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Franklin J. Svovoda

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THE BASIC HABITAT RESOURCE FOR RUFFED GROUSE¹

Gordon W. Gullion, *Research Associate*
Dept. of Entomology, Fisheries and Wildlife, University of Minnesota
and
Franklin J. Svoboda, *Junior Scientist*
Dept. of Entomology, Fisheries and Wildlife, University of Minnesota

ABSTRACT. — There is a close correlation between the distribution of the aspens and of ruffed grouse. (*Bonasa umbellus*) both on a continent-wide and local basis. As an aspen stand regenerates from destruction by fire or removal by cutting and progresses towards maturity, it is continuously providing some of the needs of grouse at some stage of their annual life cycle. Aspen leaves and staminate flower buds constitute the most important year-long food resource. As the aspen regeneration thins from high density sucker growth through the sapling stage to the pole stage and finally mature timber, best quality cover is provided for ruffed grouse broods, wintering and breeding grouse, and finally nesting hens. But to sustain highest density grouse populations these age classes must all be available to each wintering and breeding grouse within a normal foraging range of about 10 acres.

GENERAL RUFFED GROUSE - ASPEN

RELATIONSHIPS

At least 100 years ago Parker Gillmore made an observation that has since been overlooked by too many generations of wildlife and forest managers: "In the undergrowth which springs up in that portion of the country [Maine] where timber has been destroyed by fire, I ever found them [ruffed grouse] very abundant, it being almost impossible to wander half a mile through such openings without flushing a covey" (Jasper p. 121 in Studer 1888). Judging by the forest composition now in recently burned Maine forests, it seems probable that most of the "undergrowth" seen by Gillmore consisted of aspen regeneration.

Also, it is probably no accident that the North American distribution of the aspens fairly closely delimits the native distribution of the ruffed grouse as

well (fig. 1) (Bailey *et al.* 1955). There are some places where aspen is common in North America where these grouse do not occur; and there are ruffed grouse populations in the southern Appalachians, some parts of the Midwest, and on the Pacific coast where aspen is absent. Recent successful introductions into the Beaver group of islands in Lake Michigan (Moran and Palmer 1963), the Ruby Mountains in northeastern Nevada (Hoskins 1968), and into Newfoundland (Inder 1967) suggest that isolated aspen forests lack these grouse simply because the birds have failed to disperse into them. On the other hand, it is only in the warmer climates where grouse encounter less severe wintering conditions that they persist in the absence of aspen; and though sometimes locally common in these peripheral habitats, ruffed grouse seldom approach the widespread abundance common in the more northern regions where aspen is, or was, a dominant component of the forest.

Minnesota Studies

From a 15-year study of ruffed grouse — forestry relationships on and in the vicinity of the Cloquet Forestry Center in east-central Minnesota, it has become apparent that at some time during the regeneration and growth of an aspen stand, these trees

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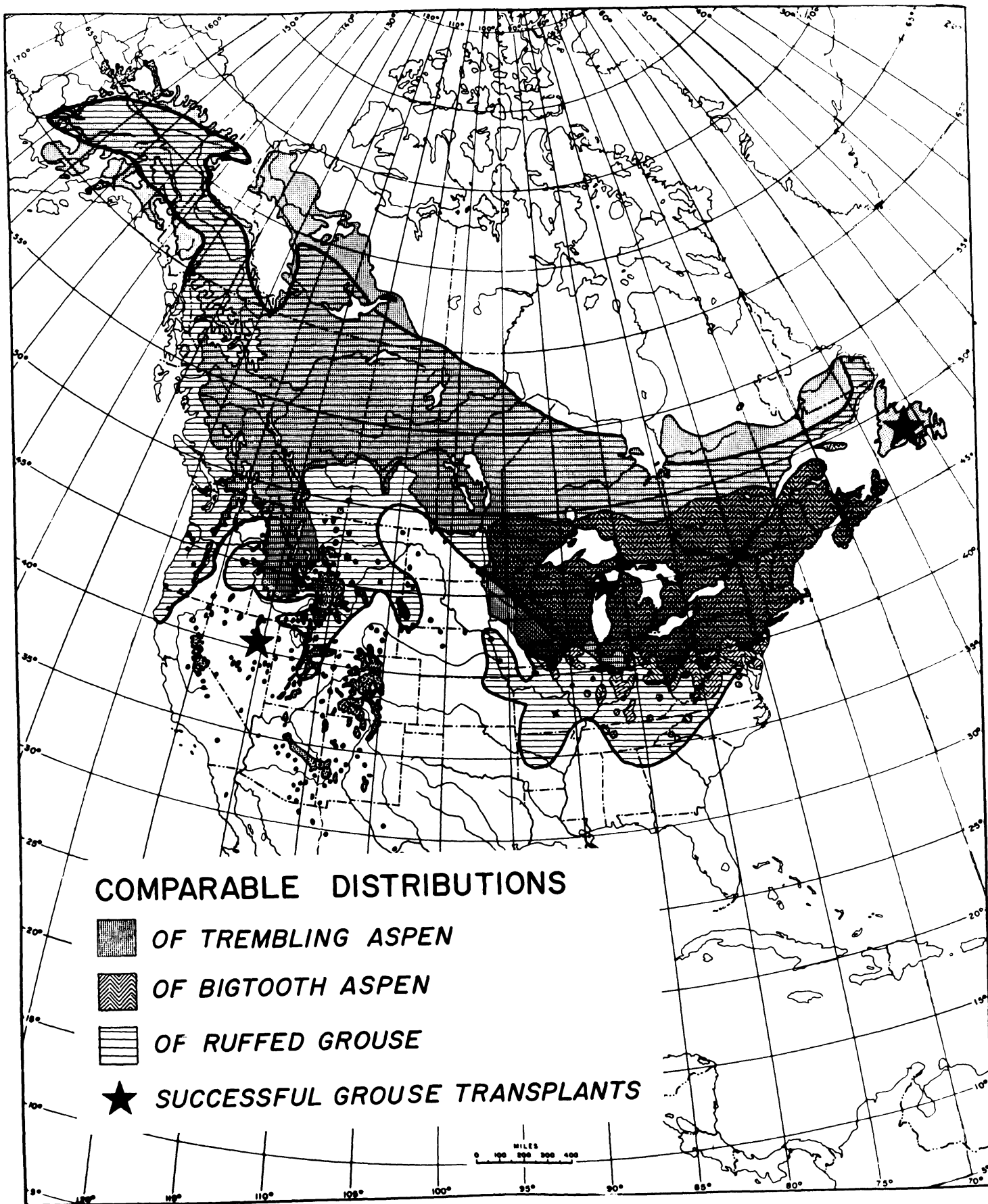


Figure 1. — *Distribution of the North American aspens and ruffed grouse. The distribution of the aspens from Fowells (1965); the distribution of ruffed grouse based on Aldrich (1963); base map from Fowells (1965).*

meet every need of the ruffed grouse at some stage of the bird's life history. If the habitat available to grouse contains a mosaic of aspen age classes within the restricted foraging range of ruffed grouse, aspen alone can meet all the habitat needs of resident grouse throughout the year, from brood cover for chicks through essential food resources and winter and spring breeding cover for the grown birds to nesting cover for the hens. No other species of shrub or tree in North American forests appears to fill the needs of ruffed grouse so adequately.

Fortunately, the aspens are not only "the most widely distributed tree species in North America" (Fowells 1965) but are economically important as well (Schneider 1970). It is hardly surprising therefore that the ruffed grouse has a larger North American range than that of any other resident game bird (Edminster 1954).

The Function of Aspen as a Resource for Grouse

To understand how the aspens function as a basic habitat resource of ruffed grouse we first need to consider briefly the basic habitat needs of these birds. Food, cover, and water are the three basic needs of living animals. A lack of free water for drinking probably seldom limits a browsing species such as grouse. But insufficient food and cover may be limiting even in extensive forested areas.

Food — A Factor Limiting Grouse Occurrence

Although wildlife biologists generally have long discounted food shortages as a threat to ruffed grouse populations in hardwood forests, our studies at Cloquet have shown that statements such as "When its preferred foods are used up . . . it can always turn to tree buds, the supply of which is virtually inexhaustible . . ." (Edminster 1954) are probably erroneous. The food resource for ruffed grouse is probably much less catholic than formerly believed.

During a series of winter "feeding runs" extending through the period when snow covered the ground during the winters from 1965 to 1970 we found that ruffed grouse fed on the flower buds of the male aspens six times as much (in relation to availability) as upon all other hardwood species combined. In

1967-68 this preference reached 13 to 1 (Svoboda and Gullion, unpublished data).

Furthermore, examination of several thousand ruffed grouse droppings collected at Cloquet from 1964 through 1969 provided the basis for the statement by Vanderschaegen (1970), "The most important food plants for ruffed grouse in the Cloquet area are aspens. Aspen buds, catkins, or leaves were used at all seasons of the year. Aspen buds (both vegetative and male flower) are the number one winter food, male buds and catkins the number one spring food, and buds and leaves the second most important fall food." Vanderschaegen found that even during summer the leaves were a most important source of food, constituting more than 53 percent of the identifiable material examined and outranking five-fold the second most important — the seeds of sedges (*Carex* spp.).

Beaked hazel (*Corylus cornuta*) ranked second overall, but under some conditions can be *most important* as a winter food resource. Catkins of the birches (*Betula papyrifera*; *B. lutea*) never ranked better than a poor third, and ironwood (*Ostrya virginiana*), often considered important elsewhere (Stollberg and Hine 1952) is rare in the Cloquet Forest.

The arrangement of flower buds and physical characteristics of the aspen twig are probably important to ruffed grouse. The twig is rigid and usually enters the fall season with 6 to 8 easily detached flower buds near the tip (fig. 2). This combination allows grouse to take their evening meal quickly and quietly before they dive into a snow burrow for the night.

We have observed ruffed grouse taking flower buds at a rate exceeding 45 per minute. Birds feeding in aspen seldom spend more than 15 to 20 minutes collecting the 90 to 100 grams of buds that constitute a meal. This compares to a 150-pound human consuming about 27 pounds of food in 15 to 20 minutes.

Grouse cannot feed as rapidly or effortlessly on any of the other arboreal foods available to them. Rapid feeding has two distinct advantages for grouse: (1) it minimizes their accessibility to predators (an evening feeding period beginning about sundown coincides with the early foraging flights of horned and other owls) and (2) short feeding periods reduce the expenditure of energy needed to keep warm during



Figure 2. — A terminal twig of trembling aspen showing three typical clusters of staminate flower buds and the apical vegetative buds.

cold winter evenings. During the colder part of winter ruffed grouse are in snow burrows almost continually, perhaps as much as 23 hours a day, except for their brief emergence to feed hastily upon a readily available food such as the aspen flower buds.

When snow is deep and crusted ruffed grouse may spend much more time feeding on the hazel catkins they can reach from the snow surface — but when conditions favorable for this type of feeding persist winter losses of grouse also increase.

Huff (1970) has shown the male flower buds of aspens to be one of the richest sources of nutrients available to these birds through the winter when snow lies on the ground.

Observations over the past 6 years show that ruffed grouse prefer certain clones of aspen for feeding. Huff's analyses (1970) have shown the flower buds

from preferred clones of trembling aspen to be about 30 percent richer in protein (14.2 vs. 10.9 percent dry weight) than flower buds taken from male aspen clones where we have seen no feeding use by ruffed grouse for the past 13 years.

Contrary to the belief that ruffed grouse are forced into arboreal feeding by snow covering their ground-level resources, we have found that heavy and sometimes exclusive use of staminate flower buds of the aspens begins many weeks before snow covers the ground.

Our earliest record of use of aspen buds is of a 13-week-old male ruffed grouse feeding in aspen on September 30, 1964 (Godfrey 1967).

In spring at least the male ruffed grouse continue to use the developing staminate catkins of aspen almost to the exclusion of other food until the aments have shed their pollen, dried, and begun falling from the twigs in early May. Only then do the grouse commence using the evergreen, frost-resistant herbs (e.g., *Cornus canadensis*, *Coptis groenlandica*, *Gaultheria procumbens*, *Fragaria* spp., *Linnea borealis*) that have been available to them at ground level since the snow melt — which may have been complete as much as 3 to 5 weeks prior to aspen catkin maturation at Cloquet.

In addition to our observations of grouse feeding preferences over a 6-year period, the analysis of droppings collected from 1964 to 1969, and the analyses of nutritional values from 1968 to date, we have further evidence of the dependence of grouse upon the aspen for food. All the previously perennially occupied breeding activity centers from which aspen was cut were abandoned by grouse even though their drumming logs were not disturbed and both hazel and birch remained in virtually their precutting abundance. At least 11 of these centers have gone "full-cycle" and now are being reoccupied by grouse 7 to 13 years after cutting.

On the Cloquet Forestry Center there are large pine stands from which all or most of the aspen has been removed through timber stand improvement. These stands are devoid of breeding ruffed grouse, even though adjacent tracts where aspen remains uncut among the pine canopy had breeding grouse densities as high as one bird per 6 acres in 1971 (this

compared with one breeding grouse per 3 acres in best quality aspen stands).

On the Bob Lake portion of the Cloquet study area there are two tracts of northern hardwood forest from which aspen was selectively cut in about 1960, leaving a forest of maple, oak, paper birch, basswood, ironwood, and some other hardwoods intact. Both of these tracts have been devoid of breeding ruffed grouse since we began studying them in 1965: one is 218 acres in extent, the other 95 acres. On adjacent areas where soil and topography are the same but aspen remains in the forest canopy, we had a breeding ruffed grouse density exceeding one bird per 6 acres in 1971.

We believe it is also significant that more than 98 percent of the persistently used drumming logs on both our Cloquet study area (including 247 logs occupied in 1971) and on 2,800 acres of the Mille Lacs Wildlife Area (94 occupied logs in 1971) are within sight of mature *male* trembling or bigtooth aspen.

Aspen Meets the Spectrum of Cover Needs of Ruffed Grouse

Aspen in various age classes best provides the quality of cover needed by ruffed grouse at various stages of their annual life cycle. But first we need to reconsider what constitutes secure cover for ruffed grouse. Some types of cover, long considered to be essential to grouse, provide better hunting cover for the major grouse predators and so are actually detrimental to the maintenance of high density ruffed grouse populations (Gullion and Marshall 1968).

Analysis of the longevity of 446 drumming male grouse over a 11-year period has shown that the longest lived grouse occupy sites where the stems of sapling aspen, hazel, mountain maple, alder, or other hardwood species provide a dense stand of small diameter (under 6 inches) stems. This we call "vertical cover" and believe that this quality of cover is not only most effective in protecting the birds from surprise attack by raptors (hawks and owl) overhead but also allows the bird to maintain effective surveillance for mammalian predators on the ground for a radius of 50 to 60 feet at all times.

The less secure cover, which we call "horizontal cover," provides effective hunting or ambush cover

for the animals that commonly prey upon ruffed grouse. Brush piles, slashing, windfalls, and the boughs of conifers both close to the ground and in the forest canopy all provide such cover for grouse predators.

Several brush species substitute structurally for aspen stems as adequate vertical cover for ruffed grouse. But none of these can be managed as easily, provide a year-long food resource, or have the economic value of the aspens. Furthermore, none of the other northern hardwoods regenerates as root suckers after being cut in the same manner as aspen, producing a fairly uniform, dense stand over a large piece of ground. Nor do any other hardwoods provide an adequate food resource for these grouse as the trees mature.

Specifically, the young regenerating sucker growth of aspen can provide in its first year high quality brood habitat for grouse by the time the chicks hatch in mid-June, following winter clearcutting or early spring burning. As the regeneration grows it continues to provide a high quality brood habitat for perhaps as long as a decade following the initial removal of the stand by logging or fire, especially if it is growing on a low, moist site.

At about 10 years of age in northern Minnesota, the aspen growth has gone through its first natural thinning and developed into a sapling stand 25 to 35 feet high that has a density of less than 8 thousand stems per acre. Then it provides a good quality cover for wintering and breeding ruffed grouse. In both 1970 and 1971 our average grouse spring density was a breeding bird per 4 acres in the 8- to 12-year old aspen regeneration at Cloquet.

Natural thinning continues as the aspen stand grows toward pole-size, and the value of the stand to ruffed grouse increases as space between stems increases and the canopy grows higher overhead. The 13- to 25-year old aspen stands on the Cloquet area supported a breeding grouse per 3 acres in both 1970 and 1971.

But when the stand density thins below roughly 2,000 stems per acre, at about 25 years of age at Cloquet, long-occupied coverts rather abruptly become devoid of breeding ruffed grouse. However, it is at about this age that the aspen flower-buds commence being used as a winter-long food resource; and the

more open, park-like aspen stand appears to be the most secure nesting cover for ruffed grouse hens. Most hens select nesting sites where they can fly directly from the nest into the crowns of male aspen to feed upon the new-grown leaves (Barrett 1970, Kupa 1966, Schladweiler 1968).

Earliest Snow-cover Is Available In Aspen Stands

Depth of winter snow is an environmental factor of critical importance to ruffed grouse in northern Minnesota (Gullion 1970). Ruffed grouse survive the winter best when they can bury themselves in 8 or more inches of soft, powdery snow.

In northern Minnesota snow reaches satisfactory depths earliest in aspen and hardwood stands. During some winters snow depths under closed canopy conifer stands may never reach adequate depths, and the grouse depend all winter upon the snow accumulation in the hardwoods for adequate roosting snow.

Grouse, Aspen, and Forest Management

Combining what we know about ruffed grouse needs and behavior and the silvicultural requirements of the aspens (Graham *et al.* 1963), it appears that there are three important considerations in managing northern forests where ruffed grouse for recreational hunting is an important goal:

1. Aspen must be maintained in the forest composition;
2. Forest stands containing aspen must be clearcut when logged to preserve aspen clonal stock and to encourage high-density sucker regeneration; and
3. Cuttings must be small enough and spaced both in distance and years so that at least three age classes of aspen (preferably four) are available to grouse on each of the 10-acre breeding activity centers that appear to represent about the highest density grouse population (a bird per 5 acres) we can expect under most conditions.

This management of both aspen as a wood resource and ruffed grouse as a wildlife resource can best be achieved by clearcutting aspen on a 40- to 50-year rotation, cutting no more than 10 acres out of any 40 acres at one time, and spacing the logging at about 10-year intervals.

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