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# Deer Habitat Relationships in Central Wisconsin

By John F. Kubisiak and Robert E. Rolley

## Introduction

Current Department of Natural Resources forest habitat management guidelines for deer recommend that for a fall density of 30 or more deer/mile$^2$ no more than 25% of a forest planning area be in shade-tolerant types (northern hardwoods, mixed hardwoods, and balsam fir) and conifer plantations. However, these guidelines are based largely on northern Wisconsin studies and may not be applicable in the Central Forest Region where deer densities frequently exceed 40/mile$^2$. We conducted this study from 1985 to 1987 to relate deer habitat use to overstory and understory characteristics of forest stands and to provide information for revising current DNR forest management guidelines for public lands in central Wisconsin.

## Study Area and Methods

Research was conducted on portions of Black River State Forest and Jackson County Forest in eastern Jackson County. Eighty-three percent of the study area is commercial forest land, which includes 30% oak, 24% jack pine, 23% aspen-white birch, 9% red pine, and 9% white pine. Swamp conifers, mixed hardwoods, upland brush, and grass occupy the remaining commercial forest land. Nonforested wetlands, which include marsh, lowland brush, and water, occupy the remainder of the study area.

We assessed deer habitat use from trail counts each November from 1985 to 1987 on 200 0.25-mile randomly distributed transects (McCaffery 1976). Each transect comprised 5 contiguous 4-chain (264 ft) segments, which we categorized by principal overstory habitat types. Upland habitat types included open (grass-forb and upland brush); aspen (trembling and large-tooth aspen and white birch); oak (northern pin, black, or white oak most prevalent); jack pine; red pine; white pine; and mixed hardwoods (red maple, silver maple, American elm, and white ash). Lowland habitat types included swamp conifers (black spruce and tamarack) and marsh (bluejoint grass-sedge, willow, speckled alder, bog birch, and various species associated with muskeg).

We classified transect segments according to the presence or absence of understory woody cover and forage. Understory woody cover included saplings of overstory trees and various tall shrubs, primarily American hazelnut, gray dogwood, chokeberry, blackberry, and red raspberry. Forage included ground-layer perennial herbs and low growing shrubs; the principal species were blueberry, sweetfern, huckleberry, dewberry, and wintergreen. Because each transect could encompass several habitat types, we used the transect segment as the experimental unit.

We related deer habitat use (as indexed by the density of deer trails) to the characteristics of the overstory and understory habitat types. Kruskal-Wallis tests (Conover 1980) determined differences in the mean number of deer trails per segment among the principal overstory habitat types. The effects of understory cover and ground-layer forage within overstory types

were also analyzed with Kruskal-Wallis tests. In addition, we used correlation analyses to assess the relationship between the number of deer trails per transect and the percent of the transect overstory composed of red, white, or jack pine.

## Results

**Effect of Overstory:** The mean number of deer trails per segment differed among the 9 principal habitat types (Table 1). Highest deer use occurred in lowland and open habitats where ground-layer forage was often more abundant. Deer use was significantly greater in open, aspen, and jack pine than in white and red pine habitats, but was not significantly different in oak habitats than in red and white pine habitats.

Deer use declined as the proportion of transect segments classified as red pine increased, but deer use tended to increase as the proportion of transect segments classified as jack pine increased (Figure 1). Deer use did not change as the proportion of segments classified as white pine increased.

**Effect of Understory:** Deer use was significantly greater where understory cover was present in all upland habitats, except white pine (Figure 2). Generally, deer use was greater where deciduous saplings and tall shrubs were present in the understory of the upland habitats and to a lesser degree where pine saplings were present. Aspen and jack pine habitats with deciduous understories were the most preferred of the upland forested habitats in this study. Deer use of oak and red pine habitats was similar whether or not a deciduous or pine understory was present.

**Effect of Ground-Layer:** Deer use was significantly greater in jack pine, red pine, and open habitats where ground-layer forage was present than where forage was absent (Figure 3). Deer use was high in aspen habitats with or without ground-layer forage. Where ground-layer forage was absent, deer use was lower in red pine than in all other upland forested habitats.

Table 1. *Index of deer use of the principal overstory habitats.*

| Habitat Type | No. of Segments | Mean (± SE) Deer Trails/Segment |
|---|---|---|
| Swamp conifers | 72 | 1.81 ± 0.17 |
| Open | 92 | 1.62 ± 0.13 |
| Marsh | 62 | 1.40 ± 0.15 |
| Aspen | 495 | 1.21 ± 0.05 |
| Jack pine | 672 | 1.15 ± 0.04 |
| White pine | 293 | 0.91 ± 0.06 |
| Mixed hardwoods | 103 | 0.77 ± 0.09 |
| Oak | 833 | 0.69 ± 0.03 |
| Red pine | 378 | 0.58 ± 0.04 |

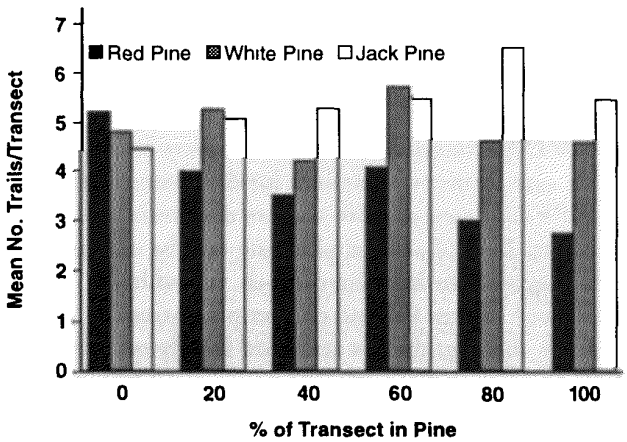


Figure 1. *Number of deer trails per transect versus percent of transect with pine overstory.*

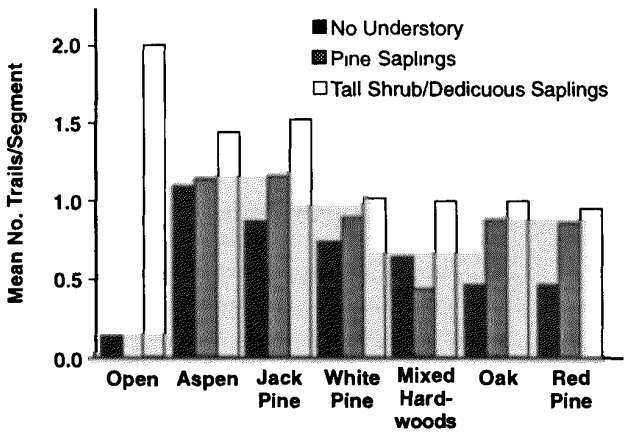


Figure 2. *Mean number of deer trails per transect segment in the principal upland habitats as influenced by understory characteristics.*

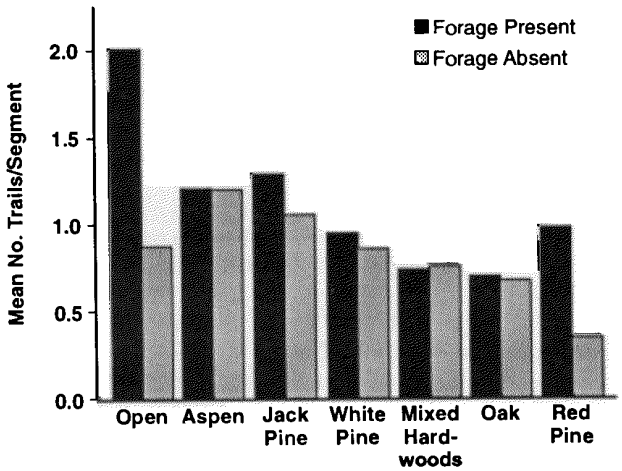


Figure 3. *Mean number of deer trails per transect segment in the principal upland habitats as influenced by the presence of ground-layer forage.*

## Discussion

Deer trails may persist longer in some habitats than in others, resulting in an overestimate of deer use in some habitats. In addition, deer trails may be easier to detect in some habitats. However, we do not believe these factors significantly biased our results. Deer populations remained relatively stable during the study, minimizing the effect of changing deer numbers on our results. The size and shape of habitat patches as well as their spatial relationship to each other may also affect deer use, but we did not assess these factors.

Aspen, jack pine, and open habitats were the most valuable upland habitats for deer in this study. These results largely corroborated earlier research. A study of deer density in central and northern Wisconsin from 1968 to 1973 found that the mean number of deer trails per segment was 1.34 in aspen compared to 1.14 in oak and jack pine and 0.90 in red and white pine habitats (primarily naturally regenerated stands) (McCaffery 1976). Kohn (1974), working in a major pinery of northwest Wisconsin, found 4 times as much deer activity in oak-aspen habitat as in red and jack pine plantations. Another Wisconsin study found that forest communities composed of aspen and jack pine provided excellent summer range for deer (Habeck and Curtis 1959). We do not fully understand the disparity between the low use of oak by deer in this study and the importance of oak in the previous studies.

## Management Recommendations

Converting aspen, jack pine, and open habitats to red or white pine plantations, without retaining understory and ground-layer plants important to deer, will reduce deer carrying capacity. If the goal is to maintain current deer population levels in the Central Forest Region, these habitats should be maintained where practical. Although oak was not highly used by deer in this study, based on other research we recommend that oak should also be maintained. In most years oaks provide fall and winter forage for deer and other wildlife with acorn production. Oak habitats will likely be reduced in the future due to oak wilt and gypsy moth infestations; some loss of aspen and jack pine may also occur because of insect infestation. Additionally, some aspen, oak, and jack pine habitats will likely be lost due to natural succession to red maple or white pine. Therefore, we recommend that forced conversion of aspen, oak, and jack pine to red or white pine be kept to a minimum and that desirable understory and ground-layer forage plants be encouraged.

While deer prefer jack pine, aspen, oak, and open habitats, red pine and white pine plantations can be managed to improve their suitability for deer. Deciduous understories and ground-layer forage plants within pine plantations should be maintained. Maintenance of small openings (≤1 acre) within larger plantations (>20 acres) will provide more diverse habitat for deer. The use of herbicides to control understory species in pine plantations should be minimized to enhance suitability for deer and other wildlife. Such management practices would partially offset the negative effect of converting preferred deer habitats to red and white pine plantations.

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