroyed by over-grazing and this permits the growth of less desirable plants.

A seeding for burned-over lands should include a legume to maintain the yield and add to the palatability of the forage.

Large seeded grasses like smooth brome grass, tall oatgrass and the wheatgrasses have not established readily under the conditions of these seeding experiments.

Livestock have shown a preference to forages like timothy, orchard grass, meadow fescue, tall meadow oatgrass, and brome grass and have used these in preference to other species such as redtop, Kentucky bluegrass, and the wheat grasses.

All the common clovers are suitable for reseeding purposes, but of these sweet clover is the only one that has maintained the original cover. This clover in all cases was improved as the stand grew older.