Sullivan 2000: Coho Growth and Stream Temperature

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Species Information

Common Name: Coho Salon
Genus: Oncorhynchus kisutch

Stressor Details

Stressor Name: Stream Temperature
Units: °C
Metric: 7-DAM (MWMT)
Scale: linear
Function Type: continuous
Vital Rate/Process: Growth and Survivorship

Life Stage & Context

Life Stages: Fry, Juvenile, Parr
Geography: Species-wide
Activity: Rearing
Season: Summer

Descriptions

Overview

> Based on the Sullivan et al. (2000) report, the authors conclude that upper temperature thresholds should be based on a risk assessment of growth loss rather than just lethal limits. Sullivan et al. (2000) determined that to minimize growth loss to no more than 10% of the maximum potential, specific temperature caps are required. They concluded that 16.5°C is the appropriate upper threshold for the 7-day maximum temperature (often referred to as the Maximum Weekly Maximum Temperature or MWMT) for Coho Salmon. If using the 7-day mean temperature (MWAT) instead of the maximum, the report suggests a threshold of 14.8°C to maintain growth within 10% of the optimum.
>
> The authors also analyzed acute lethality (direct mortality) based on the annual instantaneous maximum temperature. They suggest a threshold of 26°C (annual maximum) to prevent direct mortality. The analysis found that while temperatures between 24°C and 26°C can be lethal if exposure is prolonged, natural fluctuation patterns in the Pacific Northwest generally prevent the duration of exposure required to kill fish at these temperatures. Therefore, direct mortality is considered unlikely if the annual maximum remains below 24°C.
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> 7-day average of the daily maximum temperatures (7-DAM), often referred to as the maximum weekly max temp (MWMT); or the 7-day rolling average of daily maximum temperatures. 7-day mean or MWAT generally refers to the average daily mean temperatures.
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> The authors concluded that various temperature indices (Annual Maximum, 7-day Maximum, and 7-day Mean) are closely correlated with one another. Therefore, any of these metrics can be used effectively to set criteria, provided the specific threshold value is adjusted to match the metric used

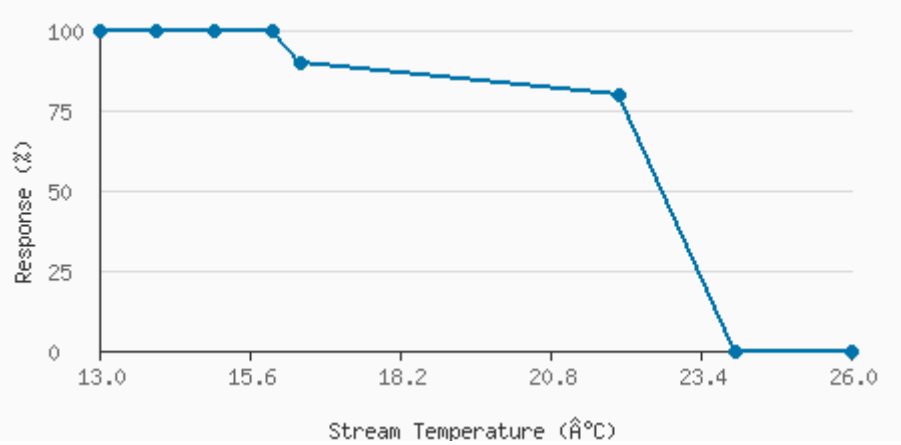
Function Derivation

> Lab studies

Transferability of Function

> Generalizable species-wide coarse estimates.

Stressor Response Data



7-DAM	Scaled Response Values 0 to 100	SD	low.limit	up.limit
13	100	0	0	100
14	100	0	0	100
15	100	0	0	100
16	100	0	0	100
16.5	90	0	0	100
22	80	0	0	100
24	0	0	0	0
26	0	0	0	0

Citations

Sullivan, K., D. J. Martin, R. D. Carwell, J. E. Toll, and S. Duke. (2000). An analysis of the effects of temperature on salmonids of the Pacific Northwest with implications for selecting temperature criteria. Sustainable Ecosystems Institute, Portland, OR (2000).

References

Sullivan et al., 2000 - https://www.krisweb.com/biblio/gen_sei_sullivanetal_2000_tempfinal.pdf