

Species: Green-faced Clubtail (*Gomphus viridifrons*)

Global Rank: G3G4

State Rank: S1

State Wildlife Action Plan: Immediate Concern Responsibility Species

Climate Change Vulnerability: Highly Vulnerable

Confidence: Very High

Habitat:

The Green-faced Clubtail dragonfly is found in clean streams in a forested landscape. These streams are typically highly oxygenated, small to large in size, with a moderate-gradient, and substrate of gravel-sand and lightly silted rocks (Dunkle 2000, NatureServe 2008). NatureServe (2008) reports that the species is relatively widespread, but very localized, fragmented, and requires very good water quality. In Pennsylvania nymphs have been collected from slow to swift flowing waters, 3 to 25 cm in depth, in sand/detritus/gravel substrates (Evans 2002). Adults have a short flight period and are active almost exclusively over water or up in the trees where they hunt insects, therefore this species can be easily overlooked and is difficult to collect. More surveys are needed to determine the range and microhabitat preferences for this species in Pennsylvania.

Gomphus viridifrons was thought to be gone from the state because for nearly 100 years there were no new records. Then in the early 1990s large numbers of *Gomphus viridifrons* were rediscovered on the Clarion River and several new records followed at other sites. These unexpectedly large populations localized in Pennsylvania justify making this species a responsibility species (Rawlins 2007).

Threats:

The most significant threats to this species are: alteration and destruction of habitat from impoundments, channelization, sedimentation, and other alterations of stream channels; water quality degradation from urbanization, acid mine drainage, agriculture, pesticides and other chemicals; spread of invasive aquatic species; fragmentation of forests around headwater streams; loss of riparian forest; direct mortality from vehicle collisions where roads intersect habitat.

Main factors Contributing to Vulnerability Rank:

Throughout its range *Gomphus viridifrons* appears to be limited to waterways with high water quality (NatureServe 2008). Climate change vulnerability for the Green-faced Clubtail is linked to factors expected to impact water quality and hydrology. These factors are expected to be important for many other clubtail dragonflies (family Gomphidae) of high quality stream and river habitats. Regions of Pennsylvania where *Gomphus viridifrons* occurs have experienced slightly lower than average precipitation variation in the past 50 years, making populations somewhat vulnerable to future changes in precipitation. Pennsylvania is expected to have higher winter and spring stream flows, but lower summer and fall flows. Changes in the timing of peak spring flows, higher

temperatures and lower flows in the summer and fall, and changes in stream channels due to more severe precipitation and flooding events are expected to negatively impact aquatic ecosystems (Shortle et al. 2009). Larvae utilize specific microhabitats within a stream as they develop over two or more years and shifts in the hydrologic regime could be problematic. A mitigating factor is the ability of adults to disperse relatively easily along stream corridors to colonize new habitats.

Other global climate change related threats include: construction of dams on small to large moderate gradient streams and rivers for hydroelectricity, flood control, or water storage; natural gas extraction and its associated impacts on forest integrity and water quality; warmer air temperatures and reduced watershed forest cover leading to increased water temperatures and lower dissolved oxygen levels; facilitated spread of invasive aquatic species due to milder winters and warmer waters.

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 occupied high quality streams and their headwaters is critical for this species. Increasing percent forest cover in occupied watersheds could be used towards carbon offsets while improving water quality for this species. Long term monitoring of water quality and hydrologic regime on occupied reaches of streams could provide important insight into habitat requirements and limits, combined with information on population stability or decline.

Migration and Movements: This species does not exhibit migratory behavior, however it is a relatively strong flier and should be capable of dispersing several kilometers in a day along stream corridors. River currents can also carry eggs or young larvae downstream, potentially dispersing them to suitable unoccupied habitat.

Literature Cited:

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