

Species: Cobblestone Tiger Beetle (*Cicindela marginipennis*)  
Global Rank: G2  
State Rank: S1  
State Wildlife Action Plan: Immediate Concern Species  
Climate Change Vulnerability: Moderately Vulnerable  
Confidence: High

Habitat:

Cobblestone tiger beetles are found on the edges and islands of small to medium sized rivers with swift flowing water. They are restricted to scour areas along these rivers where the substrate is comprised of wet pebbles, cobblestone sand, and sparse vegetation. The larvae dig burrows in pockets of wet sand found interspersed among cobblestones (Pearson et al. 2006).

Distribution of this species is limited to the eastern United States and southeastern Canada. In Pennsylvania, this tiger beetle is known historically from three large river systems in the eastern portion of the state. Recent data is lacking for Pennsylvania, but there is suitable habitat in the upper Susquehanna and Delaware rivers that merit surveys for cobblestone tiger beetles.

Current Threats:

The most significant threats to the cobblestone tiger beetle are alteration and destruction of habitat from impoundments and other alterations of stream channels such as channelization, water quality degradation (primarily from urbanization, agriculture, pesticides and other chemicals), and loss of riparian forests.

Main factors Contributing to Vulnerability:

The cobblestone tiger beetle is a terrestrial beetle specializing in river scour habitats. Species vulnerability to climate change is linked to factors expected to change natural stream hydrology and disturbance regimes. Regions of Pennsylvania where the cobblestone tiger beetle occurred historically have experienced average precipitation variation in the past 50 years. Therefore, populations are not expected to be extremely adapted or maladapted to changes in precipitation patterns. Shifts in precipitation patterns are expected to create higher winter and spring flows, and more frequent and severe floods (Shortle et al. 2009). This could be particularly problematic for the air-breathing larvae living in burrows at the edges of a river floodplain. However, these events can also create new habitat. According to NatureServe (2008), as with other tiger beetles, survival may be substantial if inundation is only for a few days and the habitat is not physically demolished. Long term inundation would eradicate an occurrence. Floods surely kill a lot of individuals but occurrences generally survive them. However, this could be jeopardized by either low areas of occupancy or small numbers. Acciavatti et al. (1992) reported an instance where this species survived, and may have benefited from, a devastating flood. Thus, flooding of known sites should not be assumed to eradicate

them. A mitigating factor is the ability of adults to disperse relatively easily along stream corridors to colonize newly created habitat.

Whether or not there will be suitable habitat nearby to be colonized is a pertinent question. Many populations have become isolated because of historical loss of habitat due to dam construction. Cobblestone tiger beetle populations once known from the southern Susquehanna and Schuylkill river systems may have been extirpated due to construction of dams. Climate change may increase incentives to build/enlarge dams for hydroelectric power or water storage. It is not clear how much additional dam development would occur on stream reaches historically supporting populations of cobblestone tiger beetles. Therefore the predicted impact of land use changes resulting from human responses to climate change was ranked as 'neutral to somewhat increasing' vulnerability.

Tiger beetles are adapted to specific thermal and hydrological conditions, therefore, changes in these conditions are likely to impact basic tiger beetle biology (Pearson and Vogler 2001). Climate change will likely alter the seasonality and range of moisture and temperatures experienced by this species, but more research is needed to determine whether the effects would be generally positive, negative, or neutral.

An additional global climate change related threat is natural gas extraction and its associated impacts on forest integrity and water quality, and its potential impacts on climate change itself.

Some of the current and projected threats could be mitigated with removal of dams where they are not critical to energy production, water storage, or protection of infrastructure. Protection and expansion of riparian buffers around medium to large streams and rivers is critical, and should include protection from off-road vehicle use.

*Dispersal and movements:* The cobblestone tiger beetle was historically known from a few locations on occupied streams. The species likely moved along a stream or river system to find suitable river scour habitats as they formed after floods.

#### References:

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