# ELECTROFISHING EFFICIENCY

Tab 9

# Session Objective
## (Page 9-1)

- Understand the value of considering (and estimating) catchability
- Stimulate participants to consider how to improve the efficiency (increase precision) of their sampling by
  - Stabilizing catchability
    - Identifying efficiency factors
    - Classifying factors  into categories
    - Providing examples of approaches to use efficiency factors in study designs

# Definition of Sampling efficiency

??

# Definition of Sampling efficiency

- Percent of population captured by sampling

- Example:

| | |
|---|---|
| N | = 1000 fish |
| Captures | = 150 fish |
| Efficiency | = 15% |

# Catchability (“q”)

- In terrestrial applications known as “detectability”
- Population size = Catch/q
- Population index = (Catch per unit effort)/q

# Catchability (“q”)

- If q = 1, then population size = catch, or the population index = CPUE
- Usually q is not 1 and is unknown; often ignored or considered constant across space or across time.
- Knowing q is critical especially for using CPUE as an index of population size for assessment and/or monitoring

- Either must
  - Estimate q; q modeling considered essential by some for estimating absolute and relative abundances for monitoring
  - Stabilize q (especially with indices); main purpose of standardization protocols

# Relating CPUE to Fish Density

- Some studies (e.g., Chick et al. (1999)) have demonstrated a strong relationship between CPUE and fish density.
  - Chick et al. (1999) standardized by power and removed water conductivity as a factor.
  - Stem density did affect catchabilities and was recommended to be included as covariate in their future CPUE studies.

# Activity

- Identify efficiency factors and group into categories

# Three Categories of Efficiency Factors

Biological

Environmental

Technical

# Biological Factors

- Fish factors
  - Size
  - Habitat preference
  - Behavior

# Biological Factors

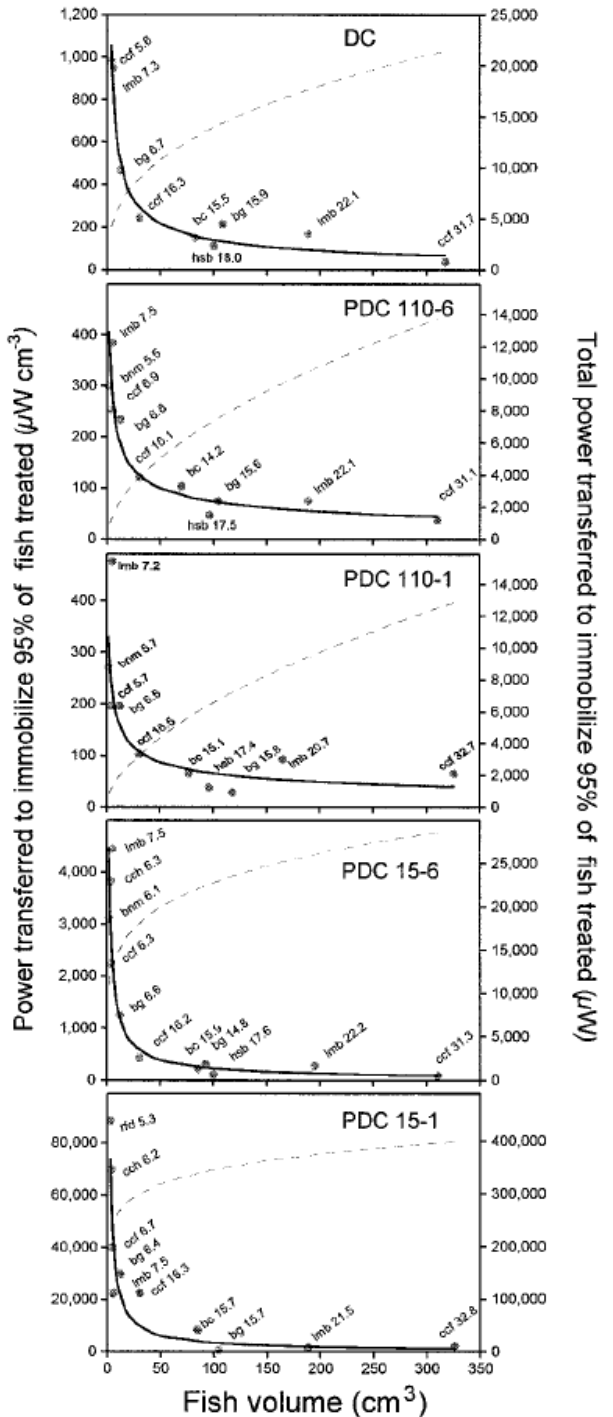
More efficient with larger-sized fish

Several studies have shown greater proportion of larger-sized individuals in a population are captured (higher q) by EF

# Biological Factors

Less power needed with larger-sized fish

Also, the main factor in susceptability to electroshock was size



# Biological Factors

Habitat Use

Sculpins are benthic and often reside under rocks

More power needed to immobilize and need careful technique to recover specimens

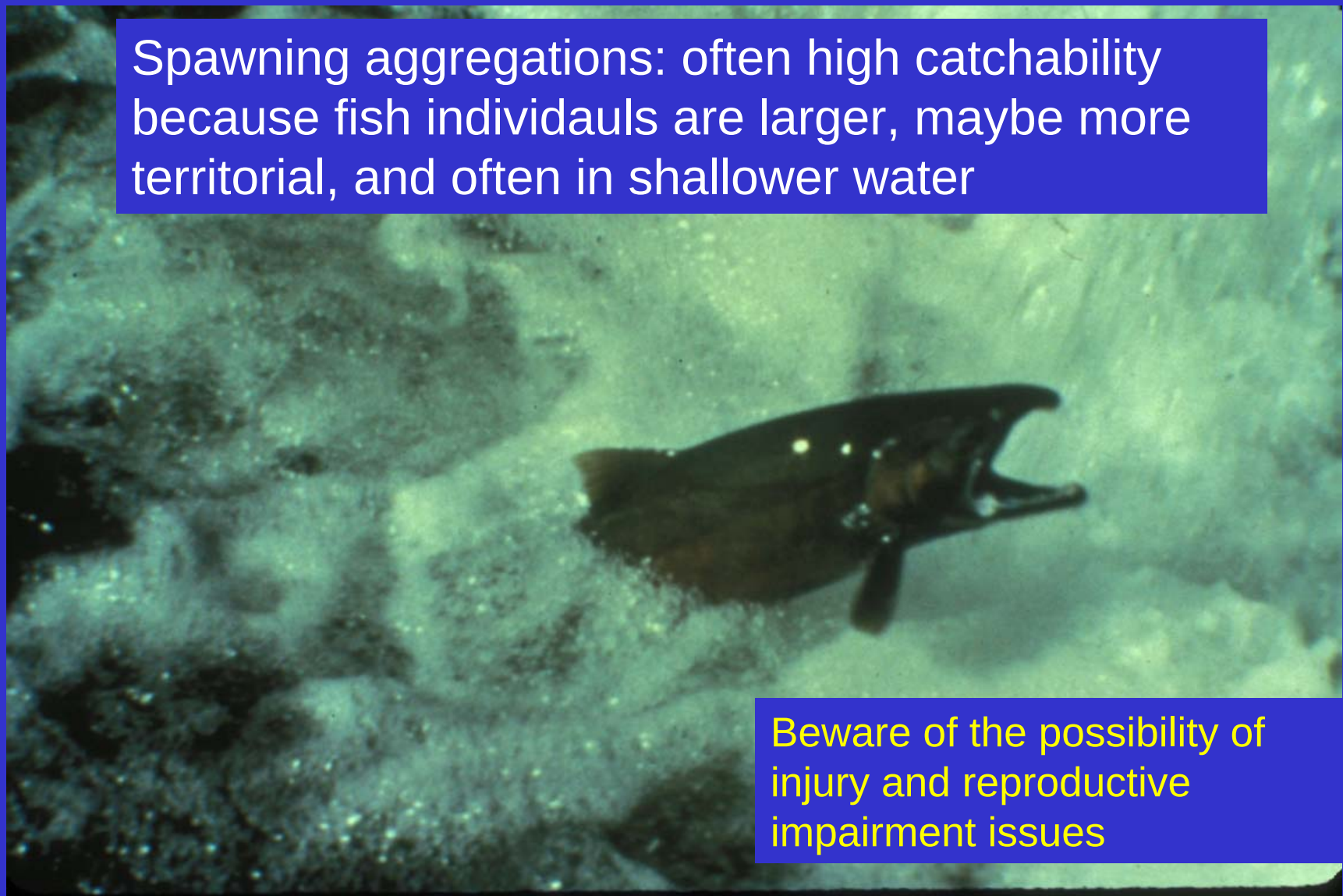
# Biological Factors

Habitat Use

| Species | # of Ponds | Detection Success % |
|---|---|---|
| Bluegill sunfish | 27 | 100 |
| LM bass | 24 | 96 |
| Crappie | 8 | 25 |
| Green sunfish | 9 | 67 |
| Redear sunfish | 4 | 100 |
| Channel catfish | 5 | 20 |
| Bullhead | 5 | 20 |
| Golden shiner | 5 | 20 |

# Biological Factors

## Behavior



Spawning aggregations: often high catchability because fish individauls are larger, maybe more territorial, and often in shallower water

Beware of the possibility of injury and reproductive impairment issues

# Environmental Factors

- Water quality
  - Ionic concentration
  - Temperature
  - Conductivity (ionic concentration & temperature)
  - Turbidity
  - Depth
  - Lotic flow rate (discharge)

# Environmental Factors

Ambient water conductivity results from ionic concentration and temperature


VIPE: very important piece of equipment

# Environmental Factors

Turbidity or clarity

Turbidity to an intermediate range can increase catchability

# Environmental Factors

Quiz question: high or low water conductivity?

# Environmental Factors

Depth, how low can you go?

# Environmental Factors

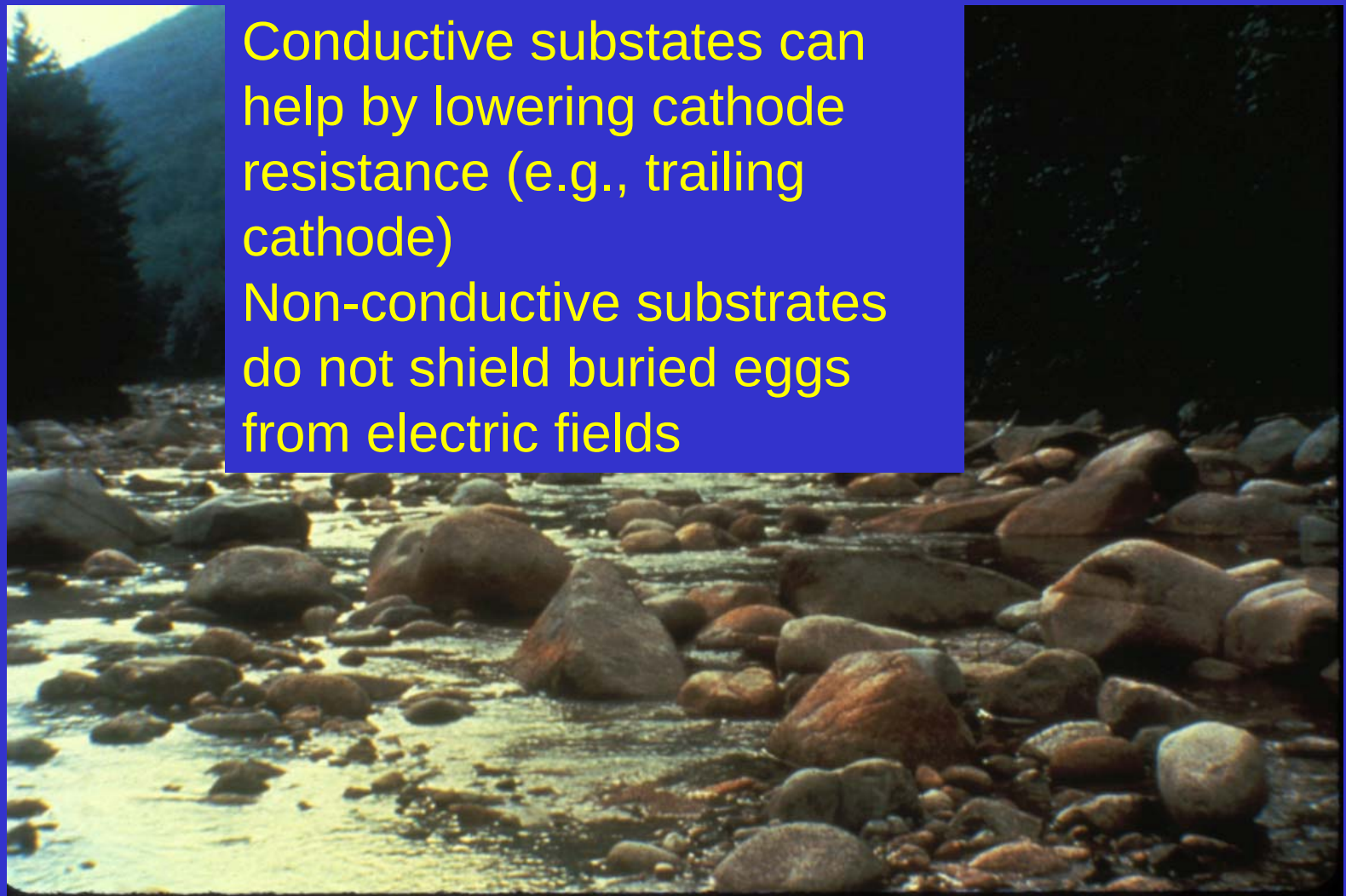
High discharge: fishes spread out and can be more difficult to sample

# Environmental Factors

- Substrate
  - Size distribution and conductivity
- Lentic water body shape
  - Round vs. many coves
- Coarse woody debris (e.g., downed logs)

# Environmental Factors

Substrate size and conductivity



Conductive substates can help by lowering cathode resistance (e.g., trailing cathode)

Non-conductive substrates do not shield buried eggs from electric fields

# Environmental Factors

Water body shape


Catchability of some species higher in more elongated lakes with coves

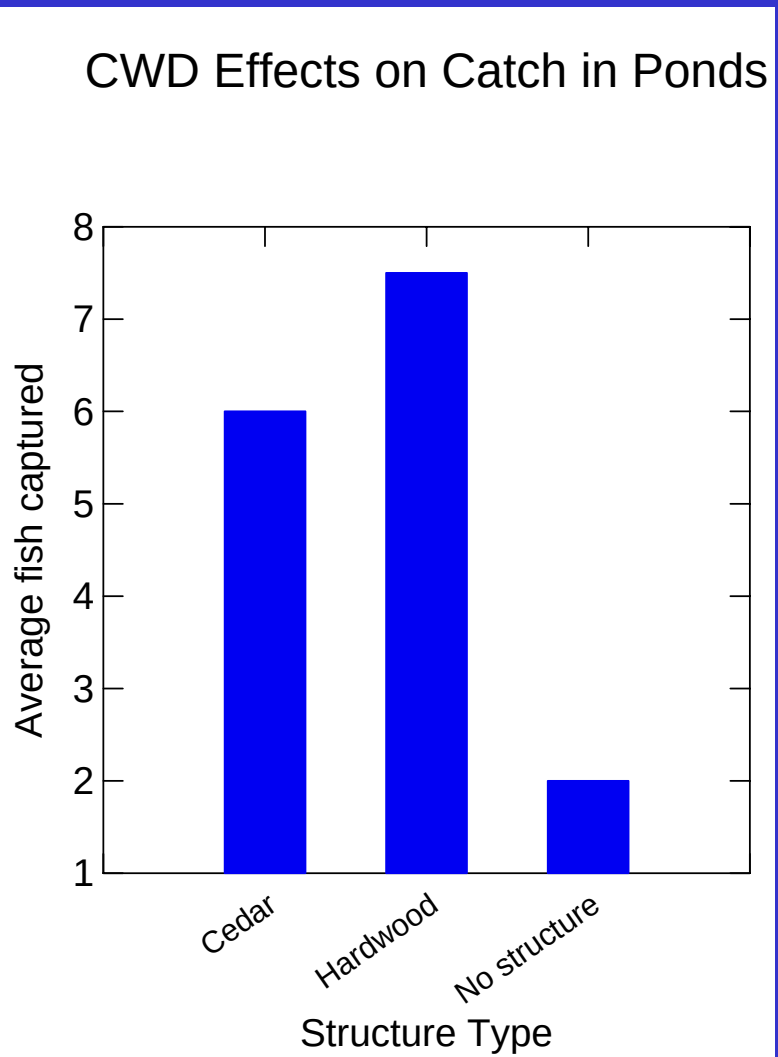
# Environmental Factors

Coarse Woody Debris

Catchability of some species higher in structure

# Environmental Factors

## Coarse Woody Debris

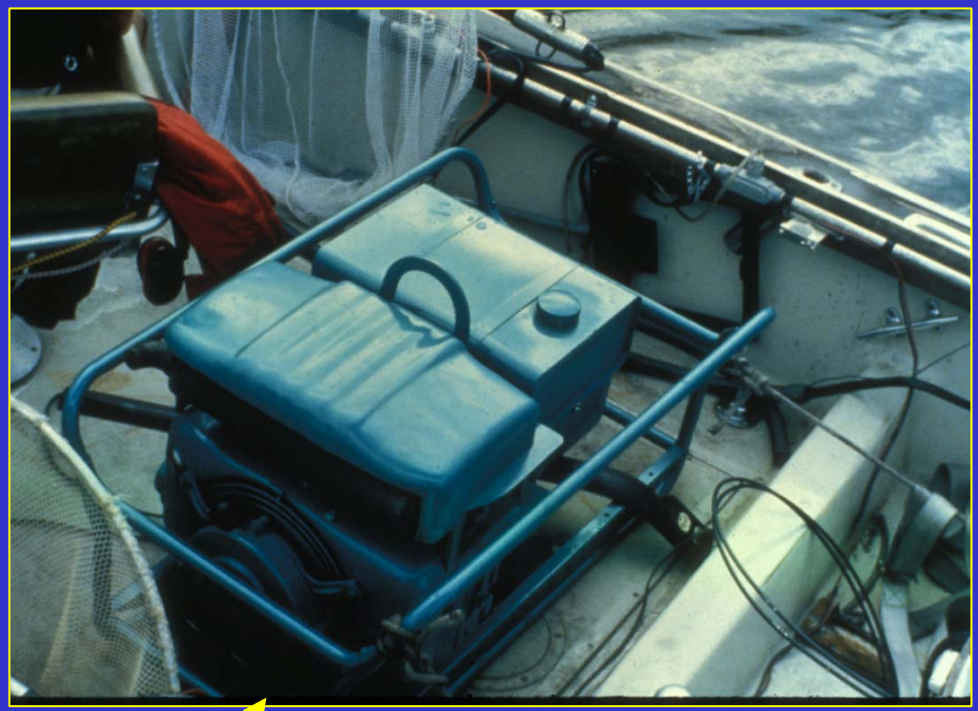



Electrofishing catchability higher in ponds with structure; all ponds stocked with same number of fish.

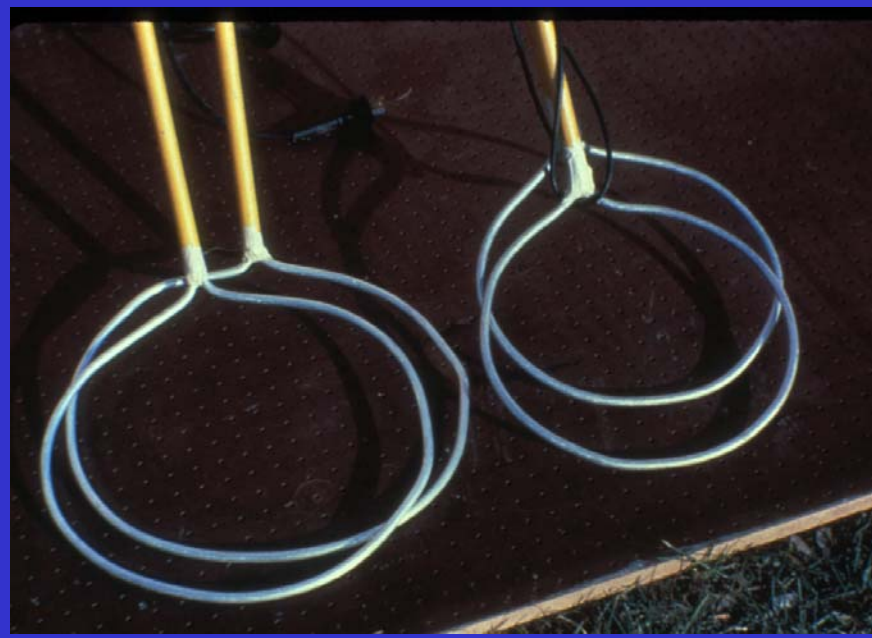
# Technical Factors

- Equipment (waveform, power capacity, type)
- Weather
- Time of day
- Sampling design

# Technical Factors

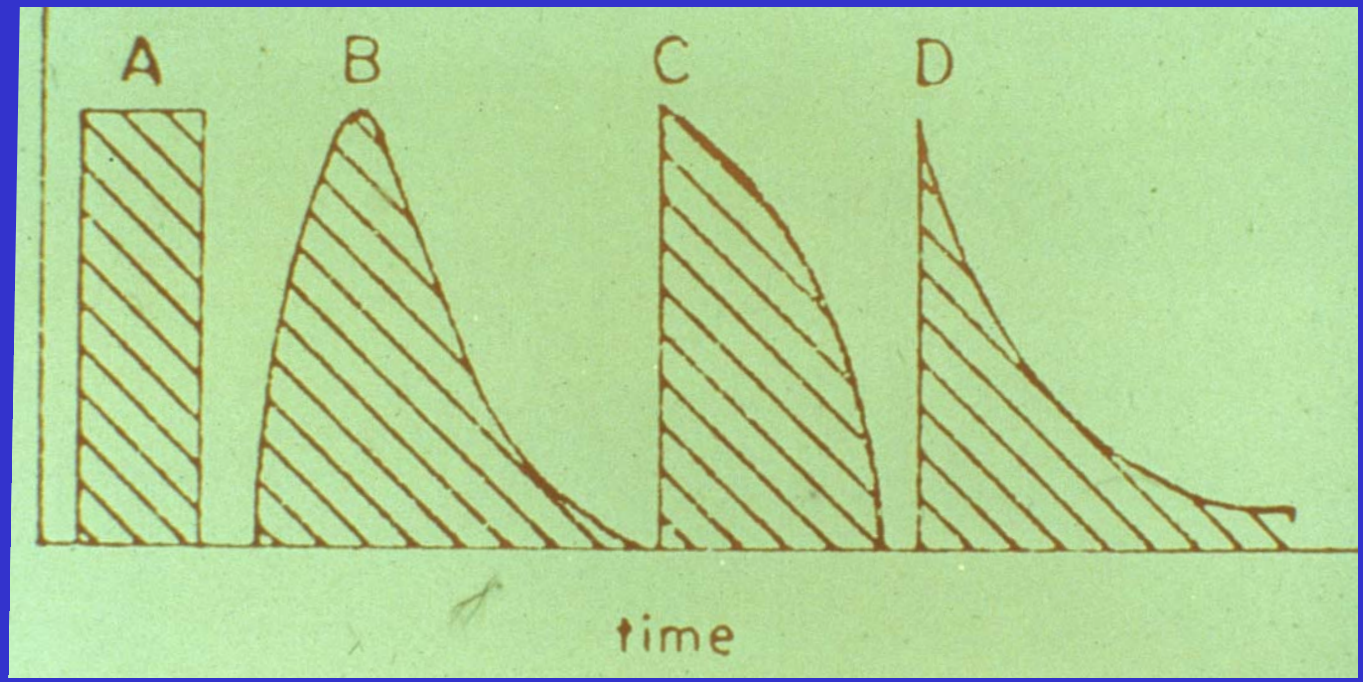


Power source: may reach limitation in conductivity extremes



Electrodes: can be modified for the conductivity regime; lower cond. = larger
higher cond. = smaller
(moderate cond.: try to make as large as system will drive and logistics allow).

# Technical Factors




Waveform: AC can be more effective in high and low conductivities. Fish usually more susceptable to igher frequencies. Waveform shape can have relatively small effect.

# Technical Factors

- May need specialized equipment (electric seine vs. backpack, pre-positioned area shockers vs. boat, deepwater cathode deployment)
- May need to change sampling design (e.g., point-transect sampling with a boat)

# Technical Factors

Night fishing often more effective in reservoirs and lakes. Predators move into shallows. Fish assemblage in area can change composition from day to night.

# Technical Factors


Inexperienced crews or crews inexperienced with a particular water body have been shown to have lower catch rates than experienced crews.

# Technical Factors (sampling design)

Point-sampling (15 min. with chase boats) for large ictalurids