

# NSEA 2023 Monitoring Report



The Nooksack Salmon Enhancement Association (NSEA) performs implementation and effectiveness monitoring to evaluate project success and improve future projects. We monitor the survival of our trees and shrubs at planting sites, fish presence at instream project sites, temperature at select sites, and complete habitat assessments at instream restoration sites.

## Vegetation Monitoring

*Goal 1: Continue monitoring all riparian habitat restoration sites for a minimum of three years after planting*

Monitoring is an essential aspect of NSEA's restoration program to evaluate plant survival and project success. Each project includes a pre-project vegetation survey and a minimum of three years monitoring post plant installation. In 2023, NSEA monitored over 15,000 plants at 79 different sites. The overall survival was 86%. NSEA replants if overall plant mortality exceeds 15% at any given site.



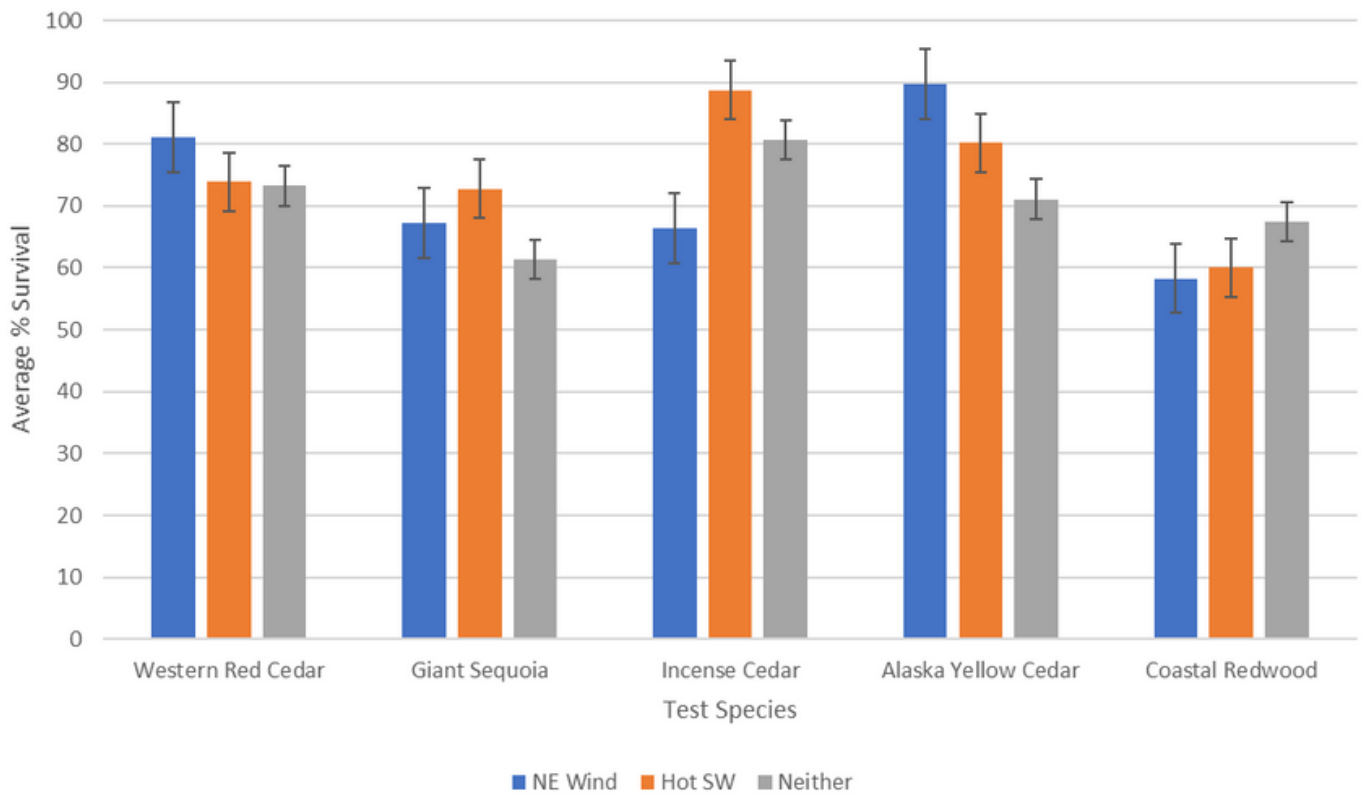
Western red cedar dieback on  
NSEA Campus

*Goal 2: Continue new conifer introduction and monitoring.*

Over the past few years, NSEA has noticed a decline in the health of native western red cedars. NSEA has implemented new conifer test species to keep up with climate change, including Alaska yellow cedar, incense cedar, coastal redwood, and giant sequoia. These species are similar to western red cedar in size, longevity and shade production, but may have higher survival rates as the climate warms. In 2023, NSEA crews monitored 20 test sites twice (once in spring and once in fall). We hope to share and compare our data with other entities that are starting assisted migration programs to accumulate knowledge from different perspectives and determine how effective this program is.

Test species were planted with three different treatments – northeast wind (NE Wind), hot southwest exposure (Hot SW), or neither. The results from Fall 2023 are shown on the next page. It is too soon to draw conclusions that would alter our adaptive management protocols, but we intend to perform a larger analysis of our data in 2024 which is the halfway point of our 10 year study.

## Fall 2023 Overall Survival of Conifer Test Species



The above table summarizes the results from the Fall 2023 monitoring. These results show that at sites with NE wind exposure, Alaska yellow cedars are outperforming other species. We also observed that incense cedar has a higher survival percent than other species in both of the other treatments.

## Browse Protectors

### Goal 3: Monitor effectiveness of browse protectors.

In 2021 NSEA started installing five feet tall Khowutzun Freegro TreeShelters (KFT) to test their effectiveness compared to the other browse protectors we typically use. Since then we have monitored survival of western red cedars and western hemlocks with KFT shelters and blue tube/cage protection. The data shows that survival is lower using KFT shelters, we think that this is due to site conditions like flooding and wind in combination with sizing issues in our stock of wooden stakes. As such we will not be assessing effectiveness of KFT shelters outside of normal monitoring protocols until we can procure correctly sized materials.

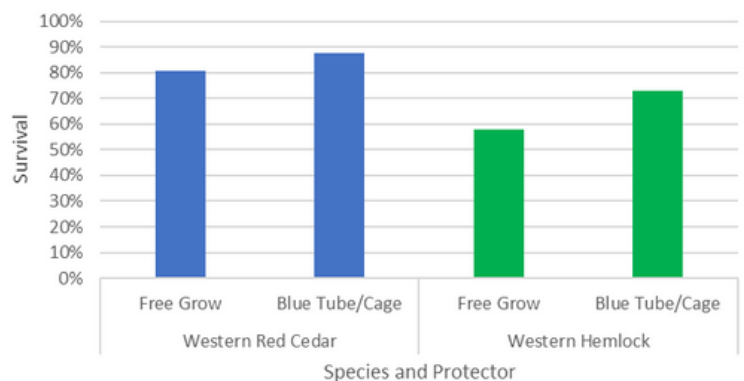
Blue tube with cage



KFT Shelter



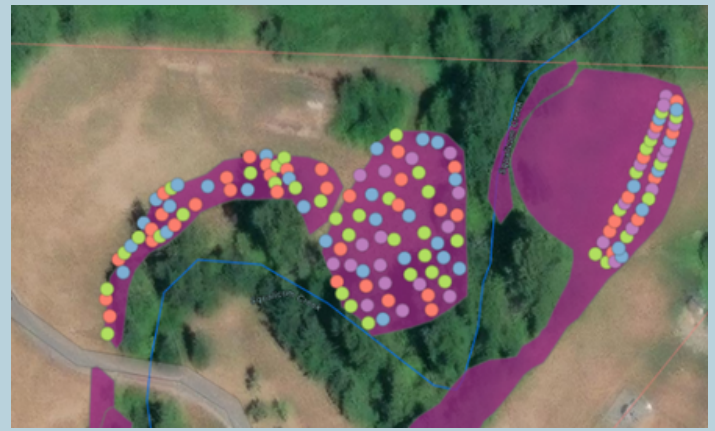
### Survival of Two Species with Protector Type



# GIS Database

## Goal 4: Continue to develop NSEA GIS database.

NSEA uses geographic information systems (GIS) to visualize project locations and prioritize new projects. The new maps that we are creating will help us be more efficient in project management, project tracking, and targeting areas for restoration that maximizes benefits to salmon and our community.



GIS map of conifer test species on Squalicum Creek

## Goal 5: Use NSEA drone in monitoring program.

NSEA documents the progression of plant growth and other changes at some sites by creating photo points with a drone. We are experimenting with a drone to collect photos more efficiently and accurately. Our goal is to continue drone research and training in 2024 to improve the data collection process and create a replicable and efficient protocol.



Nooksack River (2022) - From Ground



Nooksack River (2023) - From Drone

After instream habitat and fish passage barrier removal projects are completed, NSEA monitors for fish presence to determine the success of these projects. The restoration crew conducts annual spawner surveys, typically from October through January, to see if fish are utilizing instream habitat improved by large woody debris (LWD) placement and barrier removals. We have visited 11 sites this season. Four sites are fish passage projects. The other seven are LWD placement sites. We have documented fish presence at 2 of them. This year, like last year, there was a lack of precipitation in November and December. There needs to be sufficient flows in stream for fish to enter and spawn in. Timing can also play a role in spotting spawning fish as well.

## Spawner Surveys

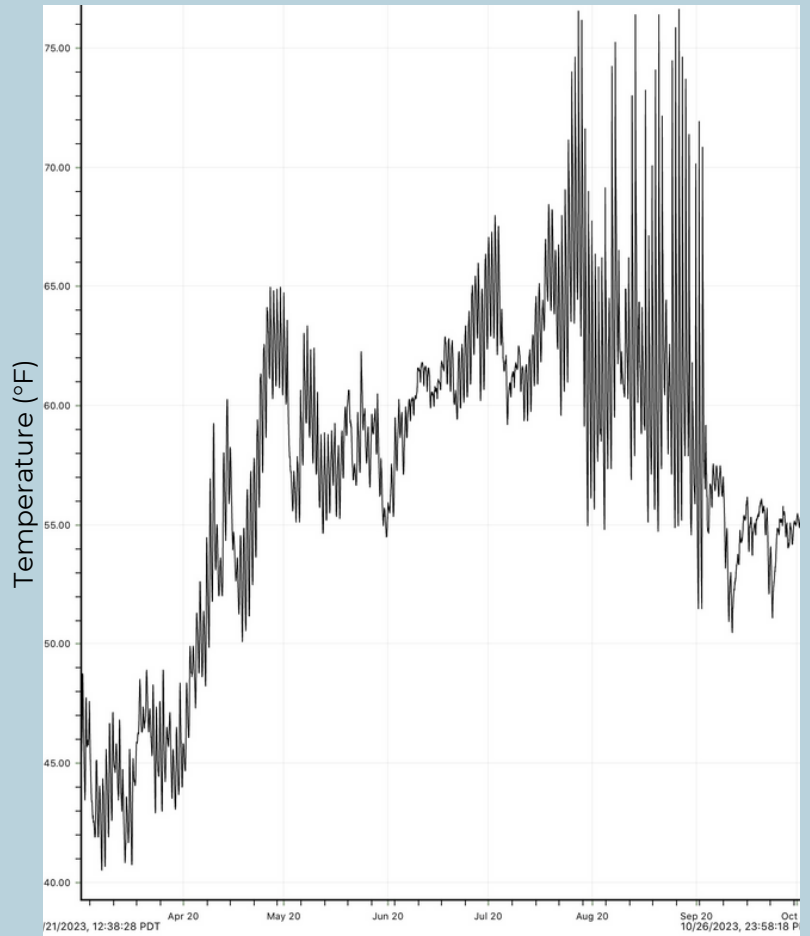


Coho found in a California Creek tributary in 2023

# Temperature Monitoring

Salmon need cold water to survive, especially in summer months when there are warmer temperatures and less rainfall. Water temperatures over 20°C (68°F) contain less dissolved oxygen and suffocate salmon. Riparian plantings provide shade that keeps streams cooler during summer and decrease salmonid fatality. In 2018, NSEA installed four water temperature loggers in a Squalicum Creek project reach in the Dewey Valley. In 2021 we installed 2 temperature loggers at a Tenmile Creek project site. The graph on the right is an example of our data from one of our Squalicum Creek loggers. All loggers in Squalicum Creek recorded temperatures above 68°F during summer of 2023. These loggers will monitor water temperatures for a minimum of 10 years and will hopefully show summer water temperatures decreasing over time as conditions in the watershed hopefully continue to improve.

Squalicum Creek Temperature Graph



April 2023 - October 2023

NSEA prioritizes restoration goals and objectives, which is why we annually perform instream habitat assessments to determine whether we are meeting our standards. For three to five years after a project is completed, the restoration crew collects data on pool depth, width and length, and available spawning gravels. We also document the presence of LWD and invasive vegetation. In 2023, NSEA completed 6 assessments over 2.7 miles of stream. This includes one Terrell Creek site that is over 2 miles long. It will take many years to observe how the instream habitat changes over time at this site where 200 pieces of LWD were installed. The NSEA crew will continue to assess this site for at least two more years, depending on funding, but it is too soon to draw any conclusions.

# Habitat Assessments

