THE WALDO HILLS
HIGHLAND BENTGRASS AREA

by

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THE WALDO HILLS
HIGHLAND BENTGRASS AREA

ABSTRACT: The Willamette Valley in Oregon produces over 90% of the Highland bentgrass seed produced in the United States. Approximately two-thirds of this production comes from a well-defined area on the eastern edge of the Waldo Hills, east of Salem. This concentration seems to be related to a set of physical factors favoring Highland bentgrass and/or disfavoring other grasses. In comparison with most of the rest of the Willamette Valley the soils of this area are more acid and have lower levels of total bases, the rainfall is greater, and the summer water deficit is of shorter duration. Highland bentgrass is alien to this region, and to the United States. It was imported accidentally, but is now firmly imbedded in the area—physically, economically, and socially. Preventing its cultivation would bring drastic changes to the agriculture and people of the region, but without technological developments these changes are a probable result of the ban on field burning that will become effective in 1975. Research has progressed well on such alternatives as pelletizing straw and the mobile field burner, but at this time open field burning is still required. Few plans have been made by the farmers as to what they will do if alternatives to burning are not developed by the time the burning ban is enforced. The information for this study was gathered by interviews with farmers, extension agents and other technical personnel, and by document research.

How and why different types of farming have evolved in specific areas has long been of interest to agriculturists. The evolution of the Corn Belt is well documented, but much less is known about many other equally interesting—though less economically significant—areas across the country. The importance of knowing the historical development of an area lies in the use of it as a base for
predicting future patterns, and for the planning of future adjustments. The focus of this paper is on the development of production of a particular type of grass seed within a well-defined area of the Willamette Valley, Oregon. The influence on future patterns of the restriction on field-burning after 1975 is also discussed. The initial framework for the discussion is provided by brief history of the grass seed industry in Oregon.

Old timers have related to H.H. Rampton, Research Agronomist with the United States Department of Agriculture in Oregon since 1931, that river boats loaded out velvet grass seed at Corvallis in the 1880's. This was less than 40 years after the first known commercial production of grass seed in the United States - probably orchard grass in Kentucky shortly before 1850. The Willamette Valley was formally recognized more than 80 years ago as having great potential for growing grass for seed. In the Oregon Agriculture Experiment Station Bulletin No. 4, Annual Report for 1890, it was stated that: "The indications are that this is a most wonderful grass country, and when farmers once become fully awakened to the value of their land for grasses and clovers, wheat growing will take a secondary position in the Willamette Valley, which will in time be the home of grasses and clovers in their highest perfection." By 1900 seeds of common ryegrass were being
marketed out of Portland. Seaside bentgrass was harvested for seed in 1918, and Astoria bent in 1928, but it was not until about 1933 that natural stands of Highland bentgrass were first harvested, in Douglas County.

Highland bentgrass was certified for the first time in 1934. Certification meant that the seed had to show less than one-half of one percent mixture of other bentgrasses; had to be 97 percent pure, and only one-third of the impurities could be foreign seed; and had to weigh at least 32 pounds per bushel. In 1934 two thousand pounds of certified Highland bentgrass seed were produced in Oregon. In 1969 3,410,111 pounds were produced, in 1970 4,835,481 pounds, and in 1971 5,313,260 pounds. At this time the Willamette Valley produces over 90 percent of the bentgrass seed grown in the United States.

The production of certified Highland bentgrass seed is concentrated east of Salem, on the eastern edge of the Waldo Hills area (see attached map). Approximately two-thirds of the 17,000 acres of Oregon farmland devoted to Highland bentgrass production is in this area. But this is an alien grass to the U.S., native to Western Europe. Its beginnings in Oregon are the next subject.

Beginnings

Don Brewer, Extension Seed Certification Specialist with the Oregon State University Farm Crops Department,
states that the seeds of Highland bentgrass undoubtedly came into the United States with the early European settlers, since Europe is the native region of the grass. He feels that its entry into the United States was deliberate, but that its beginnings in the Pacific Northwest were accidental. Highland bent probably arrived in Oregon by train, according to Mr. Brewer, as fodder for cattle. The seeds were scattered and natural propagation took over from there. Within a decade farmers were fighting Highland bent as a weed. Highland bentgrass was first harvested in Douglas County circa 1933, from natural stands. A seed industry quickly developed, centered around Yoncalla.

Today Douglas County does not harvest any Highland bentgrass. The real success story for this grass lies in the Waldo Hills region of Marion County. Judged solely from recorded commercial production data, the development of Highland bentgrass in Marion County was subsequent to that of Douglas County. The early production in Douglas County does not seem to be responsible for the later development in Marion County.

Anthony Shrewe is a retired farmer living in Sublimity, near the southern end of the Waldo Hills area. Mr. Shrewe's grand-uncle Ditter started the first general store in town in 1890, and some people still call Highland bentgrass "Ditter grass" because of him. Mr. Shrewe relates that his
grand-uncle got a shipment of china from Europe in the 1890's packed in Highland bentgrass straw. The straw got tossed out the back door, and the extremely small seeds (approximately eight million to the pound) were scattered by the wind. Mr. Shrewe states that by World War I Highland bentgrass had become a real problem. "We summer-fallowed it and dry-plowed it and cussed it, but we just couldn't get rid of it. It grows anyplace."10

Hollis Ottoway, longtime County Agent for Marion County, relates much the same beginning for Highland bentgrass, and adds that the grass was first identified in Marion County in the early 1920's or late 'teens by an Oregon State College professor.11 The story of "Ditter grass" is not the only possibility, of course. Henry Tate, a Marion County bentgrass farmer for more than 30 years, relates another.

In the 1930's Mr. Tate worked part-time for a Mr. George Hunt, on one of the original land claims in the area. In the late 19th century Mr. Hunt sent for a pair of registered Shropshire sheep from England (believed locally to be among the first registered Shropshires in America). These sheep came with straw and seeds of Highland bentgrass, and it is from these seeds that Mr. Tate believes that Highland bent got its start in Marion County.12

The above two methods of origin of Highland bent in the area are not mutually exclusive, of course. They may
both be correct, and quite likely are, and there may be more undiscovered accidental seedings of the grass. On the subject of why the resulting wild stands of bentgrass were first harvested there are again two possibilities, but here at least one can be proven.

**First Harvest**

The story that Dr. John Hardison, a Plant Pathologist at Oregon State University who has worked with Oregon grass seed for over 30 years, tells is that a Chicago commodities dealer on vacation came through Oregon in the 1920's. He stopped and talked to farmers along the way, he saw the natural stands of Highland bentgrass in Douglas County, and he found out it was being treated as a weed. He told the local farmers that if only they would harvest the seed, he knew it could be sold. Since that time millions of pounds of the seed have been marketed. The likelihood of this story is difficult to determine. A more easily substantiated case is presented by Mr. Henry Tate of Marion County.

In 1940 Mr. Tate was working on a stationary thresher on Mr. George Hunt's property. Wheat was being threshed, but Mr. Tate noticed that some extremely fine seeds were filtering down to the ground underneath the thresher. He asked permission to collect it, and permission was granted, so at the beginning of the day he spread a clean canvas
underneath the thresher. At night he and his wife returned and bagged the fine seed by hand. When threshing was done Mr. Tate took the bags of bentgrass seed to D.A. White's Seed Company in Salem. White's took the seed to Portland for cleaning, and several months later Mr. Tate got a check for his seed (minus a fee for returning the sacks). Mr. Tate believes that this was the first Highland bentgrass ever sold in Marion County, and he has sold it every year since, for 32 consecutive years. For most of those years it is the only crop that he has grown, aside from some fine fescue.14

The intriguing question remains as to what factors caused the growing of the grass to be concentrated in such a relatively small area, and why it is by far the most important agricultural activity in the area. The answer seems to be related very closely to the physical conditions found in this area.

Physical Conditions

The major portion of the Waldo Hills area is comprised of the Eola geomorphic surface. In fact, the Highland bentgrass area is entirely contained within the largest remaining area of the Eola surface in the Willamette Valley. The Eola unit consists of remnants of the oldest geomorphic surfaces in the Willamette Valley, comprised of rounded hill and valley topography with as much as 200 feet of local relief.15
The soils in this hilly region are generally moderately deep and well-drained. Clay content is high, and acidity varies from medium to strong.\textsuperscript{16} (Acidity averages around pH 5.1 for this region as compared to a Valley-floor average of pH 5.5.) Total bases in the soil are quite low, with calcium about one-tenth of the Valley average and phosphorus only 6 - 12 parts-per-million, as compared to common Willamette Valley levels of 40 - 50+ parts-per-million.\textsuperscript{17}

Average annual precipitation is significantly higher in the Waldo Hills area than elsewhere on the Valley floor. The local farmers have a rule-of-thumb of "an inch a mile", meaning that with each mile east of Salem that one travels, annual precipitation increases by one inch. This is surprisingly accurate. At Salem McNary Field Station average annual precipitation is 41.3 inches, while at Silver Creek Falls Station the average is 74.2 inches. The station at Silver Creek Falls is 20 miles east of Salem, just beyond the eastern edge of the Waldo Hills Highland bentgrass area. It is also 1100 feet higher than the Salem station.\textsuperscript{18}

The duration of a water deficit is perhaps even more important to the growing of grass than the total precipitation. The Salem station shows an average deficit in the five months from May through September, while Silver Creek Falls Station shows a deficit only in June, July, and August. In addition, the cumulative deficit at Silver Creek Falls is less than half of that at Salem (6.4 inches vs 13.4 inches).\textsuperscript{19}
It is impossible at this time to state which of the above physical factors might be responsible for the aggressiveness of Highland bentgrass in these hills. By aggressiveness is meant the success of the grass in competition with other plants, and the ability to extend its range without the voluntary assistance of man. Any of the previously mentioned physical factors — low total bases and the strong acidity in the soil, increased rainfall, shortened dry season — may be partly or fully responsible for the aggressiveness of Highland bentgrass in the Waldo Hills area. It seems reasonably certain that a physical factor is the cause of the aggressiveness of Highland bentgrass, because it is possible to follow the trail of volunteer Highland bentgrass down into the Valley and see its competitive abilities evidently decrease. In the Waldo Hills area ditches, roadsides, and uncultivated hillsides all have a heavy growth of Highland bent. As the Valley floor is approached, other grasses and weeds become more and more common. On the Valley floor itself it is difficult to find any Highland bentgrass at all.

The strong acidity of the area's soils is perhaps the major factor in the success of Highland bentgrass. An interesting experiment that tends to bear this out was conducted several years ago on the Waldo Hills farm of Mr. Don Jacquet. The experiment was conducted through the
Agriculture and Home Economics Extension Service of Marion County. In the experiment lime was added to selected plots of grass, in varying amounts. Lime is added to raise the soil pH as a matter of course in the Valley, for crops such as wheat, oats, and vetch. Mr. Jacquet said that in this case the more lime that was added, the worse the crop of bentgrass became and the better the crop of weeds became. Weeds are normally not a bad problem, because of the aggressiveness of the bentgrass.

It is difficult to over-emphasize the aggressiveness of Highland bentgrass in the Waldo Hills area. A final example from Mr. Jacquet may suffice to close this part of the discussion. Mr. Jacquet states that a field of fine fescue is good for about four years before it requires renovation. That is, with some effort on his part, he can make it last that long against the intrusion of bentgrass. Then, if he still wants fescue, he must plow the field up, summer-fallow it for two years, and then replant to fescue. If the field is left alone, in one year it will be half fescue and half bentgrass, in two years it will be mostly bentgrass, and in three years it will be virtually all bentgrass. It is indeed fortunate that the farmers of this area have been able to make a cash crop out of something they might have found impossible to eradicate.

The Future

To understand how the farmers of the Waldo Hills bentgrass area view their future, it is necessary to know the
part that the grass has played in their lives. Prior to bentgrass wheat and oats were grown, sheep were pastured, and there was some dairying. Erosion was a significant problem in tilled fields due to the hilly terrain, and the steep slopes placed limitations on the use of machinery. Making a living by farming in this area was considerably more difficult than on the Valley floor. Highland bentgrass has changed the agricultural patterns, practically eliminated the problem of erosion control, and made farming much more profitable than it used to be in the Waldo Hills. There are still a few sheep and cattle in the area, but they are definitely in a position of lesser importance. Not only does bentgrass provide the farmers with a reasonable income, but it does so with relatively little input of labor (see Appendix A). Mr. Henry Tate, for example, works his 200 acres almost entirely by himself. The only laborers he hires during the year are two high school students to help him bag and clean seed during the approximately two-week-long harvest in August. The difference between this labor requirement and that of many other types of farming - dairying and truck farming, for example - is very great. The feelings of the farmers themselves come out clearly in their comments on the importance of Highland bentgrass to them: "Bent has been the saving of the land. Without it we couldn't pay the taxes."22 "Bent has been a godsend
in all these hills."\textsuperscript{23} Without bent, we'd have a hell of a time paying taxes. It was a lifesaver for us. God help us if they enforce the burning ban."\textsuperscript{24}

It is interesting to note at this point that most of the Highland bentgrass seed produced today goes back to its land of origin - Europe. It is used there for lawns and turfs in place of the bluegrasses and fescues that dominate so much of American consumption. The Europeans place a high value on the wearability of a lawn, while many Americans seem to stress aesthetic values. Were it not for this foreign market the production of Highland bentgrass seed would of necessity be much lower than it is today.

An ominous note is sounded by the advent of so-called "creeping mesquite", or "German mesquite". This is actually not a mesquite but a variety of bentgrass even more aggressive than Highland bent. It has a foothold in this area and is very slowly taking over many fields. Fortunately it is only a little more aggressive than Highland bent - in 26 years it has taken over approximately half of a 20-acre field on Mr. Don Jacquet's farm. He says that the only way he knows of to get rid of it is to completely sterilize the soil wherever "German mesquite" is found.\textsuperscript{25} It is possible that the local farmers will someday be able to market this as they have Highland bentgrass. If it becomes
too much of a problem they may have to, but at this time the question of field burning is much more a worry than "German mesquite."

At this writing the burning of fields subsequent to harvest is still necessary for the cultivation of bent-grass (and the other grasses). It gets rid of the straw and thatch, and combats Blind Seed disease. There is at present no economically viable alternative to burning (aside from raising a different crop), nor is there an economically viable alternative method of burning. A great deal of research has been accomplished and is presently underway into all aspects of this problem. Several models of a mobile field sanitizer - a tractor-drawn field burner - have been built and tested extensively (on California rice-fields as well as on Oregon grassfields). These models are 12 to 14 feet wide, are as tall as they are wide, and ride on steel wheels. Large fans draw air into them, which mixes with propane and burns intensely. The ground is sterilized and the straw burned, as with open-field burning, but the intense heat produces a much more complete combustion. In other words, it burns much more cleanly. It does it too slowly, however, and at too high a cost to allow farmers to use it without subsidy, at the present time. The research continues.

There are alternative methods of disposing of the straw. Some straw is presently being picked up from the field by
hay balers, taken to a processor where it is chopped, mixed with a binding agent (commonly molasses), and compressed into cubes or pellets. Production of these pellets is still on an experimental basis, with last year's total output amounting to only approximately 300 tons.

In comparison, the United States Forest Service and the Oregon State Highway Department used nearly 30,000 tons of straw in the same time period, as a mulch and ground cover on highway shoulders. The 300 tons of pelletized straw was shipped to Japan as cattle fodder, and it is believed that this market is capable of expansion.26

Another process for disposing of the straw is to bale it normally, then compress a number of these bales — under tons of pressure — into "super-bales." These super-bales are much more economical to ship than normal bales. Last year's production of approximately 700 tons was also shipped to Japan as cattle fodder. One company involved in this process, Hastro-West, has orders from Japan for a much larger output of super-bales, but needs a fairly large capital input in order to begin a commercial operation. An input requirement of two million dollars is estimated for field equipment, super-balers, and warehouse facilities.27

The necessity remains for the ground to be sterilized to prevent Blind Seed Disease. Seeds affected by this disease will not germinate, and the only known method of
prevention is by subjecting the ground to temperatures greater than 400 degrees Fahrenheit. This is why burning, by some method, is necessary. So for the present, at least, it is still correct to say that without field burning there would be no grass seed industry in Oregon. Unless viable alternative methods of field sanitation are found prior to the ban on field burning in 1975, the agricultural patterns of the Waldo Hills Highland bentgrass area and the Willamette Valley region as a whole must change.

The research discussed above has been funded primarily by the farmers themselves, through burning fees. Oregon Senate Bill 38, enacted in 1970, requires that a 50 cents per acre fee be collected from any farmer that needs to burn his fields. The fees are collected by the rural fire districts. The monies are administered by a five-man Certification Committee set up by the same bill. Of the 50 cents, 10 cents goes back to the fire districts for administrative costs, 5 cents to the smoke management program and the Department of Environmental Quality, and 35 cents goes into the research fund. Total collections for the past two years have amounted to approximately $180,000.28

Most of the farmers of the Waldo Hills area, particularly the older ones, do not seem to believe that the burning ban will be enforced. For example, Mr. Henry Tate feels that property taxes could not be paid without bentgrass,
therefore the ban will not be implemented: "The State wants the taxes, not the land. Bent is the only time this land has paid its own way." While this may not be a reflection of reality, it is a reflection of a common attitude. All the farmers, of course, hope that an economical method of burning or alternative to burning will be found prior to 1975. None of the farmers speak of any plans they have made to adapt to the new environmental law. Indeed, many give the impression that they could not imagine what other crop they might raise. One summed up the attitudes in this way: Cannery crops are a lot of gamble, and cannery trucks are hard on the soil (when picking up harvested crops); cannery policy is restrictive; strawberries require a large investment to begin; berries are too much of a headache, and some farmers are limited for berries by their water supply. These comments were made by Mr. Fred Hottinger, for many years a bentgrass farmer, but now retired. He also said that he did not think that wheat was a practical alternative. His comments, and the comments of other farmers, were of course predicated on maintaining both the present standard of living and the present intensity of the labor input. Lack of available labor in the area does presently limit many crops, particularly berries, but this can probably be alleviated in time or with mechanical pickers.
In short, no one is sure at this time what he will do if burning is no longer allowed. As Mr. Shrewe said, "Maybe someone will come up with something."31 Certainly some ideas will be forthcoming when it becomes obvious that the burning ban will be enforced. The farmers are not just going to give up without a struggle - though it does seem almost inevitable that some will be forced out of business by the change. Whatever is done, without bentgrass there will be a major alteration of farming practices, the landscape, and a way of life. Economically, physically, and socially Highland bentgrass will be very difficult to replace.

Summary

An attempt has been made to systematize the development of the Waldo Hills Highland bentgrass area, and to present the system graphically. The resulting developmental schematic serves as the summary for this paper, and is on the three pages that follow. A schematic, or system, of this nature is particularly useful in aiding planning decisions, for the ramifications of possible decisions can be clearly seen. As in computer applications, however, the output is no better than the input, and the system must be thoughtfully designed.
THE WALDO HILLS AREA: A DEVELOPMENTAL SCHEMATIC

Key

- = Statements or evolutionary events
○ = Important individual occurrences
● = Decisions

Time

Topography

Temperature

Data (1830-1850)

Basic Physical Environment (ca. 1870)

Replacement of native grasses by highland bentgrass

The Agricultural System (ca. 1890)

Attempts to eradicate highland bentgrass

Cultivation of highland bentgrass

Basis Human Environment (ca. 1940)

Introduction of highland bentgrass (1950s)

Discovery of marketability of highland bentgrass (1960s)

Research

Discovery of effectiveness of field burning (1960s)
Steady growth in production — to > 4,000,000 pounds in 1971

Steady growth in amount of field burning

Increasing air pollution

Growth in population

Increasing percentage of total population living in cities

Increasing political influence of urban areas

Research into alternatives to field burning

Enactment of a ban on field burning (1971)

Time

The present

The future

Continued cultivation of highland bentgrass

Will the ban on field burning be enforced? (1976)

Are alternatives to field burning viable?

Yes

No
FOOTNOTES

1. Interview with Dr. H.H. Rampton, Research Agronomist, Crops Research Division, Agricultural Research Service, U.S.D.A.


6. Ibid., page 80.


9. Interview with Don Brewer, Extension Seed Certification Specialist, Farm Crops Department, Oregon State University.

10. Interview with Anthony Shrewe, retired farmer, Sublimity, Oregon.

11. Interview with Hollis Ottoway, County Extension Agent, Marion County, Salem, Oregon.
12. Interview with Henry Tate, Highland bentgrass farmer, Sublimity, Oregon.

13. Interview with Dr. John Hardison, Plant Pathologist, Department of Botany, Oregon State University.

14. Interview with Henry Tate, op cit.


17. Interview with Hollis Ottoway, op cit.


19. Ibid., page 97.

20. Interview with Don Jacquet, Highland bentgrass farmer, Sublimity, Oregon.

21. Ibid.

22. Interview with Henry Tate, op cit.

23. Interview with Anthony Shrewe, op cit.

24. Interview with Fred Hottinger, retired farmer, Sublimity, Oregon.

26. Interview with Harold Youngberg, Extension Science Specialist, Farm Crops Department, Oregon State University.

27. Ibid.

28. Ibid.

29. Interview with Henry Tate, op cit.

30. Interview with Fred Hottinger, op cit.

31. Interview with Anthony Shrewe, op cit.
APPENDIX A

Work Calendar

The source of the following generalized annual work calendar was an interview with Mr. Henry Tate, Sublimity, Oregon, who has harvested Highland bentgrass every year since 1940.

<table>
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<tr>
<th>Date</th>
<th>Activity</th>
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<tr>
<td>March (or when first green shows)</td>
<td>Fertilize</td>
</tr>
<tr>
<td>Late spring/early summer</td>
<td>Spray for weed control (usually once, sometimes twice)</td>
</tr>
<tr>
<td>August</td>
<td>Harvest (8-10 acres per day)</td>
</tr>
<tr>
<td>August</td>
<td>Burn fields</td>
</tr>
<tr>
<td>August</td>
<td>Clean seed (may be done later if the price in August is not considered favorable)</td>
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NOTE: Renovation of a Highland bentgrass field is usually necessary only once every 6-8 years. When it is done the field is torn up in the fall (subsequent to harvest), worked all the next summer, and reseeded again in the fall.
APPENDIX B

Questions

These are the main questions asked during the interviews conducted for this study.

1. How do you think Highland bentgrass got its start in this area?
2. Why do you think that Highland bentgrass does so well in the Waldo Hills?
3. What would (you) (the farmers) do if (you) (they) couldn't grow Highland bentgrass anymore?
4. What do you think will happen to farming practices in the Waldo Hills area after 1975? (Assuming that the field burning ban is enforced.)

Agricultural Experiment Station, Oregon State University, Special Report 150, "Temperature and Water Balance Data for Oregon Weather Stations," May 1963.


INTERVIEWS

Brewer, Don, Extension Seed Certification Specialist, Farm Crops Department, Oregon State University.
Hardison, John, Plant Pathologist, Department of Botany, Oregon State University.
Hottinger, Fred, retired farmer, Sublimity, Oregon.
Jacquet, Don, Highland bentgrass farmer, Sublimity, Oregon.
Ottoway, Hollis, County Extension Agent, Marion County, Salem, Oregon.
Shrewe, Anthony, retired farmer, Sublimity, Oregon.
Tate, Henry, Highland bentgrass farmer, Sublimity, Oregon.
Youngberg, Harold, Extension Science Specialist, Farm Crops Department, Oregon State University.