

## Output Goal Tables for Backpacks, Towbarges, and Boats

In talking with many biologists, a major initial concern is having straightforward guidance for making suitable volt and amp settings given conditions (e.g., water conductivity). Here's a brief blog that provides example voltage and current output goal tables. These charts are generated for sampling fish assemblages using common electrofishing gear types. They are meant as guidelines for setting controls as opposed to strict instructions.

These tables are constructed based on these conditions,

- a "fish catching" waveform is used to sampling assemblages (e.g., pulsed direct current, square wave, 60 – 120 pps, 20 – 40% duty cycle);
- limited electrode configurations of typical resistances;
- fish conductivity of 115  $\mu\text{S}/\text{cm}$ ; and
- the power transfer model is appropriate.

Threshold voltage and amperage estimates are derived from field work in various NCTC electrofishing classes, unpublished data from several sources and a published source (Burkhardt, R.W. and S Gutreuter. 1995. Improving electrofishing catch consistency by standardizing power. North American Journal of Fisheries Management 15:375-381).

### Procedure at the sampling site,

- measure ambient water conductivity (or specific conductivity and water temperature and convert to specific [see blogs on water conductivity and meters]);
- deploy electrodes in "fishing" fashion within typical habitat conditions; for backpacks, we suggest deploying electrodes as you would while sampling in about 1 - 1.5' depth;
- consult the goal table;
- standardize by volts or amps;
- if you are using amperage, then adjust voltage until the current goal is reached as indicated on your gear's peak ammeter;
- if you are using voltage, adjust voltage until the voltage goal is reached as indicated on your gear's peak volt meter;
- if you have time to run a trial test, go outside but near your sample area and assess subjectively your electrofishing success; if unsatisfactory, adjust settings
- record ambient conductivity, threshold voltage or amperage used (preferably both outputs)
- optionally, record the major reaction of fishes (escape, inhibited swimming, attraction, immobilization)
- optionally, record your assessment of the quality of the sampling, such as "successful" or "unsuccessful"

A big point is that these tables may not be accurate enough for your particular equipment or sample sites. Try them and adjust as needed. We'd appreciate feedback on your experiences using these tables or your output goal tables. Please reply to [alan\\_temple@fws.gov](mailto:alan_temple@fws.gov)

Please note that these values are peak not average. Volt settings and metering on electrofishing equipment nearly always peak. However, there are average ammeters are on some models as GPP and Type VI control boxes, among others.

One more thing about these charts. Amperage is the best output to use for standardization. Using current as the output goal allows broader application to different electrode types. However, in low

conductivity water, or when using low power units as backpacks, voltage may be a better choice to use instead of current.

To assist you in modifying these tables with different conductivity values, or if you have your own threshold values, a link to EF Goal Power Excel file is here [EF Goal Power 2015](#) or you can download the Electrofishing App [here](#).

### Example Backpack Output Goals

Waveform: PDC (fish catching settings, e.g., 60 pps, 25% duty cycle)  
 Electrodes: Ring anode, rattail cathode  
 R100: 275 Ohms  
 Fish Cond.: 115  $\mu\text{S}/\text{cm}$

Water Conductivity (Ambient)	Applied Voltage Goal (Peak)	Applied Amperage Goal (Peak)
25	669	0.61
28	610	0.62
32	549	0.64
50	394	0.71
75	303	0.82
100	257	0.93
125	230	1.04
150	211	1.15
175	198	1.25
200	188	1.36
225	181	1.47
250	175	1.58
275	170	1.69
300	165	1.80
325	162	1.90
350	159	2.01
375	156	2.12
400	154	2.23
425	152	2.34
450	150	2.44
475	148	2.55
500	147	2.66
525	146	2.77
550	145	2.88
575	143	2.98
600	142	3.09
625	142	3.20
650	141	3.31
675	140	3.42
700	139	3.53
725	138	3.63
750	138	3.74
775	137	3.85
800	137	3.96
825	136	4.07
850	136	4.17
875	135	4.28
900	135	4.39
925	134	4.50
950	134	4.61
975	134	4.71
1000	133	4.82

**Example Tow-barge Output Goal Table (1 anode)**

Waveform: PDC (fish catching settings, e.g., 60 pps, 25% duty cycle)  
 Anode: One Ring  
 Cathode: Plate on bottom of barge  
 R100: 147 Ohms with one anode  
 Fish Cond.: 115  $\mu$ S/cm

<b>Water Conductivity (Ambient)</b>	<b>Applied Voltage Goal (Peak)</b>	<b>Applied Amperage Goal (Peak)</b>
50	543	1.8
75	417	2.1
100	354	2.4
125	316	2.7
150	291	3.0
175	273	3.2
200	259	3.5
225	249	3.8
250	240	4.1
275	233	4.4
300	228	4.6
325	223	4.9
350	219	5.2
375	215	5.5
400	212	5.8
425	209	6.0
450	207	6.3
475	204	6.6
500	202	6.9
525	201	7.2
550	199	7.4
575	197	7.7
600	196	8.0
625	195	8.3
650	194	8.6
675	193	8.8
700	192	9.1
725	191	9.4
750	190	9.7
775	189	10.0
800	188	10.2
825	187	10.5
850	187	10.8
875	186	11.1
900	186	11.4
925	185	11.6
950	184	11.9
975	184	12.2
1000	183	12.5

**Example Tow-barge Output Goal Table (2 anode)**

Waveform: PDC (fish catching settings, e.g., 60 pps, 25% duty cycle)  
 Anode: Two Rings  
 Cathode: Plate on bottom of barge  
 R100: 87 Ohms with two anodes  
 Fish Cond.: 115  $\mu$ S/cm

<b>Water Conductivity (Ambient)</b>	<b>Applied Voltage Goal (Peak)</b>	<b>Applied Amperage Goal (Peak)</b>
50	642	3.68
75	493	4.24
100	418	4.80
125	373	5.36
150	343	5.92
175	322	6.47
200	306	7.03
225	294	7.59
250	284	8.15
275	276	8.71
300	269	9.27
325	263	9.82
350	258	10.38
375	254	10.94
400	250	11.50
425	247	12.06
450	244	12.61
475	241	13.17
500	239	13.73
525	237	14.29
550	235	14.85
575	233	15.40
600	232	15.96
625	230	16.52
650	229	17.08
675	228	17.64
700	226	18.20
725	225	18.75
750	224	19.31
775	223	19.87
800	222	20.43
825	222	20.99
850	221	21.54
875	220	22.10
900	219	22.66
925	219	23.22
950	218	23.78
975	217	24.33
1000	217	24.89

### Example 2-boom Boat Output Goal Table

Waveform: PDC (fish catching settings, e.g., 60 pps, 25% duty cycle)  
 Anode: Two booms Wisconsin rings 4 – 6 droppers (amperage goals can be used for two spheres fully immersed)  
 Cathode: Boat hull (16 – 18' length)  
 R100: 35 Ohms  
 Fish Cond.: 115  $\mu$ S/cm

Water Conductivity (Ambient)	Applied Voltage Goal (Peak)	Applied Amperage Goal (Peak)
50	502	7.17
75	385	8.26
100	327	9.35
125	292	10.43
150	269	11.52
175	252	12.61
200	239	13.70
225	230	14.78
250	222	15.87
275	216	16.96
300	210	18.04
325	206	19.13
350	202	20.22
375	199	21.30
400	196	22.39
425	193	23.48
450	191	24.57
475	189	25.65
500	187	26.74
525	185	27.83
550	184	28.91
575	182	30.00
600	181	31.09
625	180	32.17
650	179	33.26
675	178	34.35
700	177	35.43
725	176	36.52
750	175	37.61
775	175	38.70
800	174	39.78
825	173	40.87
850	173	41.96
875	172	43.04
900	171	44.13
925	171	45.22
950	170	46.30
975	170	47.39
1000	169	48.48

