

* Practical Application of Electro-Narcosis (EN) in the Field

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Application

- Use of drug anesthetics (eg. MS 222) not feasible at traps due to withdrawal period issues
 - Harvest above weir
- Begin investigating alternative methods for sedating fish rather than handling fish “hot”

Application

- Boss sees EN in use in Washington on steelhead and says we will try it on spring Chinook
 - I was skeptical at first
 - Surprised by how cheap and easy to build
 - Help from Joe Bumgarner and Doug Maxey (WDFW) using at Lyons Ferry Complex
 - Surprised by its effectiveness on fish

Electro-Narcosis vs. Electro-Anesthesia

- Electro-narcosis (EN) = low voltage ($\leq 60\text{V}$) DC equipment which results in a temporary sedation with muscle relaxation occurring only while within the in-water electric field with near immediate (< 5 seconds) recovery from the effect
- Electro-anesthesia (EA) = higher voltage ($> 100\text{V}$) AC or DC equipment which results in persistent quiescence or anesthesia lasting 3 to 5 minutes

Electro-Narcosis

Electro-Narcosis relies on two electrodes which deliver current into the water to stun the fish.

The current runs from the anode to the cathode, creating a high-voltage potential.

When a fish encounters a large enough potential gradient, it becomes affected by the electricity.

Profound stupor or unconsciousness is produced by passing this electric current through the brain.

Electro-Narcosis

Reactions to the DC field can be broadly categorized into five basic phases.

Alignment - With initial electrical introduction the fish align themselves with the direction of the electrical current.

Electro-Narcosis

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Galvanotaxis - Once parallel with the current the fish start to swim towards the anode.

Electro-Narcosis

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Galvanonarcosis - When fish get close enough to the anode to experience a sufficient voltage gradient their ability to swim is impaired. In this state their muscles are relaxed.

Electro-Narcosis

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Pseudo-forced swimming – as the fish gets even closer to the anode the fish begins again to swim toward the anode. This swimming is caused by direct excitement of the fish muscles by the electric field and is not under the control of the CNS.

Electro-Narcosis

Reactions to the DC field can be broadly categorized into five basic phases.

Tetanus – At high dc voltages the muscles go from a relaxed state into spasm. This can result in impaired ability to breathe and possible skeletal damage.

Unless held under conditions of tetanus, when the electricity is switched off, or the fish are removed from the electric field, they recover instantly.

Results

- Handling time reduced in the trap
- You don't feel like you just finished a 10 round boxing match when finished with the fish
- Seems easier on the fish as well
- No one likes to get shocked
 - ✓ As your hands move towards the electrodes you do feel a tingling sensation
 - ✓ There is no shock at the voltage and amperage we used

Results

- Viability comparison data from LGH
- EN used on GR and LG at spawning not at trap
- EN used on CC at the trap not spawning
- EN not used at all on LR or IM stocks

Stock	2006-11 %Viability	2012 %Viability
Grande Ronde	81-93 mean 88	92
Lookingglass	77-98 mean 89	94
Catherine*	85-92 mean 92	87
Lostine	85-96 mean 91	90
Imnaha	75-93 mean 88	80

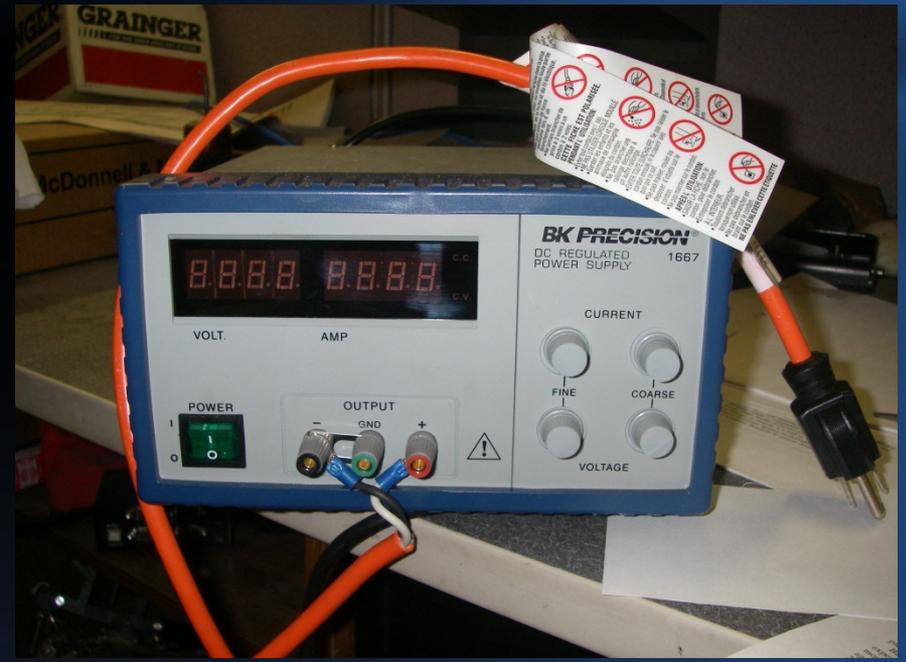
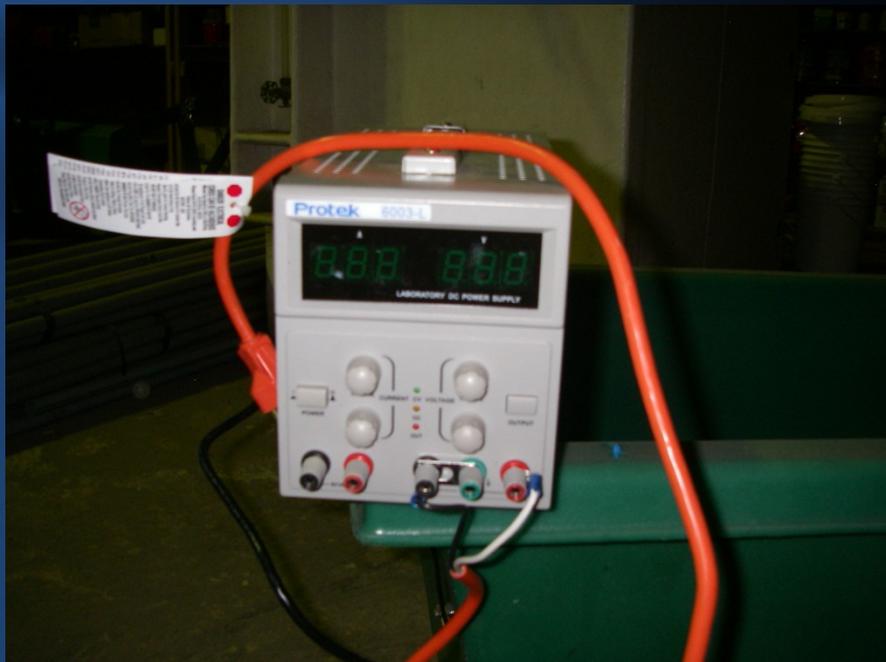
Materials

- Simple plastic livestock watering trough
 - ~4'L x 2W' x 10" water depth (75 gal)
 - Buy at any farm supply store (~\$90)
 - Drain with plug (~\$20).



Materials

- Power supply, could only find 4 different manufacturers
- We use 1-60VDC 0-3.3Amp power supply
 - Protek (discontinued) (~\$260)
 - BK Precision (~\$270)
 - Instek (~\$550)
 - Kenwood (~\$2,500)



Materials

- 15 to 25 ft extension cord (\$7-\$15)
 - Cut off male end and attach to power supply.
 - Use female end to attach to trough.



Materials

- Aluminum plate.
 - 16"x16" 0.125 thickness (~\$40).
 - Black plastic mesh screen ½ inch.
 - Eager Inc has 50' roll for \$166 or find scraps.
 - 4 Nuts and bolts to attach.



Materials

- For Lookingglass Hatchery
 - Aluminum plate larger (3'x3') 0.125 thickness (~\$104).
 - Wire for connection.
 - Rubber slats for support and connection
 - Nuts and bolts to attach.



Video

- In the video you will see
 - The phases the fish go through
 - Normally machine runs all the time, turning on and off in the video for demonstration
 - Materials used to build the device
 - People scared of electricity

Acknowledgements

- A big thanks to the crew at the Lookingglass Hatchery.
- Joe Bumgarner, WDFW
- Doug Maxey, WDFW
- My Crew
 - ✓ Laurie Hewitt
 - ✓ Ryan Seeger



Even though he doesn't get out much, he can still come up with some good ideas.

And no, the goofy expression is not because he is getting shocked, just happy to get out of the office for a while.