Temperature and Plains Sucker System Capacity

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Species Information

Common Name: Plains Sucker
Genus: Pantosteus jordani

Stressor Details

Stressor Name: Temperature
Units: °C
Metric: Mean August Stream Temperature
Scale: linear
Function Type: continuous
Vital Rate/Process: Occupancy (transformed to survival)

Life Stage & Context

Life Stages: Adults
Geography: Saskatchewan
Activity: All activities
Season: August

Descriptions

Overview

> This temperature SR curve defines the relationship between maximum annual stream temperature (MAST; °C) and percent system capacity. Stream temperatures are highly variable within and among watersheds and streams, with maximum temperatures ranging from 10.15°C-39.74°C in the Milk River drainage (usually in August or September; unpublished data). Lethal maximum temperatures in laboratory experiments can get up to 34°C [Schultz and Bertrand 2011]) and experimental agitation temperatures ranged from 9.17°C-31.16°C, though tolerance was influenced by body size (fish were from the Milk River drainage; unpublished data). Therefore, this SR function was derived using a combination of available field and experimental data. Maximum stream temperature was used for this SR function because we had data on upper thermal limits (agitation temperature) for Plains Sucker; however, it should be noted that this temperature SR function could be adjusted to represent the mean annual stream temperature as the independent variable but the stressor magnitude data must be also reported as mean annual stream temperature.

Function Derivation

> Based on data from Plains Sucker; Landscape correlation; Unpublished; manipulation; Expert opinion

Transferability of Function

> This stressor-response function is suitable for use on Plains Sucker populations in the Saskatchewan-Nelson and Missouri River drainages in Southern Alberta and Saskatchewan. It should be noted that the thermal tolerance literature tends to assume different populations of the same species have similar physiological thresholds to temperature (Hasnain et al. 2010); however, this assumption hasn't been specifically studied for Plains Sucker. Similarly, it may be reasonable to assume that the SR function can be applied to Cordilleran Sucker, given the similarity of their physical characteristics (prior to 2023 both species were classified under a single species, Mountain Sucker); however, there is no data to confirm this assumption. Further, Plains Sucker from the Black Hills reportedly have an upper thermal tolerance of 32.9°C-34°C (Schultz and Bertrand 2011), which is within the range reported for other catostomid species (30.7°C-37.2°C, Hasnain et al.

2010). However, given the range of preferred temperatures, caution should be taken when using this function on other catostomids, and it might be more advisable to gauge transferability based on thermal guild (e.g. temperature stressor-response functions for other cool-water species) rather than family.

Source of Stressor Data

Practical application of the SR function necessitates that users obtain estimates of stressor magnitude (level) in the target system. We have data for stream temperature for XX sites within the Milk River drainage; however, these data are not yet published.

Citations

Jarvis, L. 2022. Temperature stressor-response function for Plains Sucker. Department of Fisheries and Oceans CEMPRA model for Plains Sucker.

Jarvis, L. 2022. Cumulative Effects Model for Prioritizing Recovery Actions (CEMPRA): Plains Sucker case study.

Schultz, L.D. and K.N. Bertrand. 2011. An assessment of the lethal thermal maxima for Mountain Sucker. Western North American Naturalist 71(3).