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ABSTRACT

Since the early part of the 20th century, land managers have used prescribed fire during February and March to maintain and enhance habitat for northern bobwhites (*Colinus virginianus*) in southern pine forests. During the past 2 decades, some managers have started to shift their use of fire to mimic more "natural" lightning-season (April to August) ignitions because these fires encourage flowering of plants in intact native ground cover, and are potentially more effective at hardwood control than winter fires. Therefore, we designed a short-term pilot study to evaluate whether seasonal applications of prescribed fire had any effect on bobwhite brood habitat (as measured by vegetation composition and arthropod biomass) or bobwhite abundance (as measured by hunting success) during the subsequent fall. During the first two years of our study (1994 and 1995), results showed that arthropod biomass and bobwhite hunting success were slightly greater on the shooting course burned during lightning-season (May) than the one burned during February and March. These results indicate that applications of lightning-season fire can be used, at least on a small scale (i.e., management blocks <250 ha) in southern pine forests for hardwood control, and possibly enhancement of native ground cover without short-term negative impacts on northern bobwhites.

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INTRODUCTION

Since the early part of the 20th century, forest and wildlife managers have used prescribed fire during February and March to maintain and enhance habitat for northern bobwhites in southern pine forests (Stoddard 1931, Brennan et al. 1998). During the past 2 decades, some land managers have started to shift their use of prescribed fire to mimic more "natural" lightning-season ignitions during April and August (Robbins and Myers 1992; Figure 1). Lightning-season fires encourage flowering of keystone native plants such as wiregrass (*Aristida* spp.), and seem to be, under certain conditions, more effective at control of invasive hardwoods than winter fires (Robbins and Myers 1992). However, the effects of varying seasonal applications of prescribed fires on vertebrates, as well as on plants and arthropods that provide food and habitat resources, remain poorly known. Additionally, it is conventional wisdom among many quail managers that use of lightning-season fire (which coincides with the northern bobwhite nesting season) will have devastating negative effects on bobwhites and other ground-nesting birds, despite the lack of data that either support or refute this idea.

Our objective was to design a short-term, pilot study to examine the effects of seasonal applications (March versus May to June) of prescribed fire on: (1) elements of brood habitat (i.e., vegetation composition and arthropod biomass); and (2) hunting success during the subsequent fall and winter seasons.

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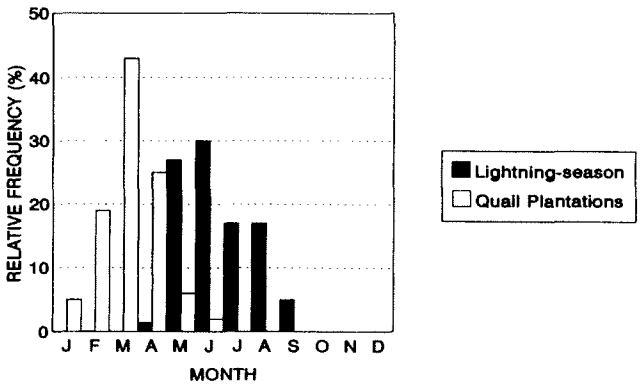


Fig. 1. Relative frequency of applications of prescribed fire on quail plantations in the Tallahassee-Thomasville region of northern Florida and southern Georgia (data from Brennan 1994), compared to occurrence of lightning strikes in the southeastern U.S. (from Komarek 1964).

METHODS

Sampling Unit

We used 2 shooting courses which were approximately 200 ha each, on a 1,500 ha hunting plantation in northern Florida. Major activities in the annual cycle of management events of hunting plantations in northern Florida and southern Georgia are described in Brennan (1994). Each shooting course had received annual applications of prescribed fire during February or March for the past 5 decades. Management treatments (winter [February to March] versus summer [May to June] applications of prescribed fire) were assigned at random.

Prescribed fires were applied during 1994 and 1996, with no burning on either course during 1995. Approximately 70–80% of the vegetation on each shooting course was burned; remnant patches (several square meters up to 0.3 ha) remained unburned and were distributed throughout the area.

Vegetation and Arthropod Sampling

We estimated the relative frequency of occurrence of plant species present on dormant and lightning season burned areas using a meter square grid placed at 5 meter intervals along 25 meter transects. Thirty 25-meter transects were sampled in areas that were burned during the summer, or during the winter, in each shooting course. Sampling was conducted during June, July, and August of 1994 and 1995. Arthropods were sampled using a D-vac suction device along 30 25-meter transects in winter and summer burned areas in each shooting course, also during June, July, and August of 1994 and 1995. During each sampling period, arthropods were sampled first. Vegetation data were subsequently collected within 1 to 24 hours after collecting arthropods.

In the laboratory, arthropods were sorted to Order, dried for >12 hours at 70 degrees Celsius, and weighed to 0.001 gram.

Hunting Success

Bobwhites were hunted with pointing dogs on 2 to 3 week intervals during the hunting season (December to February). Tallies on number of bobwhite coveys flushed per half-day (4 hours) of hunting were recorded by the plantation owners, managers, or dog handlers. Hunting success data were collected during the 1994, 1995, and 1996 hunting seasons.

RESULTS

Vegetation

The shooting course burned during summer produced more ragweed (*Ambrosia* sp.) and panic grass (*Panicum* sp.). The shooting course burned during winter produced more legumes than plots burned during summer. The presence of oak (*Quercus* sp.) sprouts was also greater on the area burned during winter (Fig. 2a). Otherwise, there was little difference in vegetation composition on the areas burned during the winter or summer.

Arthropods

During 1995, the course burned during summer produced more grasshoppers (Orthoptera), true bugs (Hemiptera), leaf hoppers (Homoptera), and spiders (Aranea), all of which are important foods for bobwhite hens and chicks (Fig. 2b). Total biomass of arthropods was greater on the shooting course burned during summer in both years of the study (Fig. 3). During 1994, the shooting course burned during summer produced a pulse of arthropods during the peak of the northern bobwhite breeding season (Fig. 4a). This pattern was not repeated during 1995 (Fig. 4b).

Hunting

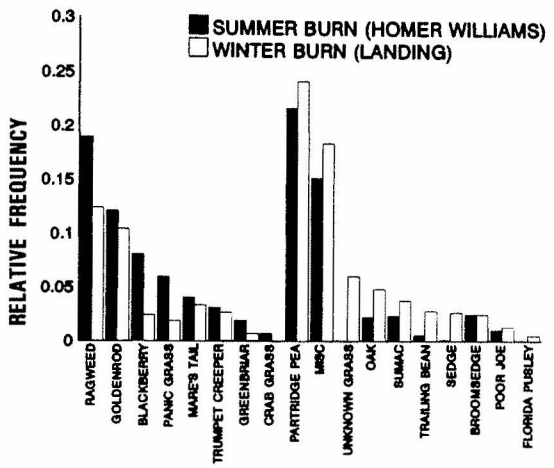
During the 1994 and 1995 hunting seasons, northern bobwhite hunting success was slightly greater on the shooting course burned during summer, compared to the shooting course burned during winter (Fig. 5). There was no difference in hunting success between the summer and winter burned shooting courses during the 1996 hunting season (Fig. 5).

DISCUSSION

Contrary to popular opinion, conventional wisdom, and management tradition, our results indicate that summer (lightning-season) applications of prescribed fire can be used for northern bobwhite habitat management, especially in areas where economical control of invasive hardwoods is needed. Such applications of fire can be used without negatively impacting bobwhite populations or hunting quality. We caution, however, that use of summer fire should be limited to relatively small blocks (<250 ha) and not be used exclusively over an entire shooting plantation.

There may be significant economic advantages that can be gained from using summer fires for hard-

A.



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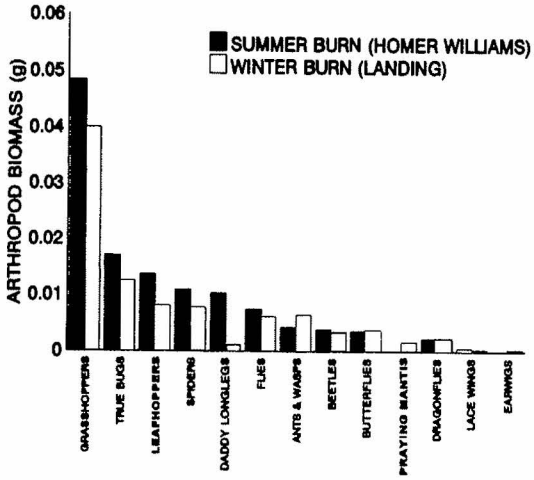


Fig. 2. (A) Frequency of occurrence of plants on shooting courses burned during summer (solid bars) and winter (open bars) measured during June, July, and August, 1994, and 1995. (B) Arthropod biomass on shooting courses burned during summer (solid bars) and winter (open bars) measured during June, July, and August, 1994, and 1995.

wood control. For example, control of small (1 to 2 centimeter diameter) hardwoods using fire costs about $5.00 per acre, whereas herbicide or mechanical methods cost between $25.00 to $40.00, or more, per acre.

Results from habitat use analyses of radio-marked northern bobwhites at Tall Timbers Research Station near Tallahassee, FL corroborate the results reported here. At Tall Timbers, bobwhite hens were documented moving broods into areas 1 to 2 weeks postfire during June and July, apparently to feed on phytophagous arthropods that respond to post-fire vegetation (Carver et al. *this volume*).

This study, along with a series of companion studies on seasonal effects of fire on other wildlife in southern pine forests, supports an emerging pattern which shows that winter versus summer fires influence wildlife populations in subtle ways. For example, results from experimental comparisons of winter versus

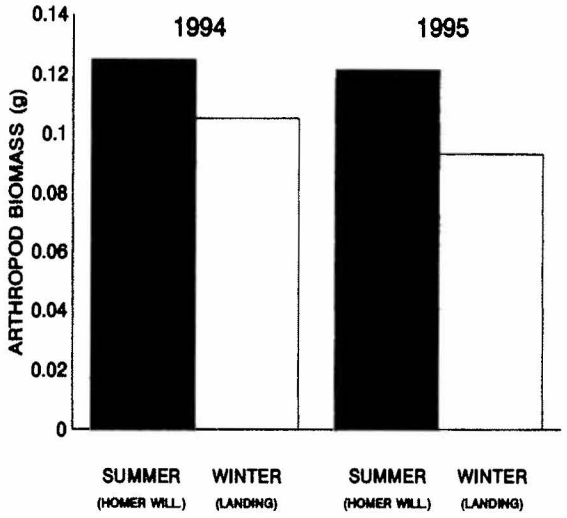
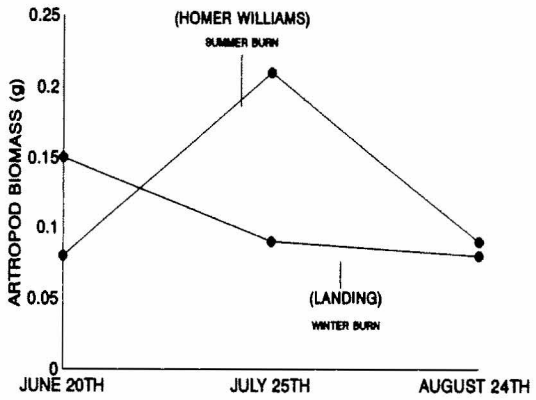


Fig. 3. Arthropod biomass (g) on shooting courses burned during summer (solid bars) and winter (open bars) measured during June, July, and August, 1994, and 1995.

summer fire applications had only minor effects on birds in both the Apalachicola National Forest (Engstrom et al. 1996, Engstrom unpubl.), North Carolina Sandhills (Brennan et al. 1998), and wild turkeys (*Meleagris gallopavo*) in the Red Hills region of southern Georgia and northern Florida (Sisson and Speake

A. 1994



B. 1995

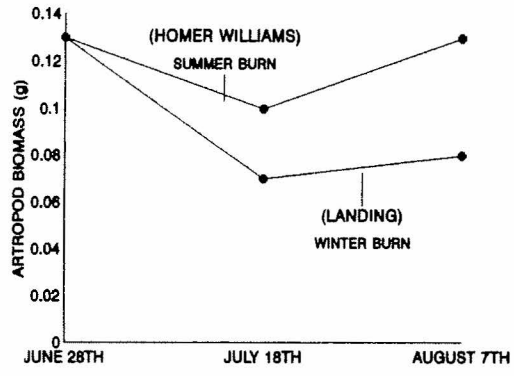


Fig. 4. Arthropod biomass (g) on shooting courses burned during summer and winter measured during June, July, and August, 1994 (A), and 1995 (B).

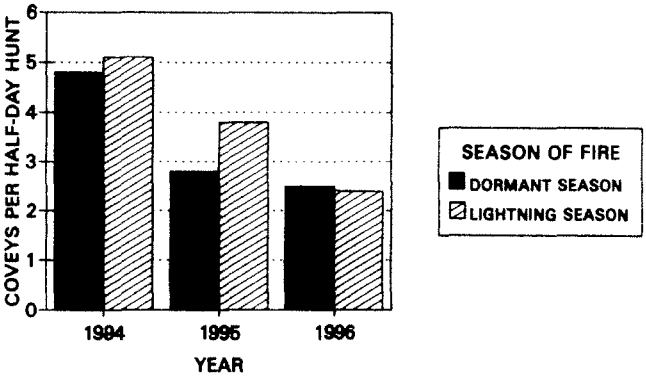


Fig. 5. Northern bobwhite hunting success during the 1994, 1995, and 1996 hunting seasons (December through February). One half-day hunt equals approximately 4 hours of hunting effort.

1994). When the results from these studies are compared with earlier classic studies on the effects of fire exclusion on birds (Engstrom et al. 1984), it is clear that the use of fire is absolutely critical to the maintenance of habitat for many species, including northern bobwhite, whereas the seasonal timing of fire application can be flexible. Nevertheless, much additional research is needed, such as long-term studies with extensive spatial replication, before we will be able to fully understand the long-term effects of applying winter versus summer prescribed fire in the context of wildlife and ecosystem management.

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LITERATURE CITED

Brennan, L.A. 1994. Introductory comments and background, the Tall Timbers 1993 plantation managers survey. Pages 100–102 *in* Proceedings of the 1994 Tall Timbers Game Bird Seminar, Tall Timbers Research Station, Tallahassee, FL.

Brennan, L.A., R.T. Engstrom, W.E. Palmer, S.M. Hermann, G.A. Hurst, L.W. Burger, and C.L. Hardy. 1998. Whither wildlife without fire? Transactions of the North American Wildlife and Natural Resources Conference 63:402–414.

Brennan, L.A., S.M. Hermann, and S.T. Lindeman. 1995. A burning question. Quail Unlimited Magazine 14:76–79.

Engstrom, R.T., R.L. Crawford, and W.W. Baker. 1984. Breeding bird populations in relation to changing forest structure following fire exclusion. Wilson Bulletin 96:437–450.

Engstrom, R.T., D.B. McNair, L.A. Brennan, C.L. Hardy, and L.W. Burger. 1996. Influence on birds of dormant versus lightning-season prescribed fire in longleaf pine forests: experimental design and preliminary results. Transactions of the North American Wildlife and Natural Resources Conference 61:200–207.

Komarek, E.V. 1964. The natural ecology of lightning. Tall Timbers Fire Ecology Conference Proceedings 3:139–183.

Robbins, L.E., and R. L. Myers. 1992. Seasonal effects of prescribed burning in Florida: a review. Miscellaneous Publication No. 8. Tall Timbers Research Station, Tallahassee, FL.

Sisson, D.C., and D.W. Speake. 1994. Spring burning for wild turkey brood habitat: an evaluation. Proceedings of the Southeastern Association of Fish and Wildlife Agencies 48: 134–139.

Stoddard, H.L. 1931. The bobwhite quail: its habits, preservation, and increase. Charles Scribner's Sons, New York.