

Species: Northern Metalmark (*Calephelis borealis*)  
Global Rank: G3G4  
State Rank: S2  
State Wildlife Action Plan: Immediate Concern Species  
Climate Change Vulnerability: Moderately Vulnerable  
Confidence: Moderate

Habitat (adapted from NatureServe 2008):

The northern metalmark and its larval host plant, the roundleaf ragwort (*Packera obovata*), have specific habitat requirements. In Pennsylvania, the butterfly is closely associated with limestone and shale barrens habitats. Sites tend to have close access to water from sources such as streams, and adults prefer to nectar on a variety of flowers.

Current Threats (adapted from NatureServe 2008):

Habitat loss is the most serious threat to the northern metalmark in Pennsylvania. Current records are mostly found along the Appalachian ridges. Historical records from the eastern part of the state are from sites that have been lost to development. Spraying for gypsy moth control is another threat. Northern metalmark caterpillars overwinter after their first summer then resume feeding the following April at the time spraying for gypsy moth takes place. Loss of the host plant due to displacement by exotic plants and excessive deer browsing can negatively impact northern metalmark populations.

Main factors Contributing to Vulnerability:

The main factors contributing to climate change vulnerability of the northern metalmark are changes in the amount and seasonality of soil moisture, the physical habitat specificity of the species, dependence on one host plant during the larval stage, small habitat and population sizes, and the relatively sedentary nature of adults. The region of Pennsylvania where the northern metalmark occurs (currently and historically) has experienced slightly lower than average precipitation variation in the past 50 years, making populations somewhat vulnerable to future changes in precipitation. The impacts from development of alternative energy sources and microhabitat changes in seasonal soil moisture levels and temperatures are expected to be especially important for northern metalmark caterpillars, pupae, and the round-leaved ragwort host plant.

The impacts of climate change on northern metalmark microhabitat (positive, negative, or neutral) cannot be predicted at this time without more data on microhabitat requirements of the species. Increased summer soil droughts are predicted by climate models, and could lead to an increase in the amount and severity of forest fires (Shortle et al. 2009). Forest fires could create new habitat and reset succession, which could benefit the species. However, known extant habitats in Pennsylvania are shale barrens and openings, which do not require disturbance for maintenance, and burning of small shale barrens habitats could extirpate local populations.

This species appears to be adapted to warmer microhabitats, but details on the optimal range and seasonality of soil temperature and moisture for the development of overwintering larvae and pupae are unknown. Northern metalmark caterpillars overwinter by hibernating in plant duff at the base of the host plant until spring. Soil moisture is also important for the caterpillar food plant. Roundleaf ragwort is found in moist fields, woods, and calcareous slopes (Rhoads and Block 2000). It prefers soils in the mid-moisture range, and does not tolerate extremely dry or extremely wet conditions (Landis and Fiedler 2006).

Infrastructure development supporting alternate energy sources such as wind energy and natural gas are likely to create many acres of disturbed land in forested habitats. Under certain conditions of soil, bedrock, moisture, and aspect, and with proper type and timing of vegetation management, these disturbed lands could become potential habitat for northern metalmark. Northern metalmarks could be encouraged with plantings of roundleaf ragwort and other native nectar plants. Right-of-way corridors could then play an important role in providing habitat and promoting species dispersal.

These developments would require considerable investment in planning and resources to maximize the potential benefit for this species. Therefore, the impacts of predicted land use changes could range from somewhat decreasing to somewhat increasing vulnerability. Infrastructure development could easily have negative impacts as well. Broadcast herbiciding of rights-of-ways would eliminate their usefulness as habitat corridors. Undocumented populations and currently unoccupied (but ultimately recolonizable) habitat could be inadvertently destroyed in right-of-way development. Pre-development surveys for potential habitat would be needed to avoid destruction of occupied or potentially occupied habitats.

*Dispersal and movements:* Northern metalmark populations are small and very localized in Pennsylvania. Adults are slow and weak fliers (Allen 1997) and are occasionally encountered only within their preferred habitats. Metapopulation dynamics are very important for long term survival of this species in a locale. Multiple small populations scattered across a landscape with corridors of wetlands, forests, streams, and even right-of-ways will help maintain this species into the future, allowing individuals to travel between occupied habitats and colonize new areas (NatureServe 2008).

#### References:

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