

Patuxent Wildlife Research Center

Predicting risk of declines, endangerment or extinction of amphibians under Marcellus shale development activities



Range of *Plethodon wehrlei*, from IUCN

The Challenge: Although Marcellus shale development is an important energy resource, concerns have been raised about potential impacts on natural resources, wildlife, and human and animal health. Unfortunately, a lack of baseline data hampers efforts to quantify ecological risk and forecast ecological impacts of the rapid expansion of Marcellus extraction-related activities. A taxonomic group of significant concern in this context is the plethodontid salamanders (family Plethodontidae), several species of which have ranges corresponding closely to the Marcellus shale play. Most of these species are classified as 'globally secure', primarily because much of their ranges include state- and federally protected lands, which have been presumed to be free from habitat conversion, a primary concern for population declines. However, the proposed and ongoing development of the Marcellus gas resources, particularly on state and federal lands, may result in significant range restrictions for these and other terrestrial salamanders.



Photo By Brian Gratwicke

Plethodon richmondi

The Science: To begin to address the gaps in our knowledge of the impacts of shale gas development on forest-dependent terrestrial salamanders in the eastern U.S., we use existing occurrence records for five terrestrial plethodontid salamander species to quantify potential habitat loss that may occur as a result of Marcellus shale gas extraction activities. We also examine two scenarios for future gas extraction development to offer insight on further impacts. Despite the uncertainties inherent in this analysis, we use conservative estimates of range, habitat specificity, and well development, and find a potential impact of Marcellus shale gas extraction activities on populations of five forest-dependent terrestrial salamander species. Though most of these species are not afforded protection and have not been considered at risk of population decline, the pace and scale of energy development may require re-assessment of the extinction risk to these species.



Photo By CalPhoto (copyright John P. Clare).

Plethodon electromorphus

The Future: Short-term research needs include: (1) identify those amphibian species at greatest risk due to gas extraction practices, (2) evaluate sensitivity and potential population-level effects of stressors associated with the gas extraction process to these species across all life history stages, and (3) quantify amount of habitat loss or alteration for forest-dependent terrestrial salamanders. Long-term needs include predicting (1) broad scale changes in population distribution and abundance related to gas extraction activities, (2) the interaction between land use changes associated with gas extraction and climate change, and the population-level effects on vulnerable amphibian species, and (3) identifying potential management actions or best management practices which might reduce or negate any effects of gas extraction on amphibian and reptile populations.