SOUTHERN FOREST EXPERIMENT STATION

U.S. FOREST SERVICE RESEARCH NOTE

Forest Service, U. S. Dept. of Agriculture

T-10210 FEDERAL BLDG. 701 LOYOLA AVENUE NEW ORLEANS, LA. 70113

EXOTIC GRASS YIELDS UNDER SOUTHERN PINES

H. A. Pearson[1]

SOUTHERN FOREST EXPERIMENT STATION

Kentucky 31 and Kenwell tall fescue, Pensacola bahia, and Brunswick grasses yielded nearly three times more forage under an established pine stand than native grasses 7 years after seeding. Introducing exotic grasses did not significantly increase total grass production but did enhance range quality since the cool-season grasses are green during winter and are higher in crude protein, ether extract, phosphorus, and Vitamin A than the warm-season grasses. Prescribed burning was neither detrimental nor beneficial to the exotic grass yields.

Additional keywords: Introduced grasses, perennial, forage yields, multiple-use, forest range, cool- and warm-season grasses.

The problem of providing adequate forage on southern pine range can be solved by establishing sufficient perennial forages which tolerate shade and prescribed burning. Although there are several studies concerning exotic grass species on southern ranges (Burton 19'73, Halls *et al.* 1957), little information (Hart *et al.* 1970) exists regarding introduced forages beneath pines. Moreover, most forest range improvement studies have not investigated the use of cool-season grasses, which provide green forage during winter and reduce the need for supplemental feed. The present study was initiated to determine the productivity of selected warm- and cool-season exotic grasses under an established, well-stocked 16year-old pine stand.

METHODS

The study was on the Palustris Experimental Forest in central Louisiana, where annual precipitation averages 58 inches. In 1952 about 0.2 acre of cutover land was burned and planted with slash (*Pinus elliottii* Engelm.) and loblolly *(P. taeda* L.) pine seedlings at a spacing of 6 by 6 feet. By the fall of 1974, the pines had a basal area of 210 ft^2 per acre and averaged 6.6 inches in d.b.h. Pine density was 885 trees per acre, but because the plantation was small, forage responses were expected to be somewhat higher than normally found under trees this dense.

The area was not grazed after pine establishment. Pinehill bluestem *(Andropogon scoparius* var. *divergens* Anderss. ex Hack.) and slender bluestem *(A. tener (Nees)* Kunth) originally dominated the herbaceous vegetation; however, by 1971 switchgrass *(Panicum virgatum* L.), spreading panicum *(P. rhizomatum* Hitchc. & Chase), and pinehill bluestem dominated.

[1] Principal range scientist. Southern Forest Experiment Station. Forest Service. USDA, Pineville, La.

In November 1967, 14 plots (10 by 20 feet) were burned and randomly assigned to be seeded with one of six exotic grass species or left unseeded as a control.[2] No soil disturbance or vegetation control methods were used other than burning. Four varieties of tall fescue (*Festuca arundinacea* Schreb.), all cool-season perennials, were seeded in December 1967 at a rate of 25 pounds *per* acre; varieties were Fawn, Goar, Kentucky 31, and Kenwell. Two warm-season grasses, Brunswick (*Paspalum nicorae* Parodi) and Pensacola bahia (*P. notatum* Flügge), were seeded in May 1968 at a rate of 15 pounds per acre.

Since cast pine needles covered the understory vegetation, half of each plot was prescribed burned in February 1970. In 1974 pine litter accumulations were measured on four 2.4 ft^2 quadrats per split plot.

During 1971 and 1974, grasses were clipped once in summer from two 9.6 ft^2 quadrats in each split plot. The grasses were separated by species, ovendried, and weighed. Total yield and yields of exotic and native grasses were evaluated with analysis of variance; significant (0.05 level) means were separated by Duncan's multiple range test. Chemical analysis[3] and in *vitro* dry matter digestibility (Pearson 1970) were determined from forages harvested in June 1971.

RESULTS AND DISCUSSION

Four years after seeding (tree age 19 years), Kentucky 31 and Kenwell tall fescue yielded significantly more forage than any of the other exotic grasses (table 1), but residual native grasses on each plot outproduced the exotics. Native grass production averaged 159 pounds per acre; exotic grasses averaged 42 pounds per acre. Warm-season exotic grass yields were not significantly greater than zero.

After 7 years (tree age 22 years), Kentucky 31 and Kenwell tall fescue, Pensacola bahia, and Brunswick yielded 3 to 14 times more forage than at 4 years; Brunswick showed the greatest proportionate increase (table 1). Precipitation during winter, spring, and early summer of 1974 was 33 percent higher than it had been in 1971, which at least partially explains the increased yields. Average yield of these four exotics was 342 pounds per acre, or nearly three times more forage than the native grasses yielded (117 pounds per acre average). Kentucky 31 tall fescue yielded 83 percent of the totai grass production on its plots, Kenwell tall fescue 75 percent, Pensacola bahia 64 percent, and Brunswick 73 percent. The other fescues essentially disappeared.

Chemical analyses indicated that cool-season Kentucky 31 and Kenwell tall fescues were higher in crude protein, ether extract, ash, phosphorus, and Vitamin A than the warm-season Pensacola bahia or native pinehill bluestem (table 2). Crude fiber and nitrogen-free-extract were higher in the warm-season grasses. Digestibility was higher for the exotics than the native bluestem. Nutritional differences between warm- and cool-season forages in winter are probably greater than these June analyses show since warm-season plants are dormant.

Total yields did not significantly increase on any of the plots, even those with significantly high exotic yields. Consequently, the only apparent benefit to be derived from seeding exotic

2 Plots established by V. L. Duvall and L. B. Whitaker.

3 Chemical analyses were conducted by the Feed and Fertilizer Laboratory. Louisiana State University, Baton Rouge, La.

Table 1.—*Grass production under a slash-loblolly pine plantation*

Species	Tree age 19 years			Tree age 22 years		
	Exotic grasses	Native grasses	Total	Exotic grasses	Native grasses	Total
	Pounds/acre[1]					
Kentucky 31 tall fescue	88a	160a	248a	542a	111a	653a
Kenwell tall fescue	100a	137a	237a	260b	86a	346a
Pensacola bahia	36b	197a	233a	304b	171a	475a
Brunswick	19b	146a	165a	261b	99a	360a
Fawn tall fescue	8b	225a	233a	4c	286a	290a
Goar tall fescue	1b	147a	148a	4c	178a	182a
Control	0b	101a	101a	0c	230a	230a

[1] Within columns, means followed by unlike letters are significantly different at 0.05 probability level.

Table 2.—*Chemical analysis and in vitro dry matter* digestibility *of forages under* pines

Chemical analysis	Pinehill bluestem	Pensacola bahia	Kentucky 31 tall fescue	Kenwell tall fescue
Digestibility (%)	34.9	46.1	44.5	49.8
Crude protein (%)	8.0	8.9	12.9	11.6
Ether extract (%)	2.3	3.9	4.9	4.4
Crude fiber (%)	36.9	40.1	31.9	30.5
Nitrogec-free-extract (%)	46.7	44.6	36.9	39.8
Ash (%)	6.1	2.5	13.4	13.7
Calcium (%)	.32	.20	.27	.29
Phosphorus (%)	.09	.10	.15	.18
Vitamin A (IU)	1,081	4,515	12,521	15,917

grasses under dense stands of pine is the green forage that cool-season exotics provide during winter which is higher in some nutrients than native grasses.

Prescribed burning 1 and 3 years before measurement neither increased nor decreased the productivity of the exotic grass species. Native grasses and total yields were similarly unaffected. Burning did not have a significant effect on litter accumulations; however, at 5,000 pounds of litter per acre, burned plots averaged 1,000 pounds per acre less than unburned plots. More frequent burnings may reduce litter sufficiently to increase grass yields.

LITERATURE CITED

Burton, G. W.
1973. Integrating forest trees with improved pastures. In Range resources of the southeastern U.S. Am. Soc. Agron. Special Publ. 21: 41-49.

Halls, L. K., G. W. Burton, and B. L. Southwell.
1957. Some results of seeding and fertilization to improve southern forest range. U. S. Dep. Agric. For Serv., Res. Pap. SE-78, 26 p. Southeast. For. Exp. Stn., Asheville, N.C.

Hart, R. H., R. H. Hughes, C. E. Lewis, and W. G. Monson.
1970. Effect of nitrogen and shading on yield and quality of grasses grown under young slash pines. Agron. J. 62: 285-287.

Pearson, H. A.
1970. Digestibility trials: in vitro techniques. *In* Range and wildlife habitat evaluation-a research symposium. U. S. Dep. Agric., Misc. Publ. 1147, p. 85-92.