

INSERT CATCHY TITLE ABOUT SHADE CLOTH HERE

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DWORSHAK NFH



AREA OF DEPLOYMENT



WHY SHADE CLOTH

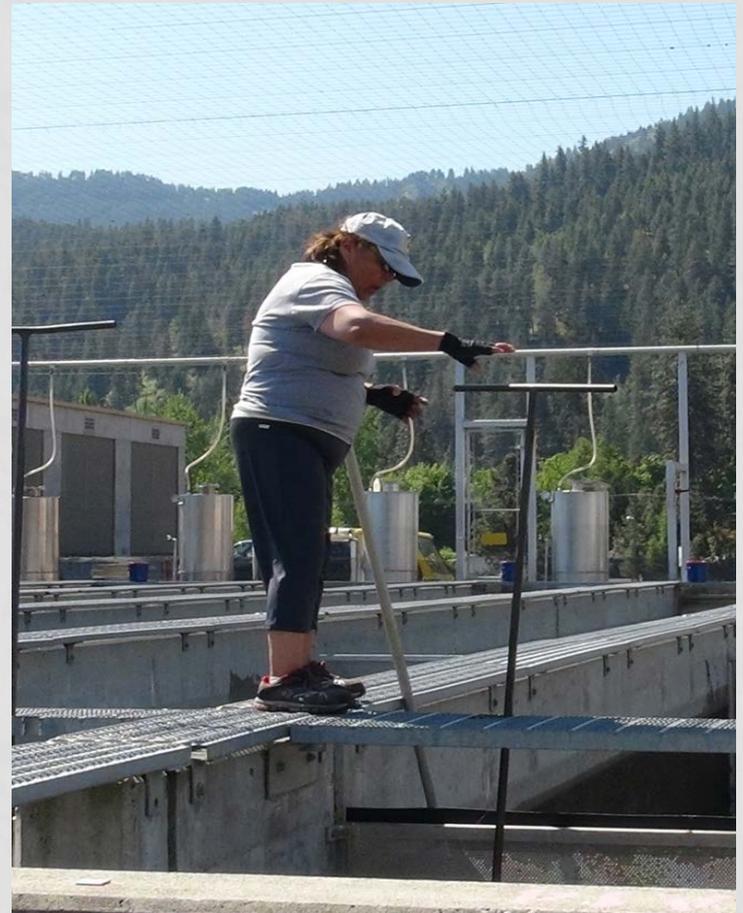


- Inhibit Algae Growth
- Enhance habitat by providing shelter
- Increase pond rearing space utilization
- Improve working conditions for employees
- Low cost temporary alternative to roofing



HAPPY PEOPLE = HAPPY FISH

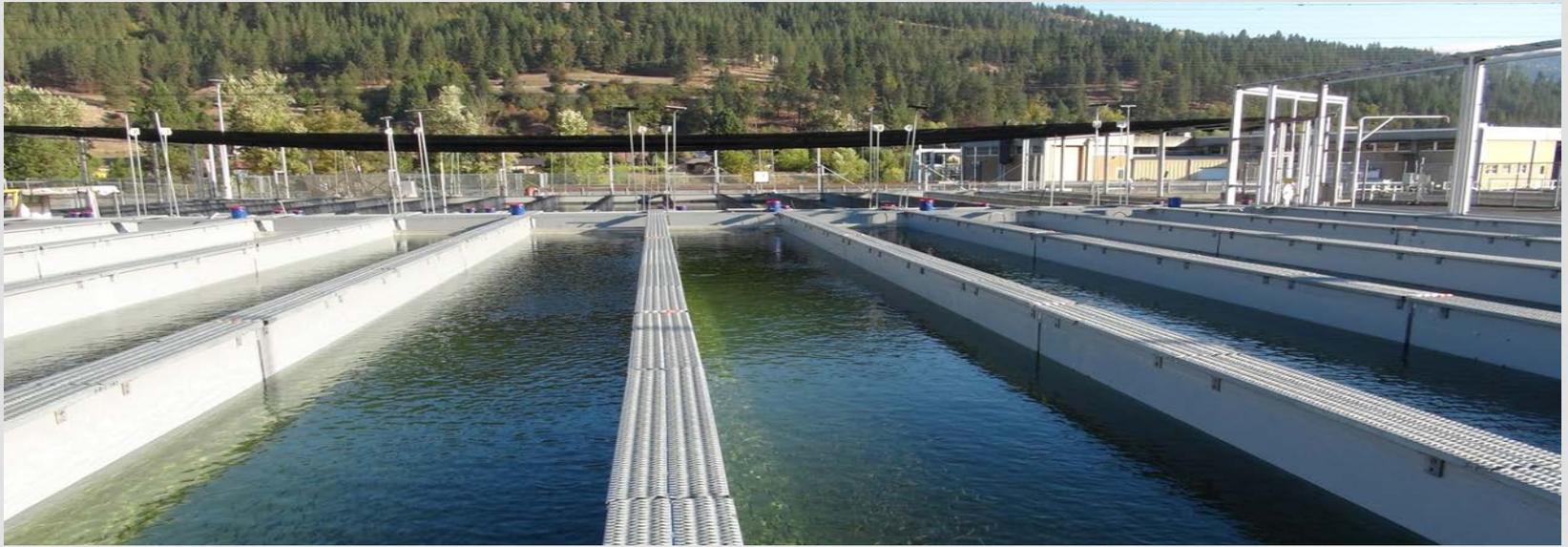
DURING THE SUMMER IT CAN GET UPWARDS OF 110 °F AT DWORSHAK. THE FISH HAVE IT MADE IN THEIR 45 °F WATER, BUT THE STAFF TEND TO WITHER A LITTLE.



BRIEF HISTORY

- In July, 2014 shade cloth purchased from Christensen Net, (Everson, Wash.), was installed over half of Dworshak's Spring Chinook Raceways, "B-Bank". The other half of the raceways "A-Bank" were left uncovered.
- Observations in fish behavior during feeding and use of raceways were made between the shaded and unshaded banks.

A-Bank Uncovered



B-Bank Covered

HISTORY CONTINUED

1. After reviewing our observations, panels were ordered that were sewn together allowing the installation of two panels, one over each bank. Grommets were also sewn into the fabric allowing the use of carabineer style clips along load bearing guide wires.
2. Installation over all 30 ponds was completed in the spring of 2015

INSTALLATION



Load bearing guide wires were placed liberally across the bird structure to prevent sagging

Ladders may be necessary to prevent hang-ups. Empty ponds at installation increases bio-security







Original design had panels hog-ringed together. Tearing and separation occurred during weather events.



Grommets were used to secure shade cloth to frame using bungee ball cords. Ropes rolled into the shade cloth allowed cloth to be pulled across.



B-bank fully Installed.

At full sun, 3 raceways remain unshaded. We plan to experiment with side panels in 2016.



Pond tools may need to be shortened due to slight sag in ceiling.

SUPPLIES PER PANEL

- 80x120 grommet edged shade cloth panel
- Bungee balls
- ¼" cable set 10' apart and associated hardware
- 4 lengths of rigid rope 260' long for installation and removal
- Rope to secure corners

OBSERVATIONS

- Lower algae growth in shaded raceways = cleaner ponds and less raceway brooming and stress.
- Fish dispersed throughout the ponds regardless of time of day.
- Temperature was significantly cooler under shade cloth.
- Weather was a concern
- Modifications (discussed later) may increase ease of installation and removal, weather concerns and limitations of shade from above.



UN-SHADED RACEWAYS

WHAT IS THE DENSITY OF THIS POND

$$\text{DENSITY INDEX} = \text{WT} / (\text{CU FT} * \text{L})$$

Shaded Pond

Fish = 130,000

Length = 2.6"

Volume = 1664 cuft

Density Index = .15

Partial Shade

Fish = 130,000

Length = 2.6"

Volume = 832 cuft

Density Index = .31

If fish occupy only shaded portions of a pond it would appear that they are too dense.



PARTIALLY SHADED RACEWAY

FULL REARING SPACE UTILIZATION INCREASES FISH HEALTH





SHADE COVER REMOVAL



Ropes were attached to carts and cloth pulled slowly off the structure. The raceways were manned to make sure the cloth did not snag. **Removal after a rain is recommended as the rain acts as a lubricant.**

REMOVAL CONTINUED



Cloth is deceptively heavy. This is a quarter panel. When storing, fold the cloth with roped rolled within so they will be ready to be put into place next season with minimal preparation.

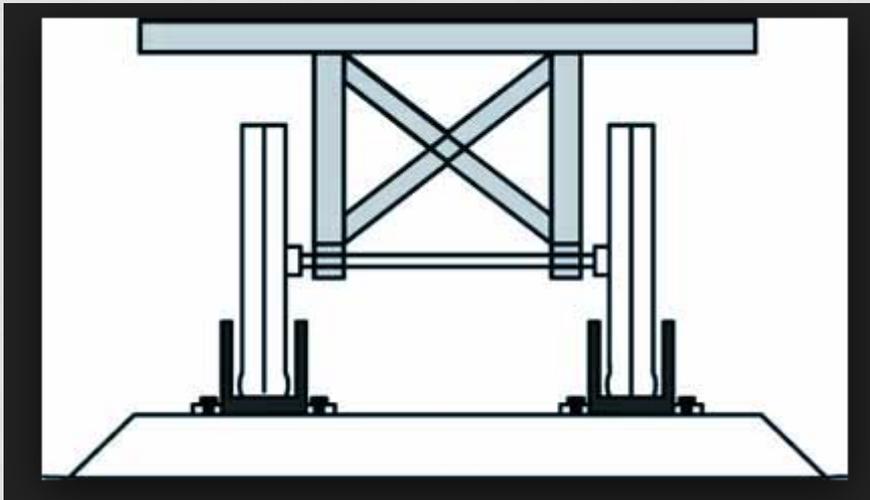
FUTURE MODIFICATIONS

- Side Panels
- Ventilation holes for weather events
- More break-away points
- Store in place options



OTHER INSTALLATION OPTIONS

- Shade strips
- Tracked Installation



CONCLUSION

- Shade covers have definite advantages to both fish and human health
- Covers are not feasible in all situations and modifications and testing should be undertaken
- Covers are susceptible to weather events and do not take the place of a roof over rearing units
- Shade cloth is heavy and engineering limitations should be considered.
- Happy fish = Happy employees, and visa versa.

QUESTIONS?

