



JOINT HIGHWAY  
RESEARCH PROJECT

FHWA/IN/JHRP-79/17

SUPERIOR BLUEGRASSES FOR  
ROADSIDE TURF

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Final Report

SUPERIOR BLUEGRASSES FOR ROADSIDE TURF

TO: H. L. Michael, Director  
Joint Highway Research Project

October 23, 1979  
Revised: December 31, 1980  
Project: C-36-48E

FROM: W. H. Daniel  
Department of Agronomy

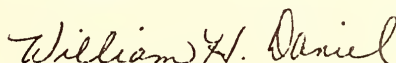
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The attached Final Report is submitted on the HPR Part II Study titled "Superior Bluegrasses for Roadside Turf". It has been authored by myself and Dr. R. P. Freeborg also of the Department of Agronomy staff. The Report bears the title of the Study.

This report is the culmination of fourteen years of research in the development of a new bluegrass, Wabash, with better characteristics than existing bluegrasses for roadside use. The improved vigor of spread, drought tolerance, and relatively lower growth height provides a turf for roadsides, when used alone or in combination with other grasses, which reduces roadside maintenance and hence cost. A patent for Wabash has been granted and continued seed production by commercial growers is in progress. Provision for marketing and maintenance of the new variety have also been established. The research has fulfilled its objectives.

The Final Report is submitted for publication and dissemination.

Sincerely,



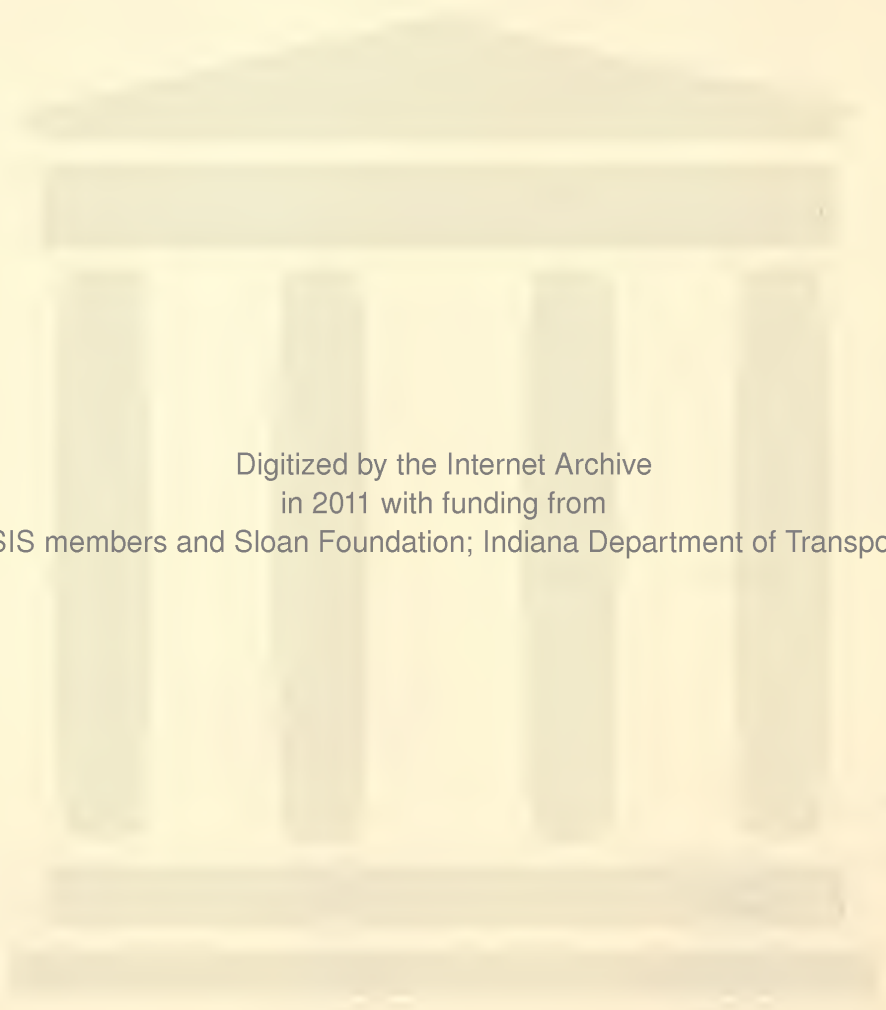
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Final Report  
SUPERIOR BLUEGRASSES FOR ROADSIDE TURF

by

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Joint Highway Research Project

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Conducted by

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Engineering Experiment Station  
Purdue University

In cooperation with the

Indiana State Highway Commission

and the

U.S. Department of Transportation  
Federal Highway Administration

The contents of this report reflect the views of the author who is responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

Purdue University  
West Lafayette, Indiana  
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16. Abstract This final report brings to a close research on roadsides begun in 1965, which was built on research on bluegrasses since 1952. The original objective was to develop a cultivar with definite low growth character in order to reduce the need for mowing. During the study it was determined that aggressive spread and competitive ability were necessary to provide more competition to infestations of annual and perennial weeds, even at low nutrition. The 'Wabash' cultivar of Kentucky bluegrass <i>Poa pratensis</i> was identified as plot 1W19N as the sixth generation from a collection of plant 16B made in 1952. It is the result of annual screening of successive generations totaling over 20,000 observed individual seedlings. Wabash is medium green in color, vigorous in spread, drouth tolerant, and medium in disease tolerance. It is medium in seed yield. The seed is comparatively small (average) in size - 4800 seed/gram. Germination is fast (as any bluegrass) and in laboratory tests ranges from 92-96%. A plant patent, #4453, was granted for Wabash, dated 21 August 79. In three years of roadside tests Wabash has proven desirable for use on roadsides and its incorporation into seed mixtures is anticipated as commercial seed production expands.					
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## SUPERIOR BLUEGRASSES FOR ROADSIDE TURF

## EXECUTIVE SUMMARY

Wabash is announced as a new plant patented Kentucky bluegrass, Poa pratensis (patent #4453, dated 21 Aug. 79), as a result of highway research since 1965. It is characterized by vigorous rhizome spread, medium green color, medium disease tolerance, and medium seed yields. Seed is average to small, 4800 seed/gram; germination is high, 92-96% in all samples tested, and germination is as fast as any Kentucky bluegrass tested.

Some added drouth tolerance is noted when compared to darker green cultivars (three days on silt loam under mowed conditions). The seed stalks are medium to small, and in mature stands few seedheads form. Wabash's aggressive spread is favored by strong underground rhizomes. Its leaf length is medium yet it forms a dense turf, which tends to reduce infestations of annual and perennial weeds and grasses. Wabash, a cultivar of Kentucky bluegrass, offers improved roadsides with need for minimal mowing and herbicide usage.

The research which resulted in development of Wabash was conducted by the Agronomy Department of Purdue University, West Lafayette, IN 47907, where Drs. W. H. Daniel and R. P. Freeborg tested more than 20,000 bluegrass seedlings since 1965. Subsequent plantings of potentially improved bluegrass seedlings resulted in the selection of Wabash as the most applicable for roadsides. Contracts for seed harvest for three years were made and seed received and planted on roadsides in Indiana. Plantings of Wabash made along roadsides of Highways 41, 28, 38, 43, and 52 in Indiana as research plots demonstrated ability of the grass to perform provided nutrition was adequate for vigorous early growth. Cost of seed will tend to be equal to other improved bluegrass cultivars. Contract seed growing is being expanded.

Monetary savings created by reduced mowing and herbicide use and need for less repair of equipment are potential benefits of this research. Wabash should also be useful on athletic fields, playgrounds, parks, and areas where good growth and wear tolerance are desired.

The research was sponsored by the Indiana State Highway Commission and the Federal Highway Administration with the Joint Highway Research Project at Purdue University providing project administration.

## I. INTRODUCTION

This final report brings to a close a 14-year period of research which has led to a release of the Wabash cultivar of Kentucky bluegrass, Poa pratensis. Research studies of the cultivar have proven it to be desirable for use in areas where bluegrass is adapted.

The use of a combination of tall fescue, ryegrasses, and common bluegrasses creates problems for mowing and erosion control. The tall fescue predominates and later becomes clumpy, allowing soil erosion between clumps. Throughout the cool humid region of the United States, bluegrass is noted for its persistence and adaptability. Therefore, a vigorous bluegrass should develop a uniform, weed resistant turf, which would require less mowing and reduce erosion problems.

Improved varieties of bluegrass have been released based on needs of lawn and recreational turf which require ample fertilization, grooming and protection from damage of drouth, diseases or insects. These are not adapted to the low nutrition and neglect normal for roadsides.

Among the bluegrasses collected and tested in the turf research program at Purdue University was a selection labeled 16B. The initial plant material was found as a large circle (20 feet) of dense predominating bluegrass in the 16th fairway of the Chicago Golf Club. The fairways had many individual circles of bluegrasses from which more than 30 were collected for research studies. Seed from the 16B vegetatively increased parent provided about 100 different seedling types which had characteristics that varied from very fine leaved dwarf to broad leaved and aggressive types. Several fast growing, spreading types, similar to the mother plant, were successivly chosen. However, the medium to light green color was initially considered less desirable. Thesis studies of Eric Melkerson, 1962, M.S.; W. C. Lobenstein, 1964, PhD; Charles Berry, 1965, M.S.; and Terrance Riordan, 1968, M.S. and 1970 PhD contributed a broad base for the resulting projects.

The JHRP Progress Report, "Research on Roadside Development and Maintenance, Part I, Bluegrass Research" by W. H. Daniel and T. P. Riordan, September 1968, 8 pages, details results of early seedling selection and space plantings during the years 1965-66-67.

The JHRP Progress Report No. 25, "Improvement of Kentucky Bluegrass Through Selection and Breeding" by W. H. Daniel, July 1972, 28 pages, reports on 13 superior bluegrass types that deserved further evaluation in roadside tests and field plots. Nine characteristics were measured during these studies:

leaf height	overall rating	panicle height
spread	rust resistance	panicle quantity
leaf color	winter survival	panicle maturity dates

Selections producing a vigorous spread, thus more competition, appeared best suited for roadsides.

In 1973 studies continued with these objectives:

1. To expand tests and continue field plot and roadside studies and evaluation of experimental bluegrasses.
2. To increase seed quantity and determine quality, germination and seedling viability.
3. To expedite early seed production, processing, and planting; assist in contract grower selection, inspection of seed fields, and follow-up procedures.
4. To coordinate initial plantings necessary to demonstrate turf quality, educate or inform various highway personnel and introduce new grasses in actual roadside situations.

The Interim Report, "Superior Bluegrasses for Roadside Turf" by W. H. Daniel and H. L. Michael, July 1977, 41 pages, continued the observations on roadside plots and space plantings at the Agronomy Farm. Throughout the total period of research over 20,000 seedlings in spaced planting plots had been measured.

Finally, in 1975, one type was selected for release as the most promising based on the following characteristics: uniformity of seedlings, vigorous spread, resistance to disease, color, improved drouth tolerance, reduced leaf and seedhead heights, plus fast and high germination rates.

Plant patent 4453 further describes the selection. (See page 25)

## II. Continued Research on the Agronomy Farm

Research with many experimental bluegrasses has continued so as to confirm that during the experimental testing and before commercial utilization expands, Wabash will continue to provide superior, desirable qualities when compared with other cultivars.

A series of older "experimentals" has been maintained at low nutrition and minimum mowing. These were observed to determine if any superior clones were present and a continuing check on the comparative value of the Wabash selection.

In field 10B2S a collection of 27 experimental bluegrass eight-inch plugs (the third generation of our breeding program) were planted in rows of eight plugs during June 1967. These were chosen as the preferred turf bluegrass from field 9A1 before that field was plowed under. Of the 27, 14 were considered vigorous in growth pattern, 10 were medium, and 3 were dwarf.

By 1970 four of the 27 experimentals were considered "highway types" and had spread from the original 8 inches to 4 feet in diameter. By 1979, plant 16BB56, the best high type, had spread to 6 feet, but neither the density or spread was better than the adjacent (field 9B1 and 2) planting of the selection released as Wabash.

In field 9A3 seed from the original plot 1W19N (Wabash) was harvested 4 through 1978, then the field was plowed under. Following seed harvest in 1975 the surface sod was cut for demonstrational use. The underground rhizomes left after the sod was removed emerged as new plant parts. Many of these were hand dug and spaced 2' x 2' into field 9A1N to produce a new breeder seed harvest in 1977-78 and 1979.

Each year the rhizome spread of Wabash far exceeded that of the commercial lawn types of Merion, Baron, Nugget, and Sodco. Comparative study showed Wabash produced 100% cover and expanded into adjacent plots; Nugget provided only 30% stand while Sodco yielded a 70% stand with a sparse cover. Several individual vigorous seedlings were observed among the other varieties of grasses. These were harvested and planted for further observation, but none exceeded Wabash in desirability.

In the 'highway type' mowed plots of 9A3S the color of seedlings from entry A4 in 10B3 (later named Wabash) was medium in greenness, four (in scale of 1 dark to 9 light) and in rank was 15th when 1 was darkest and 27 was lightest color of entries.

As projected in the plan of work 17 May 75, Field 9B3 was divided into 88 blocks where 35 seedlings of each of 88 parents were transplanted and spaced two feet apart. Neither seedlings of Touchdown bluegrass nor Penn State University experimental K-169 provided more than 80% ground cover while Wabash produced 95% within the next growing season. Following the 1980 seed harvest the plots were plowed under.

Field 9B2 (an area of 10,000 sq. ft.) was divided into 37 blocks in which 36 seedlings from each seed source (parent) were spaced planted (27 May 76). These were observed for seedhead height, seed quantity production, and date of

maturity. None of these grasses exhibited more desirable characteristics than the Wabash which was included. All 36 seedlings of the new stand of Wabash were vigorous and produced seedhead height of 70 cm.

A 100% cover was evident within one growing season of Wabash and no other entry equaled or exceeded that. Several dwarf types from other entries were marked and seed harvested for future planting into field 10A1 and 9A3.

Of 66 seed lots harvested in 1977, Wabash was one of the ten earliest to mature. (This is a distinct advantage to the seed grower for it lessens the risk of hot drying winds of early summer affecting seed swathing and combining.)

The early germination and development of Wabash was evident in comparative plantings made at the Agronomy Farm in fall 1978. A total of 110 bluegrasses, 60 named and 50 numbered experimentals from 20 companies and research institutions, were planted in replicated plots. Comparisons for two-month old seedlings grown in these turf plots are illustrated below.

Table 1. Comparative height of selected bluegrasses

	<u>Height</u> cm	<u>Spread</u> cm	<u>Tillers</u> number	<u>Rhizomes</u> number	<u>Type and Source</u>
Wabash	8.2	6.7	2.4	1.1	most of any
Glade	2.3	4.0	2.1	.9	turf type, Jacklin Co.
Victa	5.6	4.8	.0	.3	turf type, Scott Co.
K-150 P	3.7	6.0	1.4	.0	experimental, Penn State

In April of 1979 Wabash bluegrass was rated in the top 8% for height of growth to that date. It was measured at 17 cm in the range of 2 to 20 cm. Most commercial lawn types measured 9-12 cm. Wabash averaged 91% ground cover prior to first mowing.

In seed germination tests Wabash has been consistently high with 91, 92, 96, 94, and 91% reported over the years, when 85% is considered very acceptable for bluegrass in general. This feature of Wabash is outstanding.



Roundup Renovation Study:

Among the newer chemicals available to turf managers is the product glyphosate (Roundup<sup>TM</sup> of Monsanto Co.), which has great potential to kill existing weedy or undesired plants, which can then be replaced with improved newer desired cultivars. Extensive research on such products has been carried on throughout the United States with quite favorable results.

The M.S. thesis of Jeff Kollenkark, Department of Agronomy, Purdue University, 1978, states that grass seed can be soaked in hydroseeding solutions of Roundup for more than 40 hours, be sprayed over the soil, and yet germinate normally. The study also proved seed could be planted and within the next two days be oversprayed with Roundup solutions without damage. This extensive work proved so favorable and decisive that it eliminated the need for demonstrational work earlier proposed for the roadside of Hwy. 52 near the entrance to the Agronomy Farm.

Growth Regulation:

Although not a phase supported by our highway research grant, comparative testing of growth regulators for turf has been extensive. Screening began in 1974 when chemical solutions were applied on 200 plots of tall fescue located at I-65 and Hwy. 38. In 1979 at eight locations, including roadsides, more than 400 plots were treated with growth regulating materials. Data taken and studied includes leaf reduction, seedhead inhibition, height reduction, drouth susceptibility, sod density, and duration of effects. Tests have included more than 17 chemicals in varying formulations and rates. Those tested include:

<u>Commercially available</u>	<u>Experimentals as coded numbers</u>	
maleic hydrazide	CGA 24705	S108
Embark	CGA 17020	S734
Sustar (withdrawn)	CGA 34640+45476	EL509
CF125 - fluorenals	FMC 28979	EL72500
Ethephon	RO 7-6145	R1910
	Nortron	PP757

Spring, summer and fall treatments have been made. Exceptionally good results were obtained with a fall (October) treatment with CGA 24705. Unfortunately, this product is currently not being developed.

Growth regulator evaluation will continue, and new products will be included as they become available for evaluation. The current status of our program evaluation is, that of products tested and commercially available, i.e., maleic hydrazide and Embark, Embark is the better plant growth regulator. There are potential problems as some grass species are more sensitive and thus more susceptible to thinning. However, at the proper rate and with uniformity of application, both seedhead and plant leaf numbers, and stem height have been effectively reduced.

### III. On-Site Testing

The proposed testing of Wabash bluegrass on the roadside of Sagamore Parkway (May 76) was not permitted because of the divided turf areas, its urban location, and the delayed completion schedule. An alternate site was chosen on Hwy. 41 by the Indiana Highway Department.

#### Hwy. 41 and Raccoon Creek Bridge area

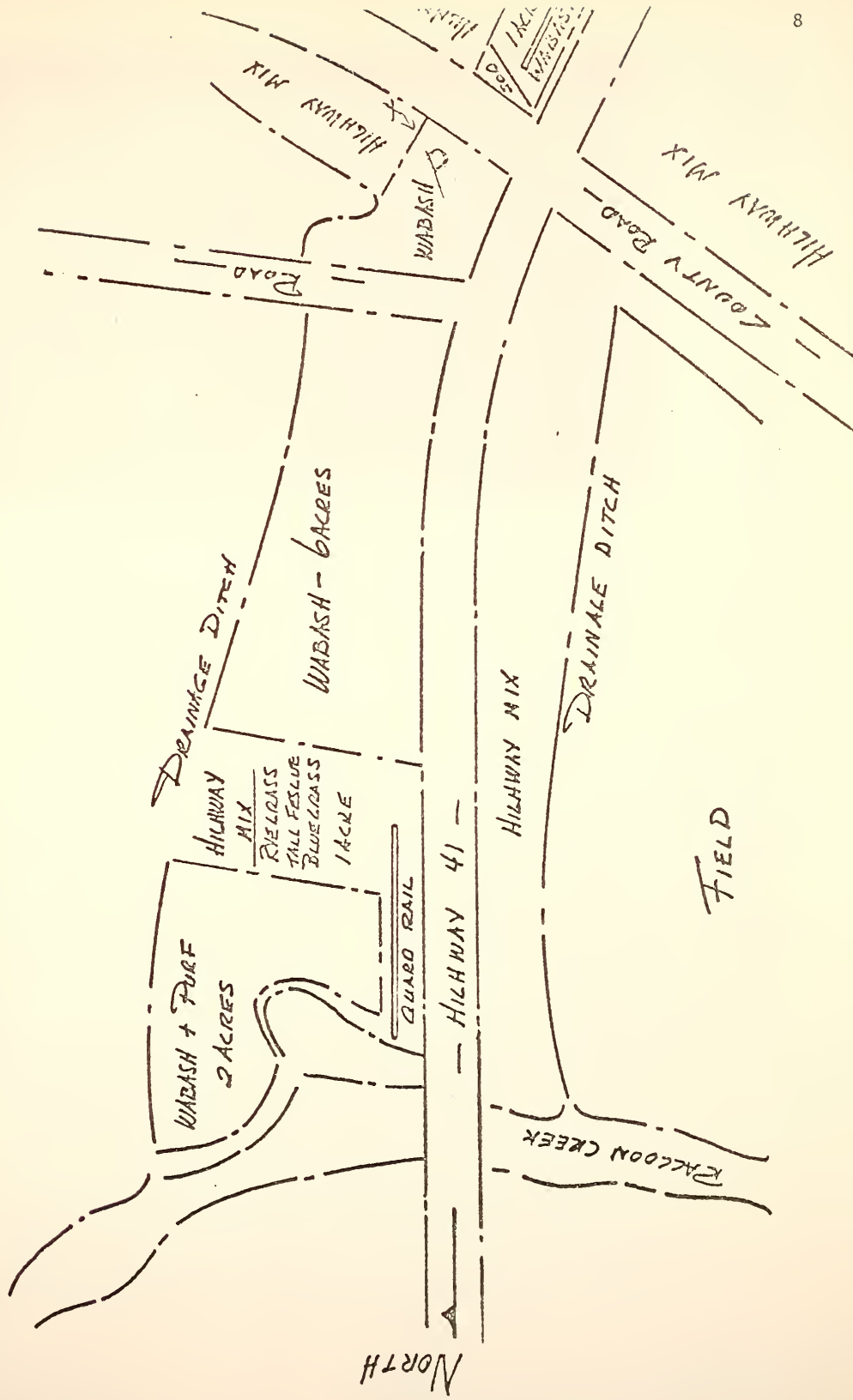
The construction of a new bridge, plus straightening of the highway in the vicinity provided areas for plots to be planted in 23 September 76.

1. a six-acre tract of Wabash north of cross road, east of 41
2. a two " " " " plus PURF red fescue, south of creek
3. a one " " " " south of cross road, east of 41
4. a one-acre tract of highway mix between 1. and 3.
5. a five " " " " " west of 41

Site preparation was similar and consistent with standard highway practices currently in use except the fertilizer was hydroseeded separately (and not very uniformly) on the test site. The seed was spread separately by hydroseeding, and it was very uniform. All areas were straw mulched.

Due to extended dry periods, germination was delayed, but by winter a uniform but thin stand resulted.

# WABASH BLUEGRASS TEST RACCOON CREEK.





\*P.1 Poor nutrition on left, adequate on right for starting Wabash. Planted 23 Sept. 76. Picture 10 June 77.

In spring of 1977 it was evident that the fertilizer applied with a hydro-seeder had been poorly distributed and was generally inadequate. As shown in Picture 1, small areas had normal to excess growth, but within one foot distance inadequate growth was evident. On 8 May 77 supplemental nitrogen (as urea 45-0-0 and 16-4-8) was applied as a corrective treatment by principal investigator and staff on an estimated seven acres at a rate of 40 pounds actual nitrogen per acre. On 10 June 77 a light touch-up of 20 pounds per acre was made on approximately three acres of the more deficient portions. This was sufficient to bring all areas to uniform nutrition and active growth.

The standard seed mixture of Highway Department ryegrass, tall fescue, and common bluegrass contains grasses that produce early seedling cover as shown in Picture 2. These provide early initial ground cover and competition for weeds as shown in Picture 6. The spacing or frequency of individual seedlings of the standard mix compared favorably to that of the Wabash bluegrass.

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\* All photographs were color in original report. Color prints available, from the author, for the photographs in this copy of the report at cost of procurement.

P.2 Highway mix in foreground, 10 June 77



P.3 Legumes developing, 20 Oct. 77

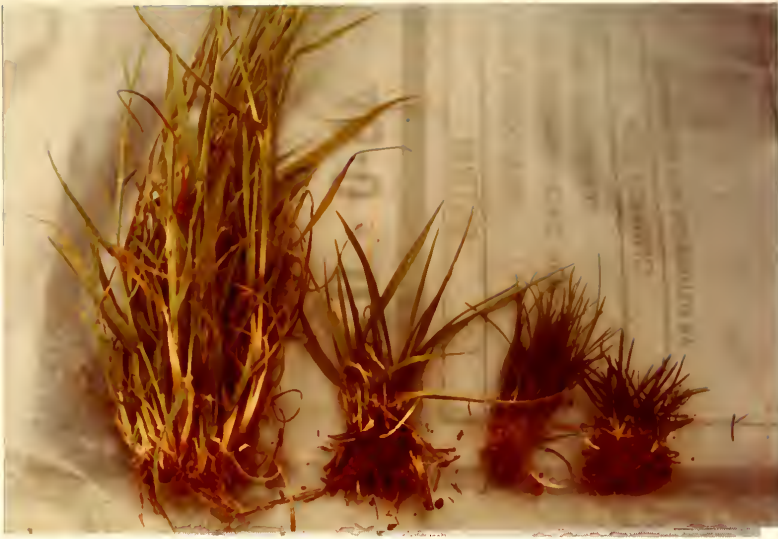


P.4 Legumes top cover, 24 May 78



P.5 Wabash beyond ruler, 1 June 79  
Roadside spray had killed legumes back





ryegrass            tall            PURF            Wabash  
                         fescue        exptl.        bluegrass

P. 6 Comparative sizes of four species at normal nutrition.  
10 June 77. Planted 23 Sept. 76.

Coverage - A one-half square meter grid with fifty 10 cm squares was placed at regular intervals to determine the percentage cover of desired grasses. Pictures (as in Picture 7) were taken so visual comparisons can be made as to the ground cover in May and June.



P. 7 Coverage for Wabash at normal nutrition by 24 Aug 77.  
A 50 mesh grid in  $.5m^2$ .

Table 2. Density of turf cover along flat areas measured 40 ft. from pavement and at 20 foot intervals. 24 August 77

a. bluegrass <u>good nitrogen</u>	b. bluegrass <u>poorest nitrogen</u>	c. red fescue <u>and bluegrass</u>	d. standard <u>highway mix</u>
100	50	70	100
95	80	98	95
98	60	100	98
97	80	95	97
<u>95</u>	<u>80</u>	<u>90</u>	<u>99</u>
97%	70%	91%	98%

Table 3. Percent of coverage on down slope 10 ft. from pavement, 20 ft. intervals. 24 August 77

a. Wabash <u>bluegrass</u>	b. highway <u>mix</u>
98	98
75	90
80	98
60	95
<u>75</u>	<u>97</u>
80%	95%

### Weeds

The area planted with standard highway mix was comparatively free of ragweeds which indicated that early competition of grasses was effective. However, large ragweed plants predominated in the bluegrass in a few areas. Because of those weeds, mowing was requested for portions of the area in August 1977.

As evident in Picture 3, the alfalfa, clover, and other legumes native to that area will be part of the sward until eliminated by applications of proper chemicals. Picture 4 shows lower spring growth, and Picture 5 shows turf after legumes are killed.

### Heights

Seedling counts were not taken because of the extensive rhizome development in the area. On 24 August 77 the poorest (nitrogen deficient) bluegrass measured only three inches high; the highest was 14 inches. Red fescue was 10-11 inches high. The standard highway mix plants grew to 18-24 inches. The tall fescue measured 16-20 inches high. Ryegrass seedlings were germinating due to wet weather prior to 24 August 77.

On 10 June 77 the predominance of peppergrass was very evident, as was the early competition of volunteer wheat. By 24 August 77, these had matured and died releasing the area to perennial grasses.

The heights of plants is given to illustrate the response to varying nutrition and soil matrix. The measured lengths of the second to tenth highest leaves were recorded.

Table 4. Heights of species along roadside

<u>Species</u>	<u>10 June 77</u>	<u>24 Aug. 77</u>
	inches	inches
wheat seedheads, volunteer from straw	10-30	dead
peppergrass seedheads, mature in early summer	4-16	dead
ryegrass seedheads	10-20	10-20
tall fescue, not seeding	3- 6	16-20
PURF exptl. red fescue, not seeding	2- 6	10-11
Wabash bluegrass, not seeding	1- 5	3-14

By 1978 the Wabash bluegrass was 4-10 inches high and had a thin stand of seedheads. The Wabash provided a 100 percent cover with the exception of thin areas which had a 60-90 percent cover. A recent roadside spraying along the edges of the road had currently killed weeds and weakened the clover. Normal practice limited mowing to 10-20 feet from the asphalt roadway.

The PURF red fescue was 6-12 inches high. The crown vetch was 50-80 percent cover and expanding fast.





P.8 Wabash showing low turf cover where farm equipment has traffic over area. At very low nutrition.



P.9 With ample nutrient and good soil in flat area (60 ft. from edge of pavement) Wabash shows normal dense cover.

Observations made on 23 May 79 showed the entire experimental area had not been mowed and the Wabash bluegrass needed no mowing. Picture 8 shows turf as of 1 June 79. Picture 9 shows the higher growing ryegrass and tall fescue were in the seed maturing stage, and therefore appeared to need mowing.

As occurred earlier, anywhere there is extra nutrition, such as around animal burrows, the bluegrass grows larger. Along the edges of pavement additional nutrients and moisture, as well as less competition favored improved grass growth.

Where only bluegrass was seeded in some plots, seed of tall fescue and ryegrass was blown from across the road, the upwind side, during and after the hydro-seeding in the original planting. In some areas the infestation was sparse (1%), while in other areas it was as much as 30% of mature turf stand. The ryegrass grew to 20 inches high, and tall fescue was 20-24 inches. Wabash seedheads ranged 12-14 inches high, while leaves were 4-8 inches long. Where commercial sod was laid (and thus better nutrition was provided by the attached soil) the common bluegrass had approximately three times the seedheads as the adjacent Wabash.

The circle area portion (site A) where Pictures 2-5 were taken, was one of the most unfertile, gravelly, unsuitable sites of the entire area. The initial seeding of grass produced a thin open stand which obviously needed, and received, additional nutrients during the first year as a part of its improvement program. In 1979, with the reduced nutrition available, the turf cover was 98-100 percent, the Wabash seeded at about 4-6 inches high, the leaf varied from 2-4 inches high. In the same area, tall fescue was seeding at 16 inches and had a leaf length of about six inches. Either grass would be suitable; however, the basic low growing Wabash cover provides lesser clippings from a normal highway mowing. Where the sod strip of common bluegrass was placed, it had leaves 6-8 inches in length and seedheads 10-12 inches high. Few legumes are currently in the area. Earlier, before the usual Highway Department's weed spraying, they had predominated.

The red fescues planted near the bridge comprise up to 80 percent of the turf stand in small areas, but in general are ten percent or less of total stand. Where silting occurred, from flooding or erosion, the tall fescue survived, as did Wabash. Wabash survived better than red fescue. In areas where Canadian thistle is growing, recent eroded areas 2-4 inches deep exist because of the lack of turf type grass cover. It is evident that Wabash is creeping into such areas, and will in time occupy them if the Canadian thistle loses any of its aggressiveness.

While there was wide diversity in weed infestations during the first summer of the project, the successive summer showed minimal weeds of minor consequence. As far as management is concerned, Wabash bluegrass will not require routine mowing. This particular plot requires mowing only to control the tall fescue which initially blew across the roadway from the opposite side during hydroseeding.

It was evident in 1979 that the vigor of legumes affects the turf cover in the test site. Since the sites being tested are deficient in nitrogen, all legumes have a definite advantage.

Numerous individual birdsfoot trefoil plants spread in a procumbent fashion. The sweet clover reached a height of four feet in mature plants. Meanwhile, sweet clover seedlings germinated in spring of 1979 were 3-5 inches high. Red clover was about 12 inches high.

The crown vetch sown on slopes grew to approximately 20 inches in height with a dense stand, and flowering by 20 June. Wherever established, crown vetch completely predominates over existing grasses whether tall fescue, ryegrass or bluegrass.

By 30 June 1979, the areas of sodded Wabash predominated with a 100% turf cover. Where crown vetch or sweet clover had been introduced, these grew higher and tended to predominate. Where introduced, tall fescue formed clumps which grew higher than Wabash.

Under the lowest available nutrition, Wabash grew to only 1-2 inches high, and where the rootzone is most gravelly the grass cover is only about 60-80 percent. Where there has been any available nutrition or moisture, and somewhat normal soil condition, the Wabash provided 100 percent cover with no gravel or bare soil areas. It is obvious that where tall fescue infests, as in chance seed blowing across the highway, that the individual clump predominates and grows without competition from the bluegrass. However, where traffic has occurred over both Wabash and tall fescue (field road, tractors and field equipment cur across the shoulder) the Wabash looks excellent while the tall fescue is damaged and shows the bruising created by the impact of tractors more than the bluegrass. Again, as observed elsewhere, extra nutrition has caused the grass to grow much denser.

Across the road where the normal highway mix was used the stand is approximately 60-80 percent tall fescue, with very minor infestation of ryegrass and bluegrass. The ground cover of live plants is approximately 70 percent. The amount of coverage is no greater than that observed in the Wabash planting. Where unmowed, the leaf growth of the standard highway mix is approximately 12 inches and seedhead height is approximately 16-20 inches. The area of tall fescue cut by the rotary mowing shows a stubby characteristic.

The area sowed to the highway mix shows a predominance of tall fescue, approximately 28 inches high, with an under story of bluegrasses. In contrast, where there is no tall fescue the bluegrass appears vigorous. However, in bluegrass there is evidence of much less height of growth, and therefore less need for mowing. Weed infestation in 1979 seemed equal for the two types of plantings. It appeared there may be more legumes in part of the bluegrass areas as the plants spread.

None of the areas has been mowed since planting; therefore the taller grasses and legumes predominate as expected. Of all plants present, crown vetch makes final and predominant stand.

Any legumes on low nutrient soils are evident as an unhampered infestation. This is an obvious, but completely normal occurrence for roadsides because of the low available nitrogen. Red clover grows to about 12 inches high. Birdsfoot trefoil spreads, but grows to be about 3-6 inches high. Some clones of birdsfoot are 16-20 inches across. Where there is any available adequate nutrition, Wabash bluegrass leaves grow to 8-10 inches high and produce seedheads of 10-14 inches.

Grass stands on barren sites of low nutrition normally will improve slowly over the years. This can be attributed to the accumulation of organic matter and recycling of nutrients, and from dust which tends to improve the moisture and nutrient retention. This is particularly true along roadsides where considerable dust and grit is flashed over the roadsides by the wind from passing vehicles.

In total it is believed the project is successful. There is ample reason to continue using Wabash as the bluegrass portion of any highway roadside seed mixture. There is also reason to continue consideration of tall fescue since it does survive under a wide range of conditions. However, the ground cover created by older tall fescue is not as good as that formed by Wabash bluegrass.

The Advisory Council, during its meeting on 24 May 1978, reaffirmed that where grown on better soil and with adequate fertilization, the Wabash bluegrass turf equaled that of the standard highway mix. On low nutritional or stress areas, the highway mix turf cover thinned rapidly and was equal to Wabash under similar stress conditions.

Research on six additional turfgrass sites is briefly summarized so as to be useful in an overview of the work accomplished. As requested by the committee, the author was careful that no expenditures of the research funds were allotted to these first four reported projects.

#### Highway 38

In October 1970 a group of 22 seed lots and 24 sods were planted between overpass bridges of Hy. 38 and R. R. on I-65. The elevated filled site was excessively compacted for purposes of stability and contained considerable stone and gravel. The elevated exposure favored strong winds which made it impossible to cover the seed with straw. As evident in Picture 10, experimental sods were placed along the concrete channel and as a covering of the north end.



P.10 Hy. 38 & I-65. Elevated Island. Seeded to left & right.  
Sodded to experimental selections in center & background.

From this study it was evident that the seeded portions, even those with normal new types of Baron, Victa, and Sodco, had inadequate vigor to become established or to produce a competitive turf cover without additional nutrition and special care. Of the areas sodded, only those sods having the most aggressive spread seem to survive under the total neglect management procedures normal for such isolated turf areas. The plots have remained, but no data has been taken in recent years. Parent plants of Wabash bluegrass were included as seed and sod in this series.

Plots along I-65 near State Road 28

Sloping areas along a cut (both east and west facing) were planted in September 1973 with both commercial and experimental bluegrasses. During 1974 these were twice mowed and fertilized with urea 45-0-0. After the turf type bluegrasses developed a good turf cover, all fertilizing and mowing was terminated. During the five year period 1975-79, the more competitive experimental entries (forerunners of Wabash) provided evidence of better turf survival than any turf types in commercial use. Of the seven experimental entries, 9A1C6 appeared best when the experiment was terminated in 1979.



P.11 Slump areas where Wabash sod was used after 2-inch slitted drain pipe was placed to drain subgrade

Along Hy. 43 near I-65

In October 1975, seed of Wabash bluegrass (1W19N) was applied to west facing cut slopes in need of repair. At the same time, PURF-1 red fescue (experimental) was seeded on adjacent slopes.

In spring of 1976 where a soil slump, shown in Picture 11, occurred, a clam bucket was used to open a trench in which two half circles of two-inch diameter, narrow-slit (.008 inch) drain tube called Turfflow (manufactured by Hancor, Inc. of Findlay, Ohio) was inserted. Each end which emerged at the ditch was fitted with a vertically placed tee which allowed water to move to the surface from the upper end or seep into the soil from the lower end. In spring of 1976 Wabash bluegrass sod was placed over the repaired slope. Also, Wabash sod was placed as a strip adjacent to an area 40' x 50' which was overseeded to Wabash, and an area 100' x 40' was seeded with a mix of Wabash and experimental PURF red fescue. The Wabash performed well in protecting the slope. However, crown vetch later predominated.

#### Wabash sod - Urban areas, Hy. 52

The rebuilt Sagamore Parkway-Northwestern Avenue roadside was the site chosen to lay 100 sq.ft. of Wabash sod on 20 November 77. The Wabash sod was used in lieu of standard sod as supplied by the contractor.

The site has received no special care other than mowing by the homeowner. No data has been taken, but it is easily identifiable when compared to adjacent sod because of the greater density of the entire Wabash sod area.

#### I-65 and I-70 Junctions

In late May of 1978 a contractor hydroseeded Wabash bluegrass over an extensive area of roadside slopes along the two interchanges at northeast and southeast Indianapolis. Fortunately, favorable weather followed, and excellent uniform stands were secured. Three to four mowings per year have been made. Rhizome growth of the seedlings has contributed to the obvious desirable spread of the grass. At the time of the final fall mowing in 1978 the regrowth of leaves totaled nine inches.



### Vigor as a Goal

During the Advisory Committee meeting on 25 June 74, all research plots were visited. During the discussions the desire for an aggressive type of grass for competing with normal weeds and poor soil conditions was affirmed as an important goal. Earlier our work has focused on the concept of dwarfness as a major goal. This 'turn-around' or change in emphasis permitted advancement toward the selection of the Wabash variety during 1974. By the time the Advisory Committee met on 16 September 1974, four bluegrasses had been selected. The final selection, however, was plot 1W19N. A proposal for seed increase (by Bob Peterson of Burlingham Co., Forest Grove, Oregon) was discussed with the Committee on 17 September 1974.

### Production

As review, the Interim Report of July 1977, pages 29-30, detailed the plan for increasing the seed of Wabash bluegrass. The states of Oregon, Washington, and Idaho in the Northwestern section of the United States have the climate best suited to commercial grass seed production. An organization known as the Agricultural Alumni Seed Improvement Association, Inc. (AASIA) by agreement with Purdue University takes the releases made by Purdue of new crops and increases seed supplies and develops market arrangements.

In August 1975, the Joint Highway Research Project (JHRP) approved a three year agreement between JHRP and ASSIA to increase the Wabash seed supply.

The principal investigator, Dr. W. H. Daniel, delivered breeders seed produced under his control at the Lafayette Agronomy Farm to AASIA. They contracted a processor, Burlingham Seed Co. of Forest Grove, Oregon, who in turn contracted a grower for actual seed production.

On 22 August 1975, approximately 1500 grams (3 lbs.) of recleaned breeders seed of cultivar Wabash (1W19N) was planted on 2.50 acres by Olson Farms near Madras, Oregon. This is a high elevation area (3,000 ft.) south of Mt. Hood,

which is subject to late spring frosts. Crop growth requires irrigation. The grower reported a thin stand plus some lodging of the variety due to its fine stem character. In 1976 the first harvest provided 545 pounds of cleaned seed. Of this, 95 pounds was retained for future seed source and research. The 450 pounds of seed was used on a large test area of Hy. 41. (See page 7)

At the seed fields the spring weather of 1977 was cool and frosts occurred as late as June 15. The Wabash was pollinating about June 21 so a reduced seed set occurred not only on Wabash but on several other varieties in production. The cleaned seed of 1977 harvest totaled 1,530 pounds. This was delivered in November and stored until May 1978 when used on roadsides along the junction of I-65 and 70 in both southeast and northwest areas of Indianapolis.

The cleaned seed of the final harvest of 1978 totaled 1,441 pounds. It was used in the fall of 1979 on median planting of Hy. 41 near Boswell and along I-275 near Cincinnati. Since the contract was finished and most fields are used for only three harvests, the grower plowed the field under.

#### Patent Procedure

Details of the patent plan were covered in the Interim Report, July 1978, pages 32-35 and appendix. In brief, the breeder submits the selection to a Varietal Release Committee of the Experiment Station. On 23 February 1976 this committee approved Wabash Kentucky bluegrass. Only after an agreement was reached with the Department of Transportation (appendix, Interim Report) was a patent application filed by the Purdue Research Foundation.

The agreement requires that PRF will retain the title to the bluegrass and provide breeders seed. PRF will provide liaison for development, marketing, certification, and education of the variety. Since the research was in part supported by the Federal government (via Joint Highway Research Project) federal,

state, and local government units will be able to obtain Wabash seed without payment of a royalty fee to PRF. A service charge by Ag. Alumni Seed Improvement Association (AASIA) on all seed processed is made for handling the continuing liaison, and will include a royalty for seed sold to non-government purchasers.

The plant breeder, W. H. Daniel, principal investigator, has the responsibility to maintain a source of "breeders" seed. This was done by taking 1,000 individual tillers (or sprigs) from the original selection, block 1W19N in 9A3 located at the Lafayette Agronomy Farm. These were spaced on two foot centers and grown for seed production. Harvests in late June of 1977, 78, and 79 from this block have provided breeders seed. After hand harvest and partial threshing, the supply is forwarded to a small lot seed cleaning laboratory in Washington for preparation for machine planting.

Fields are planted in narrow rows so that three pounds of seed per acre are used. The first generation, Foundation seed, is utilized for planting fields so that the second generation, Certified seed, is sold commercially.

## NEW AND DISTINCT VARIETY OF BLUEGRASS PLANT

Wabash Bluegrass - 4453

ABSTRACT OF THE DISCLOSURE

A Kentucky bluegrass plant which exhibits strong rhizome spread and thus predominates over other adjacent bluegrasses. The plant is a medium to light green color and thus more drought tolerant than dark green bluegrasses characteristically are. The new variety has moderate leafspot and powdery mildew resistance and is ideally suited for roadside use where competition from weeds is intense. The potential increased density and wear resistance of the new variety also make it useful for athletic fields, playgrounds, parks, and other surfaces where a heavy wear factor is involved. This new variety of Kentucky bluegrass was developed from clones originally discovered during 1952 among a collection of 24 bluegrasses taken from fairways of the Chicago Golf Club of Wheaton, Illinois. The new variety was the result of selections made after observing six plant generations as reported hereinafter, and the variety has been named "Wabash". The instant plant was asexually reproduced by cuttings through succeeding generations. Each subsequent generation from seed maintained the characteristics of the original parent plant. The original plant was selected as a discovery which was unique. The subject plant is a single, genetically identical plant, as shown by the fact that applicants carried through additional generations and continued to find that this particular plant was genetically true. A single plant propagation was used, reproduced in series, as a way of maintaining identity. The plant increase began with LW19N, the sixth generation. The variety is characterized by its rapid spread by rhizomes and its predominance in solid stands after establishment. Its tolerance to disease and its high density have resulted in reduction of crabgrass and weed infestation when compared to other bluegrass cultivars.

The new variety exhibits greater tolerance to drouth, probably due to its lighter green color, as indicated by delayed wilting. It is distinctive in this wilt resistance when compared to other varieties of which applicant is aware.

#### DESCRIPTION OF THE DRAWINGS\*

FIGURE 1 is a photograph showing three rows of Wabash bluegrass nearing maturity, about 25 inches tall, second year harvest.

FIGURE 2 is a photograph showing the Wabash variety (photo, center) in comparison with common bluegrass (photo, left) and an experimental dwarf type bluegrass (photo, right).

FIGURE 3 is a photograph taken in August 1975 after mowing, and the excellent regrowth of Wabash (photo, top) compared with bluegrass P-104 (U. S. Plant Patent No. 3643) (photo, middle) and TVA, a tall common type bluegrass (photo, bottom) is shown.

FIGURE 4 is a photograph showing bluegrass tillers of the same age, and under the same management, of Wabash (photo, top), P-104 (photo, middle) and TVA (photo, bottom).

FIGURE 5 is a photograph of 16B (a parent of Wabash) and the genetic vigor of the parent strain is evident in this eight year plot showing the spread of 16B into the eight adjacent plots.

FIGURE 6 is a photograph generally showing drouth tolerance of the light green Wabash bluegrass marked plot compared to the surrounding darker green plots which show wilt.

#### BACKGROUND OF THE INVENTION

After the original clone was selected, and assigned an identifying number of 16B, six subsequent generations were selected and numbered, respectively, A8, 23-14, 1-10-1, A4, D5-8, and 1W19N, which selection maintained the same light green vigorous appearance and growth type.

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\* Drawings not included in this report.

The original selection made, with the most spread of all selections made at that time, was 16B, the second clone taken upon leaving the No. 16 tee area at the golf course aforementioned. Interestingly enough, Warren's Turf Nursery later made comprehensive selections from this same golf course but, upon investigation by the applicant and others, it has been established that their A-34, A-20 and A-10 bluegrasses are not from the clone discovered by applicant and furthermore, Wabash is six generations of selection away from the original clone.

Sprigs of each clone chosen for observation were vegetatively planted in 1952 in small plots within field 10B3 at the Agronomy Farm, Purdue University. At a later time when seedlings from the harvested seed were space planted, more than 100 different types were selected. For example, five were dwarf fine leaved, yet some were very wide leaved, and since then six generations have been recorded.

These generations are as follows:

1. 16B1 - this is a selected type similar to the mother, has good spread, and was transplanted and the seed harvested.
2. A8 - seedlings were spaced into 10B3S in the fall of 1961. Row A, plant 8 was chosen as representative of the light green colored vigorous spread type being sought. Seed harvests were made in 1962, 1963, and 1964 before the plants were killed in 1965.
3. Row 23, Plant 14 in 9A3 was space planted in 1965, harvested, and then killed in 1966, and this was another typical plant chosen for the desired type.
4. Block 1, Row 10, Plant 1 in field 9A1 was space planted in 1966.
5. Row A, plot 4 included 33 seedlings space planted into 10B3C in the spring of 1969. The seed was harvested in 1970 and then the stand was mowed in 1970-71 and the seed harvested again in 1972. Some seed was planted as a roadside test along U. S. Interstate Highway 65 near its intersection with Indiana State Highway 38 in the fall of

1972. Also some sod was cut and placed in two plots at this location. Eight plugs from A-4 were transferred to Block D, Row 5, plot 8 in 9A1 in the fall of 1970. The uniform vigorous spread and medium green color was the basis for selection for seed harvest from this plot in 1972-75. These plots were killed in 1975.

6. Block 1 West 19 North was 35 seedlings spaced in field 9A3 in 1973.

The seed harvested off this plot in 1974 and 1975 was transferred to the Agricultural Alumni Seed Improvement Association for increase in the early fall of 1975 and identified as the variety "Wabash". The new variety has remained true to its original type as selected for drought resistance, light green color and aggressive rhizome spreading. The variety can be asexually reproduced, although seed production runs true to type as discussed more completely below under "Apomixis".

DETAILED DESCRIPTION OF THE NEW VARIETY (Patent as granted 11 May 7

The new Wabash variety of Kentucky bluegrass possesses the following combination of characteristics:

1. An excellent spreadability as clones.
2. A medium to light green color.
3. High drouth tolerance.
4. Medium seed head height.
5. Improved leafspot resistance.
6. Stripe smut and flag smut resistance.
7. Dense penetrating turf.

The characteristics of the new variety described above are hereafter described in more detail, and it should be noted that for several years in applicant's research at Purdue University it was attempted to find a dark green, low growing type bluegrass. None was found equal to the lighter green types similar to the original parent of Wabash as described above. The original mother plant, 16B, when singular tiller starts were made, increased the most when compared to other bluegrass clones collected from the same Chicago Golf Club at other locations during 1952, the comparison is shown in the following Table 1, and the source is a thesis by Lobenstein, Table 3, on file at Purdue University, dated 1964, such data being as follows:

Table 1 - Number of Rhizomes Produced from Single Tiller

Experiment No.	R1	R2b	13b	R4b
Days of Growth	180	180	150	90
16b	<u>333</u>	<u>230</u>	<u>393</u>	<u>103</u>
p.p. 3135(dwarf)	108	175	28	10
Range of				
16 in test: High	333	256	393	103
Low	39	76	55	10



Some data on entry A-4 (5th generation) in field from 10B3C (date from Record Book 27, page 77) give identity and comparisons.

Leaf height spring = 26 cm when range was 32-10 on 11 May 70.

Leaf height early fall = 26 cm when range was 19-7 on 26 Au 70

Color - medium

Leaf height - medium

Spread - vigorous, desired

Rust rating - 6-medium, when 1 best, 9 poorest

Leaf spot res. - 2-very good, when 1 best, 9 poorest

Spread May 70 - 110 cm.-fast. Turf types were only 60-70 cm.

Sod of A-4 was moved on 30 Se 70 to test plots on I-65 at Hwy. 38 as entries 3 and 7, have been mowed and maintained as roadsides since then.

The Wabash variety was also compared with other standard bluegrasses, and the data is set forth in the Lobenstein thesis above referenced, and is reproduced in the following Table 2:

Table 2 - Comparisons for Wabash and Standards

Seed Plot	Height	Leaves		Spread		of Spread Diameter	Area Covered	Leaf Ht.		Seed per Gram	Germin. Lab. Test %
	19 Oc 73 cm	13 Mi 74 cm	15 Mi 74 cm	12 Au 74 cm	31 De 74 cm	31 De 74 m <sup>2</sup>	31 De 74 cm	31 De 74 cm	no.	Test %	
Wabash	17	23	56	90	120	1.13	12	4700	92		
Baron	13	15	52	-	-	-	-	-	-		
Nugget	16	10	40	-	-	-	-	-	-		
RI 10	28	15	51	70	.38	-	-	-	-		

Seedling Vigor: Seedlings planted in the greenhouse at Purdue on 9 Ja 75, were rated 5, or average, on earliness, and 1, as best on stand. In standard seed laboratory testing, germination averaged 94%, that being the best of 50 experimental bluegrasses tested. The range found under that test was 94 to 34%.

Plant Maturity: Wabash variety matured on a 5 rated, medium, wherein 1 is the latest and 9 is the earliest of all bluegrasses in the test.

In 1976 there were 7 entries earlier, 10 about equal to Wabash, and 17 later in maturity than Wabash. In 1976, some second year old seed rows averaged 64 cm. in height when AQ6 (one parent of Sodco variety) averaged 35. In field 9A3 transplants of seedlings made in June 1973 had, by 4 Se 73, spread as follows: Wabash - 40 cm.; Sodco - 30 cm. and out of 75 entries in the test the spread range was from 50 to 20 cm. When the Wabash variety was left unmowed all summer its leaf height on 3 Se 74 was 15 cm. while the range of the same 75 entries was between 25 to 5 cm.

Apomixis: Out of 70 seedlings of A4 (the 5th seed generation from the original 16B clone) no off-types were found. In 405 space planted seedlings in 1975 of 1-19 (the 6th generation) two off-types observed were limited to 8 lower leaved and 9 medium leaved plants. These variants were less vigorous than the 388 identical Wabash plants so would not show significantly in a seed field or turf planted with Wabash variety seed. This indicates that the variety is approximately 96% apomictic. Furthermore, field observations indicate that seed from the 1W19N generation had production equal to the seed yield of the commercially available cultivar Baron which yields approximately 1100 lbs. of seed per acre under normal conditions of seed production.

Color and Drouth Tolerance: Field plot observations from 1962 through 1975 show that as drouth starts, the lighter green bluegrasses stay turgid 1-2 days longer than the dark green selections such as Fylking, Nugget and Sodco. It is possible that the leaf with a lighter green color has a slightly lower evaporation and transpiration rate than those with the dark blue-green color, but in any event the wilt resistance of the Wabash variety is high. Wabash, located in 9A3, has been classified as a light colored highway type bluegrass in 1974 and 75; in 1976 it was rated 4, when 1 is darker green and 9 is lightest green of all plants tested. The characteristic color of the "Wabash variety", based upon the Universal Language &

Dictionary of Names, U. S. Department of Commerce NBS Special Publication 440,  
is moderate olive green 125, having Munsell value of 3.5, and a Munsell  
Chroma 5.

WHAT IS CLAIMED IS:

1. A new and distinct variety of bluegrass plant, Poa pratensis,  
substantially as described and illustrated, and particularly characterized  
by a medium green color, vigorous rhizome spread, and good disease tolerance.

End of Patent

Benefits - Costs

As this is written in July 79 (revised 1980), the price of gasoline has passed the \$1.00 per gallon mark in the USA. Concurrently, the number of bids for mowing contracts for sections of the interstate has dropped greatly. One section received no viable bid in 1979. The 600 miles of Indiana Interstate includes approximately 18 acres of turf per mile. It is reasonable to expect that the use of Wabash bluegrass can effect a 50% saving in roadside mowing costs.

The future is uncertain, however, a new proven variety of bluegrass, developed over a fourteen year program, is available to contribute to safer, more economical roadsides.

Current costs of materials information is listed for the reader's general information.

## Stage III Seeding - corrective to problem areas:

Fertilizer (12-12-12)	\$260.00/ton	
Mulch (straw)	170.00/ton	
Agricultural limestone	20.00/ton	
PR seed mixture		\$3.40/lb.
30 lbs. Per. Rye (fine bladed)		
10 lbs. Certified Common Kentucky Bluegrass		
CV seed mixture		\$7.00/lb.
20 lbs. Crown Vetch		
20 lbs. Annual Rye		
20 lbs. Certified Common Kentucky Bluegrass		
CRF seed mixture		\$3.50/lb.
30 lbs. Creeping Red Fescue		
10 lbs. Certified Common Kentucky Bluegrass		

## Road Contracts - new construction

Fertilizer	\$240.00/ton
Mulch	166.00/ton
Agricultural limestone	18.00/ton

## Seed Mixtures:

R	- \$1.93/lb.
P	- 1.92/lb.
Tu	- 2.86/lb.
TR	- 3.57/lb.
U	- 2.42/lb.
CV	- 8.07/lb.

Currently the wholesale price of bluegrass seed ranges from \$0.90 to \$2.30. Most improved cultivars range from \$1.70 to \$2.30.

Seed mixtures proposed 1980

The slope, soil and climate of roadsides create vast differences in the micro-conditions of the individual plants. Recognizing these differences, the following combinations of seed are proposed:

A. Premium mixture - (no tall fescue included) - urban, medians, (northern & good soil areas)

	<u>pounds/acre</u>	<u>1979 whsl. price/lb.</u>
1. turf type perennial ryegrass	80	\$1.10
2. blend of 2-3 bluegrasses	20	2.00
(one being Wabash, as available)	100	\$128.00/acre

These grasses provide long-term turf cover. These can be rotary mowed at two inches by the homeowner, yield limited clippings. Ryegrass offers fast germination for erosion control. This mixture should be provided a fertilization of seedbed plus one to two supplemental applications to assure development of a dense cover. By 1979 more than 30 named ryegrasses and 50 bluegrasses are being produced.

B. Standard mixture - tall fescue (southern, sandy, gravelly soils)

	<u>pounds/acre</u>	<u>1979 whsl. price/lb.</u>
1. tall fescue (Ky-31 or equal)	80	\$ .30
2. annual ryegrass	40	.20
3. blend of 2-3 bluegrasses	10	2.00
Wabash, Parade, Vantage, Touchdown, Birka, common		52.00/acre

This mixture includes tall fescue which characteristically is hardy, neglect tolerant, and provides a long-term cover. A variation of this standard mixture could be 50 pounds of premium mix plus 80 pounds of tall fescue. Estimated cost: \$88.00 per acre.

C. Crown Vetch - Add 10-20 pounds on slopes that do not require mowing.

D. Birdsfoot Trefoil - Add 10-20 pounds on medians, road to ditch, or areas where Crown Vetch is not desired. Trefoil will tolerate repeated mowings.

E. Salt tolerant - Fults variety of salt grass, Puccinellia distans. Add 10-20 pounds to areas where salt accumulates along roadsides. Dawson red fescue is also tolerant to medium salt concentrations. Salt grass has an appearance similar to bluegrass.

#### Implementation

The potential exists for spraying glyphosate (Roundup<sup>TM</sup> of Monsanto Co.) to kill existing undesired roadside cover and reseeding improved cultivars such as Wabash. As seed becomes available, demonstrational programs are recommended.

The acceptance of an improved cultivar of bluegrass is quite significant. It is important for those writing specifications to be knowledgeable concerning the specific seed. Adequate nutrients, accurate planting, and favorable growing conditions also need to be considered where contracts are being developed.

Current fertilization of roadsides is 500 pounds per acre of 12-12-12 (recommendation) or equivalent to 60-60-60 pounds per acre of N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O respectively. It is suggested for all grasses, including Wabash, that the recommended amount be increased to 80-80-80 for preseeding, plus a supplemental application of 40 pounds N per acre during early growth, to favor earlier stands and minimum erosion.

For effective use of any quality grass seed the contractor must process it as specified and be alert to close inspection and, where necessary, prompt repair.

Adequate supply of a new cultivar is dependent upon growers and processors. However, the lead time in grass seed production is about equal to, or less, than the time between contract writing for construction and roadside finishing projects.

Finally, it should be noted that bluegrass is the natural climax MOWED vegetation in much of Indiana and the cool/humid region of the country. However, it is not the climax vegetation for UNMOWED areas. The tall grass and legumes, shrubs, and young trees become forests unless mowers (buffalo or sheep, repeatedly), annually or occasionally reaffirm the space as reserved for lower growing plants such as bluegrass.

#### Summary

Wabash bluegrass, an aggressive, fast spreading Kentucky bluegrass has been researched, released, patented, and utilized in demonstrational plantings. Even though there are more than 50 named bluegrass cultivars, Wabash bluegrass is a special, unique grass for roadsides, parks, athletic fields, and rotary mowed bluegrass areas. It is characterized by a dense turf cover, a medium green color, resistance to disease, fast germination, and high germination percentages.

Breeders seed supply is being maintained at Purdue University. The Agricultural Alumni Seed Improvement Association has, by agreement with Purdue Research Foundation, responsibility for seed production, handling, and promotion. Production is underway in Washington State. Because of the many dwarf types found during the past research, a future breeding and testing research program for using dwarf bluegrasses in lawn and turf as a conservation of energy is being planned for submission for support of research by the Department of Energy.





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