

Quickstart for Electrical Output Standardization

Goal: develop and standardize *species x* or *assemblage* sampling protocols to collect more accurate and precise data.

Notes:

The term “output goal” includes power, voltage, or amperage electrical output goals. Any of these three electrical entities can be used for deriving individual gear-specific standardization tables. Each has their advantages. If the desire is to use one set of output goals for fleet standardization, choose amperage as the output variable.

1. Project scope –Assemblage vs. Target Species.

- a. If you have target species, also decide on size class targets

2. Consider efficiency factors and sampling design

- a. *Know the ambient water conductivity range of your sampling sites*
- b. Decide upon sampling design
 - i. Select gear type (and see #3)
 - ii. Electrode arrangement (if using several units, try to get the electrode configuration as similar as possible)
 - iii. Number of netters
 - iv. Dipnet frame shape, mesh size, handle length
 - v. Aids as polarized sunglasses
 - vi. Time of sampling: day, crepuscular, night
 - vii. Range of turbidity appropriate for sampling
 - viii. Range of flow appropriate for sampling
 - ix. Range of water temperature appropriate for sampling
 - x. Stratification factors as stream size or reservoir type
 - xi. Implement power standardization (amps, volts) and select waveform type (DC, PDC [frequency, duty cycle], AC)
 - xii. Refine assessment variables: should you use an index as catch-per-unit-effort (CPUE) or a population estimate to assess your fish populations?
 - xiii. If using CPUE, define effort as distance, time, or a combination
 - xiv. Spatial design as simple random, stratified random
 - xv. Technique
 1. Orientation as parallel to shoreline, zig-zag, loop-in
 2. Ambush (power off and on in best habitats) or power continuously applied
 - xvi. Sample site or sample unit length
 - xvii. Example: *Long Term Resource Monitoring Program Procedures*

3. Select electrofishing sampling gear

Select most efficient gear type. Evaluate candidate gear models with their associated control box outputs and capacities (voltage and amperage maximums, average power maximum, waveform capability: AC, DC, pulsed DC [PDC]; for PDC, determine any restrictions on combinations of frequency and duty cycle). The gear type choice may be clear; for example, if the habitat is non-wadeable, options may be limited to an electrofishing boat.

4. Build and Use Target Output Standardization Tables

Output goal tables are specific to gear type, electrode design, waveform, target species or assemblages, water body type (large reservoir, shallow lake, large river, mid-sized stream). These tables are based on the power transfer model of electrofishing and require input of “threshold data” (minimum voltage, current, or power needed to successfully sample a water body type) and an estimate of fish conductivity.

- a. We often use a fish conductivity of 115 $\mu\text{S}/\text{cm}$, especially for sampling assemblages
- b. Determine threshold data and develop tables using the Excel file *EF Goal Power* or the [Electrofishing App](#)
- c. If you do not have your own threshold data and want to build tables, here are some suggestions. All outputs are pulsed DC, 60 – 120 pps, 20 – 40% duty cycle (and possibly continuous DC) at 115 $\mu\text{S}/\text{cm}$:
 - i. Backpack with ring anode and rattail cathode: 1 amp, 240 V
 - ii. Barge with one ring anode: 2.5 amps, 330 V
 - iii. Barge with two ring anodes: 5.0 amps, 390 V
 - iv. Boat with 2-boom Wisconsin-type anodes: 10 amps, 300 V
- d. Use tables
 - i. Deploy gear with electrodes in fishing position and under average depth conditions (e.g., backpack in 1 – 2 feet depth, boats in 3 – 4 foot depth)
 - ii. Take ambient water conductivity, look up output voltage or amperage on target goal table
 - iii. Adjust voltage to target voltage or adjust voltage and view amp meter to obtain target output current
 - iv. Sample
 - v. Note fish reactions, recovery times, obvious injuries, and make an assessment of successful or unsuccessful sampling
 - vi. Record this metadata to flag sampling and provide more data for fine-tuning threshold estimates given water body type and size
- e. Note: either use these target table values unmodified or do a trial nearby to your sample site to adjust output (usually that means increasing voltage or amperage)