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Importance of habitat type classifications for predicting ruffed grouse use of areas for drumming

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ABSTRACT

To incorporate ruffed grouse (*Bonasa umbellus*) habitat planning in forest management, it is necessary for managers to understand factors contributing to grouse habitat use. Previous studies examining ruffed grouse drumming habitat documented relationships between drumming grouse and broad vegetation categories (e.g., northern hardwoods, young aspen [*Populus* spp.], oak [*Quercus* spp.]), but few studies have documented how drumming grouse respond to ecological variations in site conditions of aspen or other vegetation types that might be used. Our objectives were to determine the utility of habitat type classifications in predicting the occurrence of ruffed grouse drumming habitat in the western Upper Peninsula of Michigan, and demonstrate how classifications may be used to understand how forest management may affect ruffed grouse habitat. We used survey routes on state land and conducted drumming surveys during mid-April and early May at 78 points in 2005 and 2006. We recorded the number of drumming males heard at each point, the azimuth to where the grouse was heard, and a qualitative measure of distance to determine in which forest stands grouse were drumming. Using GIS, we determined the specific vegetation type, age class, and habitat type, evaluated habitat suitability, and determined a suitability score for areas in which grouse were drumming. We constructed a logistic regression model that calculated the probability of grouse use of areas for drumming based on vegetation characteristics at used and random locations. Our results indicated that the probability of grouse use of an area for drumming is based on inherent site characteristics (i.e., habitat type) and habitat suitability. The model is useful for planning forest management activities and understanding how grouse may respond to spatial or temporal changes in vegetation through succession or manipulation.

1. Introduction

Aspen is a valuable timber resource in Michigan and is important for providing wildlife habitat components. Specifically, ruffed grouse use of the aspen vegetation type for food, nesting, and drumming has been well documented in the literature (Bump et al., 1947; Svoboda and Gullion, 1972). As such, a forest management challenge is when and where to manipulate aspen stands or encourage the development of aspen to sustain timber benefits and habitat for grouse or other wildlife.

To incorporate ruffed grouse habitat considerations into forest management plans, it is necessary for managers to understand factors contributing to grouse production. State agencies (e.g., Michigan Department of Natural Resources [MDNR]) often use several tools to assess grouse population trends and potential productivity, such as spring drumming surveys. These surveys, however, do not document vegetation characteristics associated with locations of drumming grouse. This information may be critical for understanding how grouse are distributed throughout landscapes during the breeding season and may provide insights as to what ecological factors are contributing to the observed distribution.

Researchers in the Great Lake States (e.g., Gullion, 1977; Kubisiak et al., 1980; McCaffery et al., 1996) have documented higher densities of drumming grouse in 6–25 year-old aspen stands than in other vegetation types and age classes. Other studies have also reported grouse use of older (≥25 years) aspen and non-aspen (e.g., balsam fir [*Abies balsamea*], oak, alder [*Alnus* spp.]) vegetation types for drumming (Palmer, 1963; DeStefano and Rusch, 1984; McCaffery et al., 1996). In Michigan, Hammill and Moran (1986) observed drumming grouse in lowland conifer vegetation types. Most studies have documented relationships

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between drumming grouse and broad vegetation categories or cover types (e.g., northern hardwoods, young aspen, oak; Cade and Sousa, 1985; Fearer and Stauffer, 2004), but few studies have documented how ecological classification systems using biotic and biotic components (i.e., habitat types) may describe use by drumming grouse. Habitat types are geographic areas with similar ecological characteristics that support the same successional trajectory (Daubenmire, 1966). Habitat type classifications group communities and their environments into categories useful for management interpretation (Kotar and Burger, 2000). These classifications allow a better understanding of potential successional trajectories and the distribution of ecological communities that reflect inherent site capabilities, disturbance patterns, and potential response to management.

Aspen is an early successional vegetation type occurring in several different habitat types which are supported by soil types ranging from poorly-drained loams to well-drained sand (Coffman et al., 1980). The structure and composition of aspen varies within habitat type and provides different wildlife habitat components (Felix et al., 2007; Felix, 2008). For instance, aspen in habitat types characterized by dry sandy soils (e.g., Rubicon, Kalkaska series) may contain an oak or pine component whereas aspen stands in habitat types characterized by loamy soils (e.g., onaway series) may contain a significant maple component. Therefore, it is reasonable to expect that being able to classify areas by habitat type, as well as vegetation type (i.e., aspen or the current vegetation community), might be an effective way to predict grouse drumming habitat.

The utility of habitat type classifications for understanding wildlife habitat potential and population demographics has only recently been investigated as a tool to facilitate development of ecologically-based management plans and predict wildlife population response (Haufler et al., 1996; Roloff and Haufler, 1997; Felix et al., 2007). Habitat types may be used to predict wildlife distribution and habitat potential throughout space and time because they have unique and predictable ecological characteristics and successional trajectories (Kotar and Burger, 2000). To design long-term sustainable timber harvest plans that benefit ruffed grouse, it may be beneficial to use habitat type classifications in conjunction with drumming surveys to assess grouse use of aspen and other vegetation types in different habitat types and age classes. Such information may provide insights for understanding landscape-level characteristics affecting grouse drumming distributions, and identifying specific habitat types, and successional stages within them that may be valuable in influencing grouse productivity. Specifically, understanding grouse use of vegetation within different habitat types and seral stages may indicate how drumming habitat availability might change with proportional changes in availability of vegetation in different habitat types or age classes from timber harvesting or succession. Therefore, our objectives were to determine the utility of habitat types in predicting the occurrence of ruffed grouse drumming habitat, and demonstrate how habitat type classifications may be used to facilitate development of ruffed grouse management plans.

2. Study area

Our study area was approximately 800 km^2 and located in the western Upper Peninsula (UP) of Michigan, which included parts of Dickinson and Marquette counties. Sites selected for assessment were located within the Escanaba River State Forest and the Copper Country State Forest. These areas are managed for timber production and wildlife habitat. This region of Michigan accumulated 93 cm of precipitation annually and averaged 4.2 °C (National Weather Service, http://www.crh.noaa.gov/mqt/normals/marquette.php). Soils in the western UP were dominantly spodosols and bedrock rich in iron.

Well-drained sands and loams typically support hardwood forests dominated by maple (*Acer* spp.) in climax stages. Spruce (*Picea* spp.) and balsam fir occurred frequently as components of hardwoods growing on sandy soils. Other sub-dominant species in hardwoods on loamy soils included basswood (*Tilia americana*), ironwood (*Carpinus caroliniana*), or American elm (*Ulmus americana*). Dry, sandy soils support oak, white pine (*Pinus strobus*), and red pine (*Pinus resinosa*). Poorly-drained areas were interspersed throughout the region and were typically dominated by northern-white cedar (*Thuja occidentalis*), spruce, fir, and tamarack (*Larix laricina*; Albert et al., 1986). Early successional and aspen-dominated forests were also interspersed throughout much of the area (Sommers, 1977).

3. Methods

3.1. Habitat type classification

We spatially delineated boundaries of 10 habitat types as defined by a habitat type classification guide by Coffman et al. (1980) (Fig. 1) using ArcGIS 9.2. Each habitat type was characterized by soil moisture and texture, landform (e.g., outwash plain, moraine), and ecoregion data acquired from the MDNR. Boundaries of habitat types were validated with spatial information (IFMAP; Integrated Forest Monitoring and Assessment Prescription; MDNR, 2003), and 70 random points ground-truthed during a summer field season in 2004. For validation, we ensured that the overstory vegetation and herbaceous layer in our defined habitat type boundaries corresponded with the Coffman et al. (1980) classification.

Habitat types were named according to the typical dominant overstory and understory species in the climax stage that occurred on various soil types (Coffman et al., 1980). Habitat types characterized by xeric, excessively-drained sandy soils included: *Pinus-Vaccinium*-spp. (PV; pine-blueberry), *Quercus-Acer-Epigaea* (QAE; oak-maple-trailing arbutus), and *Acer-Quercus-Vaccinium* (AQV; maple-oak-blueberry). Mesic habitat types characterized by well-drained soils included: *Acer-Tsuga-Maianthemum* (ATM; maple-hemlock-wild lily-of-the-valley), *Acer-Tsuga-Drypoteris* (ATD; maple-hemlock-spinulose shield fern), *Acer-Viola-Osmorhiza* (AVO; maple-violet spp.-sweet cicely), and *Acer-Osmorhiza-Caulophyllum* (AOC; maple-sweet cicely-blue cohosh) habitat types.

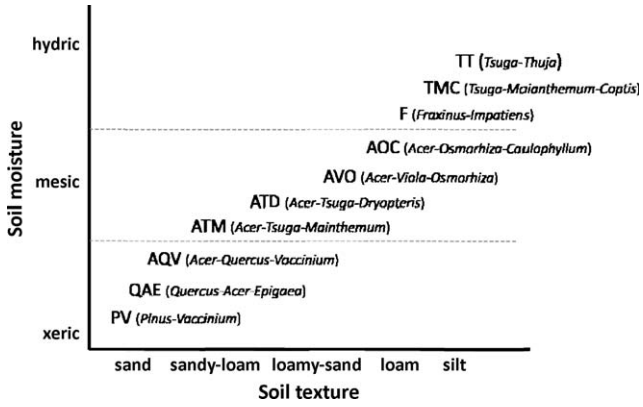

Fig. 1. Relative soil moisture and texture characteristics of habitat types occurring in a 800 km^2 area in the western Upper Peninsula of Michigan. Habitat types are based on a classification by Coffman et al. (1980). Habitat types are named by dominant overstory and understory species with the strongest tendency to dominate the community in the absence of disturbance. All habitat types are capable of supporting aspen in early successional stages.