

***Capnia arapahoe* (Nelson and Kondratieff 1988)**
Arapahoe snowfly
Plecoptera: Capniidae

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SUMMARY

Capnia arapahoe is a small winter stonefly known from only two locations in Laramie County in north-central Colorado. It inhabits reaches of two small cool streams that are tributaries to the Cache la Poudre River. Young larvae undergo a period of inactivity (diapause) during the warm months, complete development during late fall and early winter, and the dark-colored adults emerge in late winter or early spring. This species' limited habitat is threatened with degradation and destruction from extensive recreational use and increasing development pressures in the two streams from which it is known. Research should focus on assessing and strengthening current management practices for existing habitat and evaluating the population size, distribution, and stability.

CONSERVATION STATUS

Rankings:

Canada – Species at Risk Act: N/A

Canada – provincial status: N/A

Mexico: N/A

USA – Endangered Species Act: N/A

USA – state status: Colorado S1 Critically imperiled

NatureServe: G1 Critically imperiled

IUCN Red List: N/A

SPECIES PROFILE

DESCRIPTION

Capnia arapahoe is a small, dark-bodied stonefly in the family Capniidae (small winter stoneflies). Adult males have a slender epiproct (intromittent organ at the end of the abdomen) with horns on the tip; the epiproct is about 7 times as long as it is wide when viewed dorsally (from above). Adults also have a distinct knob on tergum (dorsal or top portion) of the 7th abdominal segment.

Nymphs have only been described for a few of the North American species in this genus, but *Capnia* nymphs differ from other Capniidae in having notches halfway along the inner margins of the hind wingpads, and they lack the deep serrations at the base of the ventral tooth of the right mandible seen in other genera in this family (Stewart & Stark, 2002).

TAXONOMIC STATUS

Capnia arapahoe Nelson and Kondratieff 1988. The taxonomic status of this species is accepted as valid.

LIFE HISTORY

The life history and ecology of many species in the genus *Capnia* are poorly known, due to the difficulties inherent in sampling for nymphs under ice in winter, and difficulties in distinguishing between *Capnia* nymphs of different species. Species within this genus are more commonly found in small streams. As the common name suggests, many adults in this genus emerge in late winter or early spring, and their dark-colored bodies can be easily visible as they crawl across the snow. Species in this family require cool temperatures for development. Young nymphs hatch in early spring; as the water temperatures rise they move into the hyporheic zone (a zone of loose rocky substrate under the stream saturated with water) and undergo diapause, becoming inactive until the water cools in late fall and winter, at time they feed and grow rapidly to maturity. *Capnia arapahoe* adults have been collected in late March and early April (Nelson & Kondratieff 1988). Specific feeding behavior of *C. arapahoe* nymphs has not been observed, but most species in this family feed by shredding detritus, and active nymphs are generally found in leaf packs or woody debris (Merritt *et al.* 2008). Species in this family are usually univoltine (one generation per year).

DISTRIBUTION

Capnia arapahoe is found only in Larimer County in north-central Colorado, and is restricted to Elkhorn Creek and Young Gulch, small streams with pebble, cobble, and bedrock substrate that are tributaries to the Cache la Poudre River. The upper reaches have steep slopes and canyons with sparse riparian vegetation dominated by ponderosa pine, and the lower reaches near the confluence with the Cache la Poudre are more open with a riparian border of cottonwood, willows, and alder.

The species was first collected at Elkhorn Creek, 22 miles west of Fort Collins, at an elevation of 2012 m (6600 ft). It was also found at Young Gulch above Ansel Watrous Campground in the Poudre Park area at an elevation of 1768 m (5800 ft) (Nelson & Kondratieff 1988).

THREATS

Capnia arapahoe is a rare endemic species with restricted habitat, limited populations, and unknown dispersal ability. This species is known from only one county in north-central Colorado, where it is restricted to two small tributaries of the Cache La Poudre River (Elkhorn Creek and Young Gulch). A small lake has been constructed in the headwaters of one, and the other is subject to extensive recreational use. This area is extremely popular for hiking, camping, mountain biking and paddling. Young Gulch Trail, which has heavy traffic from hikers and mountain bikers and allows off-leash dogs, crosses the stream multiple (>20) times, so excessive traffic, stream bed trampling, and pet waste may have an impact on water quality. Numerous visits to the Young Gulch locality since this species was discovered have failed to yield additional specimens of *C. arapahoe* (Nelson and Kondratieff 1988; Doyle *et al.* 2004).

The Colorado Natural Heritage Program has proposed about 5000 acres (2015 ha) along Young Gulch and Elkhorn Creek as a Potential Conservation Area (PCA) of outstanding biodiversity

significance (B1), based on the importance of those sites as the only known locations of *C. arapahoe* (Doyle *et al.* 2004). Another rare stonefly species, *Suwallia wardi*, has been found in the same area on a tributary of Elkhorn Creek (Ben Delatour Boy Scout Ranch). About half the land in this PCA region is owned by the U.S. Forest Service; the remaining half is privately owned and under strong development pressure, which could increase the rate of habitat degradation and loss for this species. Water diversions from development could result in creek dewatering or changes in seasonal flows; this is of particular concern as *C. arapahoe* relies on winter flow to complete its life cycle. Sedimentation from increased development in the area (i.e. erosion and runoff from construction, roads, impervious surfaces) could lower water quality and clog the spaces in the hyporheic zone where young larvae diapause during warm weather, increasing larval mortality.

Additional potential threats such as the effects of disease and predation have not been assessed. However, such small isolated populations are extremely vulnerable to stochastic events, and are generally at greater risk of extirpation from normal population fluctuations due to predation, disease, and changing food supply, as well as from natural disasters such as floods or droughts. They may also experience a loss of genetic variability and reduced fitness due to the unavoidable inbreeding that occurs in such small populations.

CONSERVATION STATUS

Capnia arapahoe currently receives no federal protection. It is considered a Tier 2 Species of Greatest Conservation Need by the Colorado Natural Heritage Program, and was one of 42 Colorado species included in a 2007 petition for listing made by the Forest Guardians to the U.S. Fish and Wildlife Service.

CONSERVATION NEEDS

The population status and trends for *C. arapahoe* was listed as “unknown as of March 2005” in the Colorado Comprehensive Wildlife Conservation Strategy (2006). Additional surveys to establish these parameters would be beneficial. Necessary actions include monitoring known populations and searching for new ones, and protecting habitat in regions where the species is known to occur.

RESEARCH NEEDS

Little is known about the biology of this species. Research into life history and effective habitat management strategies in the area would be valuable.

RESOURCES

CONTACTS

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