

Species: West Virginia White (*Pieris virginiensis*)
Global Rank: G3?
State Rank: S2S3
State Wildlife Action Plan: Immediate Concern Species
Climate Change Vulnerability: Highly Vulnerable
Confidence: Very High

Habitat:

The West Virginia white is a weak-flying woodland butterfly seen in the springtime in moist, rich, shady woodlands and floodplains. Caterpillars feed on toothworts such as *Cardamine diphylla* and *C. concatenata*. Preferred nectar sources include spring beauty, toothwort, stonecrop, and violets (Allen 1997). This species needs relatively intact forests with a minimum amount of fragmenting features.

Current Threats:

The invasive garlic mustard (*Alliaria petiolata*) is spreading into areas once occupied by the native toothworts. West Virginia whites will lay their eggs on garlic mustard which is in the same family as the toothworts; however, the garlic mustard is toxic to the caterpillars (NatureServe 2008). Removal of garlic mustard from woods with this butterfly or large toothwort populations is highly recommended. Deer contribute to the spread of garlic mustard as they prefer to browse on native plants but not on the introduced garlic mustard. High deer densities also reduce the abundance and diversity of wildflowers, which can leave West Virginia whites without a steady supply of adult nectar food and caterpillar food plants.

Forest fragmentation degrades habitat for many forest species, but it is especially detrimental to West Virginia whites because it creates a host of problems. Development and timbering encourage the spread of garlic mustard by disturbing soils. Forest fragmentation may also encourage the penetration of forest habitats by the much more common cabbage white (*Pieris rapae*). The cabbage white prefers edge habitats to woodland interiors, and fragmentation increases edge habitat within forested sites. This increases the contact between West Virginia whites and cabbage whites. Cabbage whites carry parasites which can be spread to West Virginia white populations. West Virginia whites are reluctant to cross large forest openings or colonize new areas (Cappuccino and Kreiva 1985; Allen 1997; Finnell and Lehn 2007; NatureServe 2008). Because the butterfly avoids any open areas, a road with open canopy through the forest can be a barrier to dispersal. Other barriers include uncanopied streams and rivers, power lines, and unshaded fields. Habitat fragmentation prevents existing populations from spreading to new sites, or re-colonizing habitat previously occupied by the butterfly.

Main factors Contributing to Vulnerability:

The main factors contributing to climate change vulnerability are large scale changes in the amount and seasonality of soil moisture, the West Virginia white's association with cooler and higher altitude sites in the commonwealth, and its dependence upon a few host plants during the larval stage. Mitigating factors include the ability of adults to disperse relatively easily through suitable habitat, though many anthropogenic disturbances, including a wide variety of openings such as roads, developments, and fields, form barriers to dispersal. This species is not restricted to highly specialized habitats.

Increased summer soil droughts are predicted for Pennsylvania by climate models, and could lead to an increase in the amount and severity of forest fires (Shortle et al. 2009). West Virginia whites utilize woodland habitats that do not need disturbance to remain suitable. The widespread burning of habitats could be devastating to local populations.

The impacts from development of alternative energy sources are expected to be especially important particularly as it relates to population dynamics. Right-of-way infrastructure supporting alternate energy sources such as wind energy and natural gas are expected to further fragment many acres of land in forested habitats. West Virginia whites occur in fairly undisturbed habitats that support good populations of the food plant, and not every colony of toothwort supports the species. Other factors that affect the distribution of this moth, and metapopulation dynamics are likely a component. This species needs relatively intact forests with a minimum amount of fragmenting features such as clear-cuts, roads, and other rights-of-ways with open canopies overhead.

Dispersal and movements: West Virginia whites are not strong fliers, but within extensive, contiguous, suitable forest with the food plant, they can be expected to move several kilometers or more. This is assuming the habitat is not fragmented by unshaded paved roads, powerlines, rivers, unshaded streams, etc. (NatureServe 2008). Therefore this species ranks as 'somewhat less vulnerable' under the 'dispersal and movements' question in the CCVI.

However, since individual butterflies are confined to their wooded habitats and will not fly out from underneath the canopy, dispersal rates are typically very weak (Finnell and Lehn 2007). This aspect of the butterflies' vulnerability is captured under the 'anthropogenic barriers' and 'predicted impact of land use changes resulting from human responses to climate change' questions of the CCVI.

References:

Allen, T. 1997. *The Butterflies of West Virginia and Their Caterpillars*. University of Pittsburgh Press, Pittsburgh.

Cappuccino, N. and P. Kareiva. 1985. Coping with a capricious environment: a population study of a rare Pierid butterfly. *Ecology* 66: 152-161.

Finnell, A. and C. Lehn. 2007. West Virginia White (*Pieris virginiensis*) Conservation Plan Version 1.0. Biodiversity Alliance 14 pp.

NatureServe. 2008. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.0. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: July 17, 2008).

Shortle, J.S., D. Abler, S. Blumsack, R. Crane, Z. Kaufman, M. McDill, R. Najjar, R. Ready, T. Wagener, and D. Wardrop. 2009. Pennsylvania Climate Impact Assessment: Report to the Department of Environmental Protection. Report number 7000-BK-DEP4252. Prepared by the Environment and Natural Resources Institute, The Pennsylvania State University.