Beechie et al. 2021: Impervious Area and Coho Salmon Prespawn Survivorship

Function Updated by mbayly on Tue, 02/17/2026 - 21:47.

Species Information

Common Name: Coho Salmon
Genus: Oncorhynchus kisutch

Stressor Details

Stressor Name: Area
Units: %
Metric: Impervious Area
Scale: linear
Function Type: continuous
Vital Rate/Process: survivorship

Life Stage & Context

Life Stages: Adults

Descriptions

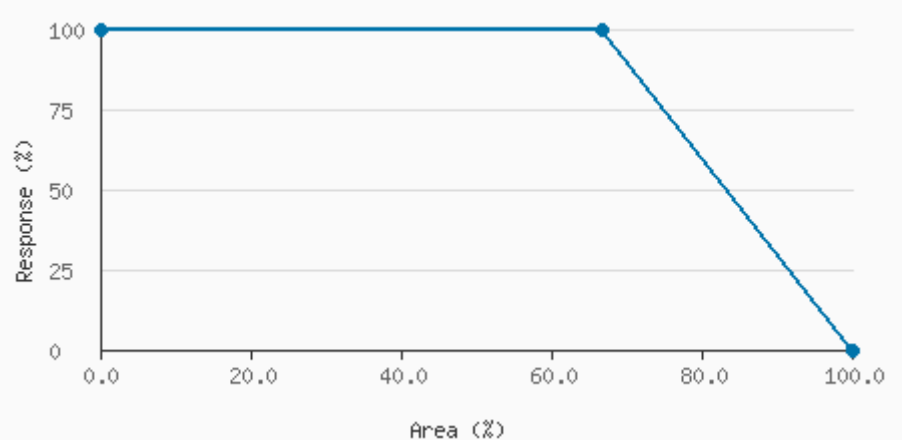
Overview

> The graph shows Coho salmon prespawn survivorship in each year at each site from Table 1 in Feist et al. 2011 plotted against percent impervious area. Blue line indicates the model function for prespawn survivorship.
>
> The original graph from Beechie et al shows pre-spawn mortality, this graph was invested to show prespawn survivorship instead.
>
> Prespawn mortality in coho salmon is correlated with a number of metrics indicating level of development (e.g., road density, percent impervious area) (Feist et al. 2011, 2017). The most straightforward function appears to be a linear relationship between prespawn mortality and percent impervious area (Figure 2a in Feist et al. 2011).
>
> We plotted the pre-spawn survival in individual years for each site. The data are fitted well with a function of:
>
> Percent impervious area ?66.67%: Prespawn mortality = (0.015) × (% imp. area)
> Percent impervious area >66.67%: Prespawn mortality = 1.0.

Function Derivation

> expert opinion

Stressor Response Data



Stressor (X)	Mean System Capacity (%)	SD	low.limit	up.limit
0	100	0	0	0
66.67	100	0	0	0
100	0	0	0	0

Citations

Beechie, T. J., C. Nicol, C. Fogel, J. Jorgensen, J. Thompson, G. Seixas, J. Chamberlin, J. Hall, B. Timpane-Padgham, P. Kiffney, S. Kubo, and J. Keaton. 2021. Modeling Effects of Habitat Change and Restoration Alternatives on Salmon in the Chehalis River Basin Using a Salmonid Life-Cycle Model. U.S. Department of Commerce, NOAA Contract Report NMFS-NWFSC-CR-2021-01.

Feist, B. E., E. R. Buhle, P. Arnold. J. W. Davis, and N. L. Scholz. 2011. Landscape ecotoxicology of coho salmon spawner mortality in urban streams. PLoS ONE 6(8):e23424, doi:10.1371/journal.pone.0023424

References

https://repository.library.noaa.gov/view/noaa/29486 - https://repository.library.noaa.gov/view/noaa/29486