THE HISTORY OF FORAGE PROGRAM AT W.S.U. [1]

B. Rodney Bertramson [2]

The dust storms of 1933-34 in the Great Plains darkened the skies over Washington D. C. Like signs from the Heavens in biblical times, these brought to the attention of Congress the preachings of the great conservation prophet, Dr. Hugh Hammond Bennett--it was high time to save our precious soils, if we were to escape the fate of other great civilizations that have gone before. A huge national program was initiated in 1934 under the aegis of the Department of the Interior and labelled, "The Erosion Service". The service was engineer oriented. The strategy--something like that of the Bureau of Reclamation--was to stop this erosion by means of engineering structures--earthen dams, concrete drop outlet dams, and more elaborate concrete structures down in the alluvial plains, in the gullies, and ditches. As the silt-ladened waters swelled over these structures, covered them with the load of silt, or washed them out, the message came through to the program planners: "You've got to hold that soil in place and control the waters up on the watersheds, not down in the gulleys and streams!" Planners began to listen to the managers of vegetation: the agronomists, range management specialists, and foresters. One cannot manage the countryside unless one manages the vegetation. For those lands involved with agricultural production and concentrated populations, the managers are generally agronomists. Even the cultivated crops call for a kind of plant management in an intensive form. From the edge of the black-top, or concrete, to where forest or wild lands take over, this is the domain of agronomists. That is a given!! All too often, the agronomist has not been consulted--or if consulted, it was

---

1/ Part of History of Agronomy and Soils, WSU. 1985.

2/ Former Chairman and Professor Emeritus. Department of Agronomy and Soils, WSU. Pullman, WA 99164.

too late, when nothing was left but an unfriendly environment of eroded, bare, mutilated landscape. With the increasing awareness via environmentalists, maybe things will change!

"Things will get worse before they get better" is an oft-spoken prediction that was well illustrated in the dustbowl days of the 30's. Things had gotten worse! And the nation decided to do something about it. A start was made!

The Erosion Service in the Department of Interior metamorphosed to the Soil Conservation Service under the Department of Agriculture and agronomists were brought into the act. The importance of grasses--and legumes--in stopping erosion, in managing the watershed, was recognized. Agronomists set up grass nurseries of collections from native and introduced grasses to evaluate their performance for erosion control as well as in forage production. The native grasses were domesticated, selections were made, and strains became carefully identified varieties with the seed processed like other crop seeds via a generation system of certified seeds increase.

It was through this process of an evolving Soil Conservation Program that the SCS Nursery for the Pacific Northwest was established adjacent to the campus of WSU. As a biased "forty-niner", arriving 15 years later at WSU, I proclaim this to have been one of the finest programs of its kind in the USA--let's say, "in the world"! It dealt not only with stopping erosion, putting sod of fibrous roots into erosive soil, but developing and testing forage plants for economic agriculture as well. It was a program with an urgent mission. It developed the closest of working partnerships between the USDA and WSU. The team of Federal and State workers served both their respective institutions and their colleagues faithfully and well. The Program was the thing!

Many illustrious and well-known agronomists participated in this program. Most assuredly, some will be omitted in this recounting and I apologize for the oversight. A special bonus of manpower to assist with nursery field work were helpers from the old CCC camp located where the Pullman-Moscow airport now stands.

The results from this cooperative program were presented very well by John L. Schwendiman and W. E. Chapin in Agronomy and Men 1950-51. They were the SCS Nursery Managers for the Pullman and Bellingham Nurseries, respectively. Their articles are excerpted here:

Grassland Agriculture

John Schwendiman

Although grass and legume work at the Washington Agricultural Experiment Station began early in the history of the Experiment Station, it really received emphasis when the two Soil Conservation Nurseries in Washington, one at Pullman and one at Bellingham, were established in 1935. The emphasis on grassland agriculture has been coincident with the organization of soil conservation districts in the state. Since 1935 the Soil Conservation Nurseries in cooperation with the Experiment Stations and other Federal departments have tested and released for use the following important grasses and legumes which are now becoming well known and widely used.

1. Primar slender wheatgrass: For use in sweetclover-grass mixtures
2. Whitmar beardless wheatgrass: A dryland range grass also for dryland pasture use on abandoned dry farms.
3. Intermediate wheatgrass: Primarily for alfalfa-grass hay and pasture mixtures.
4. Bromar mountain brome: For sweetclover-grass mixtures primarily in the Palouse area.
5. Manchar smooth bromegrass: A high-producing, leafy type brome widely adapted in northern latitudes.
6. Hard fescue: A heavy root-producing conservation grass.
7. Sherman big bluegrass: An extremely early-growing hay and dryland range grass.
8. Volga wildrye: Developed specifically for control of inland sand dunes.
9. Spanish sweetclover: A late-maturing, high-producing pasture and green-manure clover.
10. Cascade Lotus: A very productive broad-leaved hay type of wide adaptation.

The Soil Conservation Nurseries are designated by cooperative agreement as the official producers of breeders and foundation seed of new and improved grasses and legumes. Since 1946 some 4,853 pounds of foundation seed have been supplied to the Washington Agricultural Experiment Station for registered and certified seed production. In addition to this, some 15,000 pounds of seed have been supplied to soil conservation districts for seed production.

Excerpt from WSU Agronomy and Men 1950-51

There has been produced on the soil conservation nurseries to date over 330,000 pounds of improved grass and legume seed. This has been used for seed production and for conservation seedings.

Of the grasses and legumes which have been released long enough to enter commercial channels, some current figures are available on total and annual clean seed and plant production. These are all grasses and legumes which were unknown ten years ago. Some of them were released less than five years ago.

Species	Total lbs. seed produced to date	Total acres of conservation seedings made to date	Current annual seed prod. in lbs. clean seed. (Washington only)
Primar slender wheatgrass	205,790	25,720	35,000
Whitmar beardless wheatgrass	33,450	4,200	5,000
Intermediate wheatgrass	145,500	18,200	50,000
Bromar mountain brome	663,240	66,324	150,000
Manchar smooth brome	437,600	73,000	200,000
Hard fescue	36,900	7,380	10,000
Sherman big bluegrass	272,600	54,500	70,000
Spanish sweetclover	11,700	2,340	2,500
Total	1,806,780	251,584	522,500
Volga wildrye	2,510,100 plants	130	1,000,000 plants

Field Size Planting Trials as an Aid to Grassland Agriculture

W. E. Chapin

Testing work with grasses and legumes has been carried on by the Washington Agricultural Experiment Station and the Soil Conservation Nurseries for some time. These plot tests are valuable in determining the adaptability of a new species or strain, but a further test on a scale large enough for practical evaluation under farm conditions is needed. Usually neither the Experiment Station nor the Nurseries have enough land for this type of planting.

The field size planting trial program of the Nursery Division of the Soil Conservation Service is designed to fill this gap. These trials are put on farms in the following manner:

16

The Soil Conservation Nursery, in cooperation with the Experiment Station, draws up a work plan, outlining where the species should be tested, and informs the District Conservationists and the Work Unit Conservationists concerned that trials are wanted. Included is a description of the species, where it should be valuable, what other grasses and legumes should be in the mixture, and with what standard practice it should be compared.

The Work Unit Conservationist, either through his own efforts or through the Soil Conservation District Supervisors, locates a farm in a suitable site. Usually the test species is furnished by the Nurseries and the rest of the mixture of the cooperator.

The cooperator is expected to keep records on cow days pasture, tons of hay, etc., so that a direct comparison with the standard can be made.

Periodic, systematic inspections are made by Nursery personnel, Work Unit Conservationists, District Conservationists, and interested cooperators, and accurate reports are made.

When the above group agrees that a new species, strain, or practice is superior, it becomes a standard practice and all those interested in agriculture in the area are notified.

At the present time there are over 200 such trials on nearly 1,000 acres of land in western Washington, serviced by the Bellingham Nursery, and an equal or greater number in eastern Washington taken care of by the Pullman Nursery.

These field trials, described by Schwindiman and Chapin above, became an important part of both the SCS and the Cooperative Extension programs in Washington and were responsible for the rapid adoption of improved conservation practices by farmers in Washington.

Excerpt from WSU Agronomy and Men 1950-51

Simultaneously on the State side, the Department of Agronomy released, via Washington State Crop Improvement Association, 2000 pounds of foundation seed of the 10 different grasses which had been released by the Experiment Station through a cooperative review with other states and the USDA. In cooperation with the National Foundation Seed Program, Washington Agricultural Experiment Stations increased Ranger alfalfa and Kenland Red Clover. The production of these under irrigation was almost an embarrassement to the National Program because instead of only 100 lbs. of red clover seed per acre, the three-year average yields were around 900 lbs. The average yields for Ranger alfalfa were 1200 lbs. per acre. The national Foundation Seed Project was more than successful!

The history of forage work at WSU goes back to the very beginnings of the Institution. A colorful agrostologist of the faculty was Charles Piper who came here in 1892 as a botanist from the University of Washington. He left here in 1903 to become an agrostologist in charge of crop investigations for USDA. He later was Chairman of the Committee that organized the publication of the Agronomy Journal. Some of the accessions in his nursery just north of the Compton Union Building are now "escapes" to be found in the surrounding courtyside. One is a primative ancestor of our common wheats (Aegilops cylindrica) and is a bad weed. It is a winter annual (like winter wheat) introduced from Russia and is commonly called "goat grass". Dr. Piper was well known for his texts and other publications dealing with the flora of the Pacific Northwest. (Piper, Charles V., and R. Kent Beattie, 1915)

Dr. John E. Weaver, a prestigeous plant ecologist at the University of Nebraska in the 30's and 40's, worked on the Palouse Vegetation when on the faculty of the WSU Department of Botany 1911-1914. His superb teaching on the subject was witnessed by Drs. H. W. Smith and B. R. Bertramson later of WSU in

his courses at the University of Nebraska. He did a great deal of early studies on the various factors in vegetative management and slope that affected erosion control. Dr. Rexford Daubenmire of the WSU Botany Department conducted many ecological studies on the grass and forb communities of the Pacific Northwest.

The SCS Nursery at Pullman was first headed by Dr. A. L. Hafenrichter--formerly a faculty member of the WSU Agronomy Department. He was an intense, dramatic, colorful, and able scientist. Those who worked under him, lovingly and respectfully described him in such term as that "dictatorial little Dutchman!" But they bore the title of "Hafie's Boys" proudly, and they profited in later years by his teachings and supervision. (In later years when Bertramson was Chairman of the Department of Agronomy and Hafenrichter was in a supervisory capacity officed in Portland, Hafie often came to see the Chairman, to reinforce some earlier commitment from the Department. One felt as though confronted by a prophet of biblical times when he would intone, "Bert, we convenanted with you...". He always made his point well and usually got his way!

Hafie was succeeded as Nursery Manager by John L. Schwendiman whose personality and presence came to be embodied in the Soil Conservation Nursery--later called the Plant Material Center. He literally lived with the forages in the Nursery. Any damage to them, or the Program there, was a direct pain to John.

A close cohort of John's on the faculty was Prof. Alvin G. Law who was well known for his incisive and often witty pronouncements. One day, in a fit of frustration because some people in Range Management were challenging John's philosophy, Al declared, "John Schwendiman has forgotten more about range management than they will ever know!" Al's loyalty to, and esteem for, John Schwendiman was dramatically portrayed!

Harold Miller, also at the Nursery with John Schwendiman in the early days--even at the beginning--of the Nursery went to Pleasanton, California to head up that Nursery in 1947. Later, he returned to Portland, when Hafie retired in the early 70's, to take over Hafie's position as Regional Plant Materials Specialist for the 17 western states. Miller and his wife, Evelyn, returned to WSU in May 1986 to the Golden Grads celebration. Both were graduates of WSU. Hal Miller's recollections were recorded on a tape by the author for the Oral History Project of WSU. Hal said the early history records of the Pullman SCS Nursery--and of all the other SCS Nurseries--are located at the Conservation History Library of the University of Wyoming, Laramie. John Schwendiman has prepared a detailed report, or history of the SCS Nursery located at Pullman on a year to year basis. This is also to be included as a part of the History of Agronomy and Soils WSU. 1985.

Harry Schoth and Hank Rampton were earlier participants in the SCS Nursery Program here and later went to Oregon State University. Others who served at the SCS Nursery here at various times were Virgil Hawks who went to Iowa State to head up the SCS Nursery there, Joe Williams, ED Minnick, and Dick Adlard. The latter two became county agents here in Washington. Lowell Mullen worked with Schoth in collection of native plant materials for the Nursery.

Early in the Eisenhower Administration, a move was launched to eliminate the nurseries or to severely curtail their programs--transfer them to the Universities, etc. At that time, definite plans were made to maintain the Pullman Nursery Program as a part of WSU and to transfer John Schwendiman to the State payroll. Fortunately, the Pullman Nursery was one of those preserved by SCS, USDA. But it did not escape unscathed. Its funds and program were greatly curtailed. It has never returned to glory and the

prestige of its earlier days.

This regrettable de-emphasis is never the less understandable in view of the direction agriculture has taken. More and more, the agriculture of the Palouse has shifted away from animals and the production of forages to cash crops and a farm support program. Unfortunately, there is much less use made of forages and legumes in crop rotations in the Palouse. The nitrogen is supplied via the fertilizer bag and soil tilth is temporarily ameliorated by the overwhelming application of horespower and cultivation. But in the long run, the physical condition of the soils has greatly deteriorated.

Under the present economy, the hope for soil conservation lies in resorting to trashy fallow and no-till farming. Many problems remain with these types of culture in the high rainfall (more than 16") of the Palouse; but progress is being made.

In the meantime, the benefits of the SCS Nursery Program are on "hold". The knowledge of forage crop management to retain the soil is preserved in all these reports and publications. The seeds of the improved strains of grasses and legumes are available and preserved awaiting the inevitable return of times when perennial grasses and legumes will again play a greater role in conservation of our precious soil. Some years ago, when Russell Train was Administrator of The Environmental Protection Agency, a well documented bulletin came out from that Agency stating what one can observe on every hand: the conservation of our precious soil is no better--or scarcely better--than it was in the hey day of concern when the Soil Conservation Service was activated. One should not conclude all that effort was for naught: how badly off would we be today in the conservation of our soil if the program had never been initiated? Some day, we will put it all together--we hope--before it is too late?

Much work was done in the Department by Dr. J. K. Patterson, John Goodding, and others in studying means of rehabilitation of our devastated range lands which were in their prime when white man came here. Delayed grazing, staged rotational grazing, reseeding, use of selective herbicides, use of large scale cultivation where there are no rocks and use of fertilizer have all been evaluated. Suffice it to say, when food gets scarce--the price justifies greater inputs--the meat yield from these ranges can be doubled or trebled, but at a cost not now justifiable at present food prices.

Currently, 1986, the Farm Program aims to take poor and erodable lands out of cultivation and restore them to a good protective cover. This is a noble effort--if carried through with inspections to see that such put-aside lands are converted to a <u>really protective cover</u>. The original Soil Bank scheme left much to be desired where establishment in many instances was far from acceptable.

An important and gratifying aspect of forage use is in our turf program for golf courses, parks, cemeteries, residential lawns, etc. In 1948, the first annual turf conference was organized upon the initative of Prof. E. G. Schafer and A. G. Law. Four golf course superintendents had appealed to them for help with turf problems. They were Glenn Proctor, Louis Schmidt, John Harrison, and Wilfred Brusseau. By 1950, the conference had grown to draw 70 turf enthusiasts from all over the Pacific Northwest. At the conclusion of that meeting, preparation began to make this the Pacific Northwest Turf Conference. It grew rapidly, prospered, and became identified as an association that supported turf research at WSU and promoted state support through the Legislature.

Grass seed production grew rapidly to become an important seed industry of the PNW with Washington State a foremost producer. Climatic conditions

seemed ideal for maximum production of grass seed of the highest quality. And the Washington State Crop Improvement Association with its State Certification Program placed Washington Certified Seed in the top category of purity and trueness to type. Robert Dye of Pomeroy, a WSU agronomy graduate, became the largest producer and supplier of certain grass seeds in the country. And Arden Jacklin and sons Don and Doyle--also graduates of WSU--were largely responsible for a tremendous grass seed industry in Northern Idaho and adjacent areas of Washington around Spokane. Prof. A. G. Law covered the subject of turf grass seed production in the WSC Agronomy and Men 1958-59. This excerpted article follows:

13

TURF GRASS SEED PRODUCTION

Alvin G. Law

Grasses that are used primarily for home lawns, playfields, parks, cemeteries, and roadside seedings are properly considered turf grasses. It has been estimated that in Washington there are over 270,000 acres of turf in golf courses, cemeteries, home lawns, and highway rights-of-way. In Washington and Oregon there are slightly over 200 golf courses. Compare this figure with the 200 golf courses in the Chicago area alone and you get an idea of the importance of turf in this field.

The use of turf grass seed on a national basis each year also illustrates the importance of turf grasses. The 1957 usage of seed of those grasses primarily considered turf grasses exceeded 104 million pounds. Included in this list are the Kentucky bluegrass varieties, chewings and creeping red fescue, bentgrasses, and a portion of the ryegrass varieties. Over 60 per cent of this total poundage of grass seed was produced in the Northwest states. Table 1 shows production of the important turf grasses in recent years in the Pacific Northwest.

Table 1. Turf Seed Production in the Pacific Northwest[1]

Year	Acreage	Average yield (lbs.)	Production (000 lbs.)
	Merion bluegrass		
1955	6400	136	873
1956	8900	173	1336
1957	11760	192	2254
1958	10350	150	1557
	Chewing fescue		
1947-56 av.	15650	368	4336
1957	20000	390	7800
1958	21000	280	5800
	Creeping red fescue		
1947-56 av.	6570	312	2096
1957	7000	451	3160
1958	9500	315	2990
	Bentgrass		
1947-56 av.	17370	155	2823
1957	28200	286	8064
1958	26100	239	6231
	Common and Perennial Ryegrass		
1947-56 av.	121800	676	44610
1957	111000	920	51225
1958	108000	830	45720

1 USDA, A.M.S. Annual Summary 1957-58

In Washington turf grasses made up 50 per cent of the total grass seed production in 1958. It is expected this industry will become more important. One of the reasons for feeling this way is illustrated by the yield figures in Table 2. These seed yields represent the average of many experiments over a total of three years and illustrate the level of production that can be expected from the turf grasses listed. Favorable climatic conditions are, of course, basic to successful seed production. Winter rainfall, dry harvest season, ample irrigation water, and an adequate frost-free growing season are all factors contributing to high yields.

Table 2. Seed yields of turf grasses (average of several experiments for 3 years) Washington.

Variety	yield lbs. per acre
Olds creeping red fescue	724
Pennlawn red fescue	623
Delta Bluegrass	461
Merion Bluegrass	270
Astoria Bentgrass	231

These favorable climatic conditions are being utilized by an increasing number of grass seed production specialists who have become experts in their field. These growers have made seed production their primary farm enterprise. Turf grass growers must be good farmers. They must have clean fields. They usually produce the grass seed in rows and cultivate regularly. They use dinitro and 2, 4-D spray for broad-leaved weed control, and may use the grass killer sprays for the seedling grasses and annual weedy grasses. They will apply 60-120 pounds per acre each year of nitrogen plus varying amounts of other fertilizers, and they regularly do a considerable amount of rogueing and even hand hoeing to remove off-type grasses and weeds that are inseparable in the cleaning process. They must follow rigid schedules for control of wireworm, timothy mite, sod webworm, and lesser insects. The result of these practices is high quality seed of varieties needed by the turf grass consumer.

Harvesting presents two major problems--seed shatter and high moisture content. Because of its economy in labor and time saved, field combining has become a dominant harvesting method. The only exception to this is a few areas where high winds are a hazard during the harvesting period. Here windrowing while the seed is still immature and pickup combining later has become a common practice

To avoid serious shatter loss, most fields are cut before the seed is dry enough to store safely. Various drying devices are then used. The seed may be run through a scalper in the cleaning line, it may be spread on platforms and allowed to cure. Perhaps the most successful curing method is one devised by the Jacklin Seed Company at Dishman, Washington. It consists of a large concrete platform in which electric cables have been embedded. Seed spread thinly on this platform will dry in a matter of hours and can be stored safely until it can be processed.

Possibly the greatest selling point for turf seed produced in Washington is the grower emphasis on quality seed of varieties that are in demand in the seed consuming area. Varieties produced by plant breeders in the eastern states are brought to Washington and increased rapidly under the certification program. This program sets up rigid field inspection standards and equally rigid seed inspection requirements to ensure high mechanical and genetic purity. The Washington Seed Certification Program permits only three generations of increase of a grass seed variety. This is the best procedure yet devised to ensure genetic and varietal purity. A single example of how this program works to protect consumer and producers alike will illustrate this point.

Pennlawn creeping red fescue was developed by Professor Musser at Pennsylvania State University. He bred into the variety quality factors, disease tolerance factors, and adaptation factors that make it superior to other fescues for specific uses in the eastern states. Ten pounds of breeder seed (Generation I) was sent to Washington. The Washington State Crop Improvement Association, working with a leading processor, selected a grower who planted 10 acres with the breeder seed. This grower produced an average of 400 pounds of Foundation seed (Generation 2) per acre. Thus, there were available 4,000 pounds of Foundation seed for redistribution to certified seed growers for planting to produce the certified generation (Generation 3). This was sufficient seed to plant 1000 acres and thus produce at least 400,000 pounds of certified Pennlawn creeping red fescue by the fourth year after release.

This certified seed is used only for turf planting. The bulk of it was made available to the consuming area in the eastern states where the variety was developed. Such a procedure develops two points: (1) a relatively small amount of breeder seed of a variety is needed, and (2) a variety can be increased rapidly in an area favorable to seed production without losing its particular characteristics if it is grown under certification regulations. Continued growth of the turf grass seed industry in Washington is dependent on research as well as grower experience and interest. To be most effective, whether it be fundamental or applied, research must be pointed toward the problems growers and processors encounter. Fertilizer rates, row spacings, irrigation schedule, weed control, disease control, seed shatter, and processing methods are all problems facing seed growers in this area.

Dr. C. L. Canode, USDA Agronomist, is stationed with the Agronomy Department at Pullman and working full-time on grass seed production problems. Dr. Canode's experiments in the important grass seed producing areas of eastern Washington are designed to determine the most effective fertilizer rates for maximum production of high quality seed. He is measuring responses to fertilizers by seed yield and seed weight. Also Dr. Canode is determining the effect of burning and various other methods of fall straw removal on yield, seed size, insect population, and longevity of stand. Dr. W. C. Robocker, USDA Weed Control Specialist, is working with Dr. Canode to find chemical spray treatments to control annual weedy grasses such as cheatgrass and witchgrass. An important part of these experiments is to find a treatment that will kill grass seedlings growing from the shattered seed of the turf grasses.

Research is needed to define the moisture percentages at which freshly harvested seed can be stored without injury to germination. More information is needed on the number of generations of increase that can be allowed without harmful change in varietal characteristics. Data are inadequate on isolation requirements to prevent cross-pollination between varieties of turf grasses. So long as growers, processors, and research people work together on these and other problems, the turf seed industry will continue to expand.

Excerpt from WSC Agronomy and Men. 1958-59

Much research and extension work on turf has been done by Dr. Roy Goss from the Puyallup Station and by Prof. Al Law and Kenny Morrison in eastern Washington. Goss gave a good report on the turf work in western Washington in WSU Agronomy and Men 1962-63. The excerpt follows. The article by Goss and a later one by Al Law 74-75 give an idea of the scope and economic importance of the turf industry in the State of Washington. Law's article in The Agronomist 1974-75 is also included for ready reference. The WSU turf program has indeed served the State well--especially when one considers the limited resources of time and funds that have been put to it.

11

TURFGRASS MANAGEMENT IN WESTERN WASHINGTON

Roy L. Goss

Propagation and maintenance of turfgrasses for lawns, golf courses, parks, cemeteries, and other uses, is becoming big business in Washington. This is especially true in western Washington, since this is where most of Washington's population resides. With the advent of shorter working hours, increased incomes, better vacation advantages, and earlier retirement, golf course construction has been progressing at a rapid rate for increased recreational areas. The recreational park and cemetery turfs by no means represent the major turf acreage in western Washington. The home lawns are still the big business.

Assuming that western Washington has approximately 700,000 homes, both urban and rural, and assuming that these home lawns average nearly 3000 square feet each, we have about 49,000 acres in lawns. If over-all costs (1963) of construction run 10 cents per square foot (includes soil, fertilizer, drainage, soil amendments, and seed), we have an installation cost in excess of $213,000,000. Is this big business? Let's consider one more important aspect. What are the annual costs for maintaining home turf? No one really knows, but if each home owner spends $20 annually for water, mowers, mower maintenance, hoses, sprinklers, sprinkler systems, fertilizers, herbicides, insecticides, fungicides, services, and other associated costs, we have an annual maintenance cost of more than $14,000,000. Add one-third more for eastern Washington and it adds up to a whopping business.

If the costs of establishment of all golf courses, parks, play fields, cemeteries, institutional grounds, and other utility turfgrass areas are added in, the figures for western Washington will go even higher. The maintenance of these areas is still another matter. For example, a well-cared-for, 18-hole golf course will cost over $50,000 annually for all maintenance.

Managing Lawns in Western Washington

The climate west of the Cascade Mountains imposes certain limitations on turfgrass management. Such things as longer growing season, higher rainfall, acid soils, leached soils, and mild winters all bring about certain problems or conditions. The predominant grasses found in western Washington are the bents and fine-leaved fescues. These are used on home lawns and other turfgrass areas, except golf course putting greens, and here the bents are used alone in most cases. Both the bents and fescues thrive under western Washington conditions. Bents and a few fescues are found growing in the native state, and bents will dominate most lawns in a few years, whether seeded to them or not.

Kentucky bluegrass, including the improved strains such as Merion and Newport, is not an adapted grass in western Washington. This grass is usually displaced by bentgrass and weedy grasses, such as annual bluegrass, and Velvetgrass in the span of two to four years. Many theories, none of which has been proven, can be offered for this botanical change. Probably the best reasons are long dormant periods of the bluegrasses, and wet, acid, and cold soil conditions which prevail. The bentgrasses have little or no dormant period and are adapted to these conditions, hence, they actually take over while

the bluegrasses "sleep." Disease organisms causing rust, crown and root rots, no doubt play important roles in the loss of bluegrass.

Neither the bents nor bluegrasses (except annual) will last long in dense shade. This has been recognized for a long time, and attempts have been made to cope with this condition with shady bluegrass (Poa trivialis) which was imported from Holland. It has since been found that our own red fescues will tolerate just as much shade and are even better adapted and more available. Certainly, western Washington, receiving only 27 per cent of the possible winter sunshine, has its shade or low-light intensity problems. Add overcast conditions to light interference and interception by trees and buildings, and the problem becomes worse; hence, the need for shade-tolerant turfgrasses.

One of the biggest management problems on western Washington lawns is mowing at the correct height. The bentgrasses require a closer mowing height than other grasses. If mowed higher than one inch, trouble is bound to develop from thatched or matted lawn conditions. The best height is one-half to three-fourths inch even when in combination with fescues. If lawns become matted, the mat can be removed with power rakes or power mowers. This should be done before the condition becomes serious.

Perhaps no more fertilizer is required in western Washington than in eastern Washington, however, the ratio is a little different. For example, phosphorus deficiencies occur in most of western Washington and not so extensively in eastern Washington. Potash is often critically low in the western area, and only rarely in the eastern area. Nitrogen is always required in both regions. The best ratio in western Washington is about a 3-1-2 for nitrogen, phosphorus, and potassium. The intensity can be stepped up to suit individual desires, however, application of 6 pounds of nitrogen, 2 pounds of P_2O_5, and 4 pounds of K_2O is suggested as a good program. Lime is frequently required in western Washington to raise the pH and to increase the calcium level, but is only occasionally necessary in eastern Washington.

Disease Control

Fusarium patch and red thread diseases are most prevalent. The former can be controlled by applications of mercury and cadmium fungicides when used according to recommendations. The latter have no positive fungicidal control but can be masked by a good fertilization program and frequent mowing. Fairy ring is still another troublesome disease causing brown, yellow, or dark green circles on lawns. Again, little can be done with fungicides, but good management will help.

Research Helps Point the Way

Many of these problems are being investigated at the turfgrass research center at the Western Washington Experiment Station. About three acres of various-sized plots are being used to investigate the problems encountered by the home owner, golf course superintendent, and others. Some of the problems where considerable advancements have been made include turf-weed control, fertilization, mowing heights, adapted grasses, soil-mixture studies, disease control, insect control, fumigation of soils, and many others. This is only a beginning, however, and many more years of work will be needed to solve the many remaining problems.

Excerpt from WSU Agronomy and Men 1962-63

15

GREMLINS ON THE GREEN

A. G. Law

How come WSU's Agronomy and Soils Department is doing work on the use, management and care of fine turf when the world is filled with hungry, frustrated people? The Bible tells us, "Ye shall not live by bread alone" . . .and God said . . ."let the earth bring forth grass . . .and the earth brought forth grass," (Gen. 1:11-12). Research designed to improve these raw materials for turf used for home lawns, playfields, golf courses, city parks, cemeteries, and roadsides is under the direction of Dr. Roy L. Goss and Dr. Chuck Gould at the Western Washington Research and Extension Unit at Puyallup and Dr. Robert L. Warner and Mr. A. G. Law at Pullman. This research has been underway since 1942.

According to a recent survey there are 156,325 acres seeded to turf in Washington. Home lawns constitute the largest acreage (over 96,000), roadside and highway seedings are second in size (25,600 acres), while golf courses are a distant third (12,625 acres). Actual value of each is difficult to determine. A green, actively growing turf, 2,500 feet in size, will supply enough oxygen for the daily requirements of four adults. There are about 900,000 lawns in Washington with an average size of 4,700 square feet. Not only is there a major air scrubbing benefit but also a distinct cooling effect of green grass compared to bare ground, pavement, or even artificial turf. There are over 160 golf courses in Washington, two-thirds on the coast, and more than 4 million rounds of golf are played annually.

There are about 140 cemeteries in Washington with a total annual maintenance cost of $850,000 and a total investment in equipment of $1,500,000. Schools in Washington reported an annual total expense of nearly two million dollars in turf maintenance and equipment costs.

To service this gigantic industry, our research programs are designed to determine which variety of grass will wear best on playfields, home lawns and city parks and which will do best for roadside stabilization throughout the state. We are searching for bent grasses that can tolerate with minimum damage such gremlins of the green as snow mold, *fusarium corticium* take-all and others. We are finding which bluegrass varieties are most resistant to severe wear so we can have good playfields, lawns and city parks with a minimum of cost. This particular project has been greatly aided by a wear machine designed by Dr. Goss that simulates the wear caused by people walking on the turf.

In the continuing search for disease resistance and adaptation, Dr. Goss and his associates have assembled a world collection of the available bent grasses and have them growing at Puyallup and in the Spokane area on Downriver Golf Course. Similar collections of fescues and rye grasses are being established to study their possible use in parks and for roadside plantings. Dr. Goss and others (1970) have described the establishment of vegetation for roadsides in Washington. Of particular value is their method that allows revegetation of steep cuts of sterile subsoil without the expense of replacing the topsoil. With proper attention to water movement in the soil, the researchers have also established durable, playable natural turf on high school football fields that does not have either the abrasive nature or the astronomical cost of the artificial playing surfaces.

Popular concepts have associated "turf" with horse racing, neither Dr. Goss nor Mr. Law have been able to find any connection with this sport of kings and their work. We do have considerable financial support in the form of grants from the Northwest Turf Grass Association. This is a formal organization of golf course superintendents, city park supervisors, cemetery managers and others interested in superior turf. Each year this group meets to discuss current progress in management and problems in turf. These professional turf managers are convinced that truly "man does not live by bread alone" and that even though parts of the world are in tremendous travail of mass starvation, it is essential to nourish man's spirit and provide opportunity for the close communion with nature that can take place in a beautiful park or golf course. These islands of "green" will become even more important as we continue to urbanize and get further from nature.

Excerpt from WSU, The AGRONOMIST 1974-75

In addition to the work of the SCS Nurseries in the evaluation of production and quality of many grasses and legumes, there has been an extensive program of studies on cultural practices in forage production. Joe Jacobs, Don Oldenmeier, Bob Von Keuren and Dave Evans at Prosser carried out a number of yield trials with grass and legume mixtures and pure stands under irrigation. Cooperative beef grazing trials with Wilton Heineman were carried on. This cooperation was exemplary. The cooperators were so selfless that it was difficult to place credit for the work accomplished, the results obtained. The goal was to find a pasturage that would produce 3 pounds of beef per day per acre. This seemed to be just a bit beyond actual, but not far.

In Western Washington Maynard Grunder, Herman Austenson, Corwin Johnson, and Stanton E. Brauen also conducted studies on yield and quality of forage from various mixtures and under different management programs. Along came Darrell Turner in Outlying Testing (1955) and such testing was conducted extensively in most of the counties of western Washington. Much useful information was gained and put to use. Soil fertility studies with forages were conducted by M. E. McCollum 1920 to 1927. He was succeeded in this program by Karl Baur and Todd Tremblay. They were in turn succeeded by Walter Mortenson and Aaron Baker. Newell Dickson (1944-1953) was in charge of a project in Western Washington to evaluate the feasibility of converting logged-over mountainous areas of western Washington to pastures or range. Ecological and economic factors proved the fallacy of that proposal. C. B. Harston conducted cooperative TVA forage fertilization studies in western Washington.

In the irrigated central Washington area, the annual production goal was 10 tons of high quality alfalfa hay per acre. Such yield records were achieved on rare occasions. Irving Dow 1955-83 as outlying Testing Specialist

in the Columbia Basin Irrigation Project combined the fruits of research with Extension for that area in forage management with excellent results. Especially the soil fertility and minor element aspects of forage management were clarified and the information disseminated with the help of cooperating county agents.

In eastern Washington, the goal was to find ways to get 3 tons annually of good quality hay per acre--and then figure out some way to harvest it without loss. "Surest way to get a good June rain in eastern Washington is to cut down your hay crop!" At least, it seems that way. Hay harvesting in eastern Washington is severely hampered by the weather; and risks of loss from harvest greatly exceed those of any other crop.

In contrast to the ease of harvesting wheat, hay making is very arduous work; the product is miserable and awkward to handle. Much speculation and experimentation on drying, cubing, pelleting of hay has gone on. If we can only find ways to do that economically, then forage production will boom in Washington.

In the early 50's Al Law, Kenny Morrison, and dairy scientists, Al Shaw, and Scott Hodgson assisted in forage and silage clinics with emphasis on quality and palatability of forages for pasture, and hay silage produced in Western Washington. They gained much notoriety and high-lighted this aspect of forage utilization by serving as surrogates for the dairy cows as judges of palatability. If they pronounced an ensilage sample "Excellent" who could, or would, argue with them?

To coordinate these far-flung research and extension activities envolving forage management, the forage workers from all areas of the state met annually to learn what had been accomplished, to consider urgent needs and the available resources for planning and direction of the program for the future,

and to share resource efforts and expertise. Surely the program prospered from this coordination of efforts and served as a model of what faculty research and extension workers can do through such teamwork.

SUMMARY

The Regional SCS Nursery located adjacent to the WSU campus at Pullman in 1935 provided a unique opportunity to pursue forage studies in great detail. The excellent cooperation between State and SCS people was truly outstanding and provided an ideal climate for fruitful work. Many visitors from around the USA and from other countries came to inspect this Nursery Headquarters and work area. Many grad students have been trained here while working part-time for the College and the Nursery. The Nursery and the infusion of Federal funds helped provide the "critical mass" to fuel a vigorous forage program at WSU.

While Farm Programs and economics have dampened the forage production in the Palouse area, the excellent pastures and forage production in the Columbia Basin and other irrigated areas and the intensive pasture production in Western Washington bear witness to the success of the forage program at WSU from research to extension--putting forage technology to work on the land.

The Department of Agronomy and Soils recognized the tremendous importance of turf for recreational area, for landscaping residential, industrial and highway areas. It provided the research and extension to ensure the proper application of turf technology in all these areas of varied and specific needs.