Invertebrate Monitoring in Wetlands

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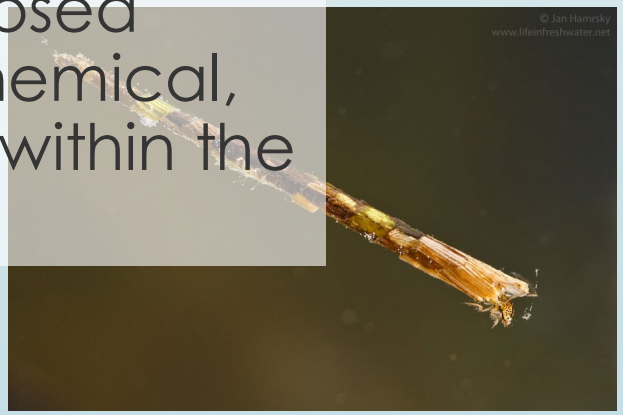
Why Macroinvertebrates?

- Invertebrates are commonly and widely distributed in many types of wetlands
- Invertebrates respond with a range of sensitivities to many kinds of pollution
- Many aquatic invertebrates complete their life cycles in wetlands, so they are exposed directly to the physical, chemical, and biological conditions within the wetland



Evaluating the health of a wetland requires a measure that integrates multiple factors

Economists rely on an integrative tool to assess economic condition

Common Leading Economic Indicators

Average workweek

Number of first-time applicants for unemployment insurance

New building permits

New orders for capital goods

New orders for consumer goods and materials

Consumer confidence Index

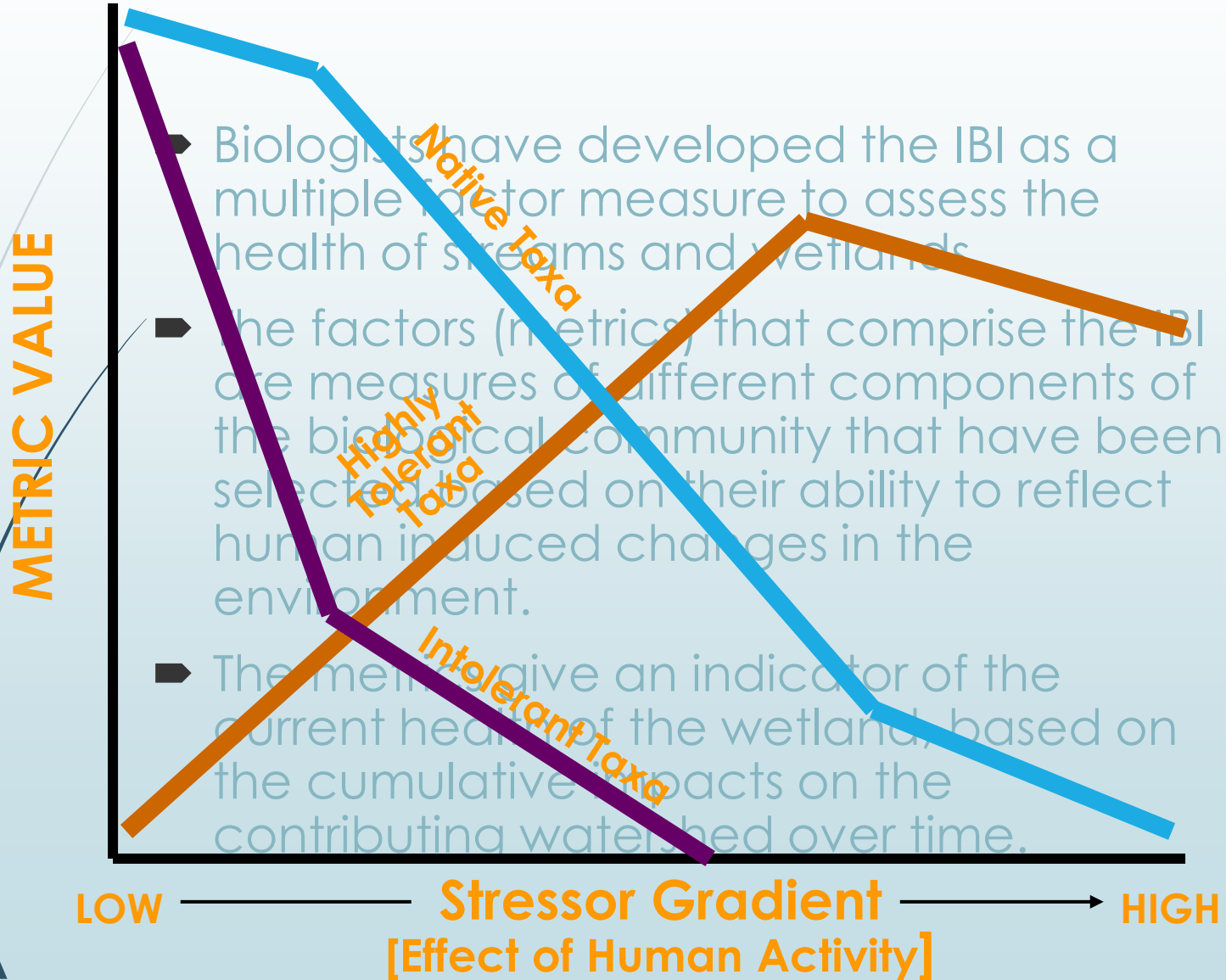
Purchasing managers' index

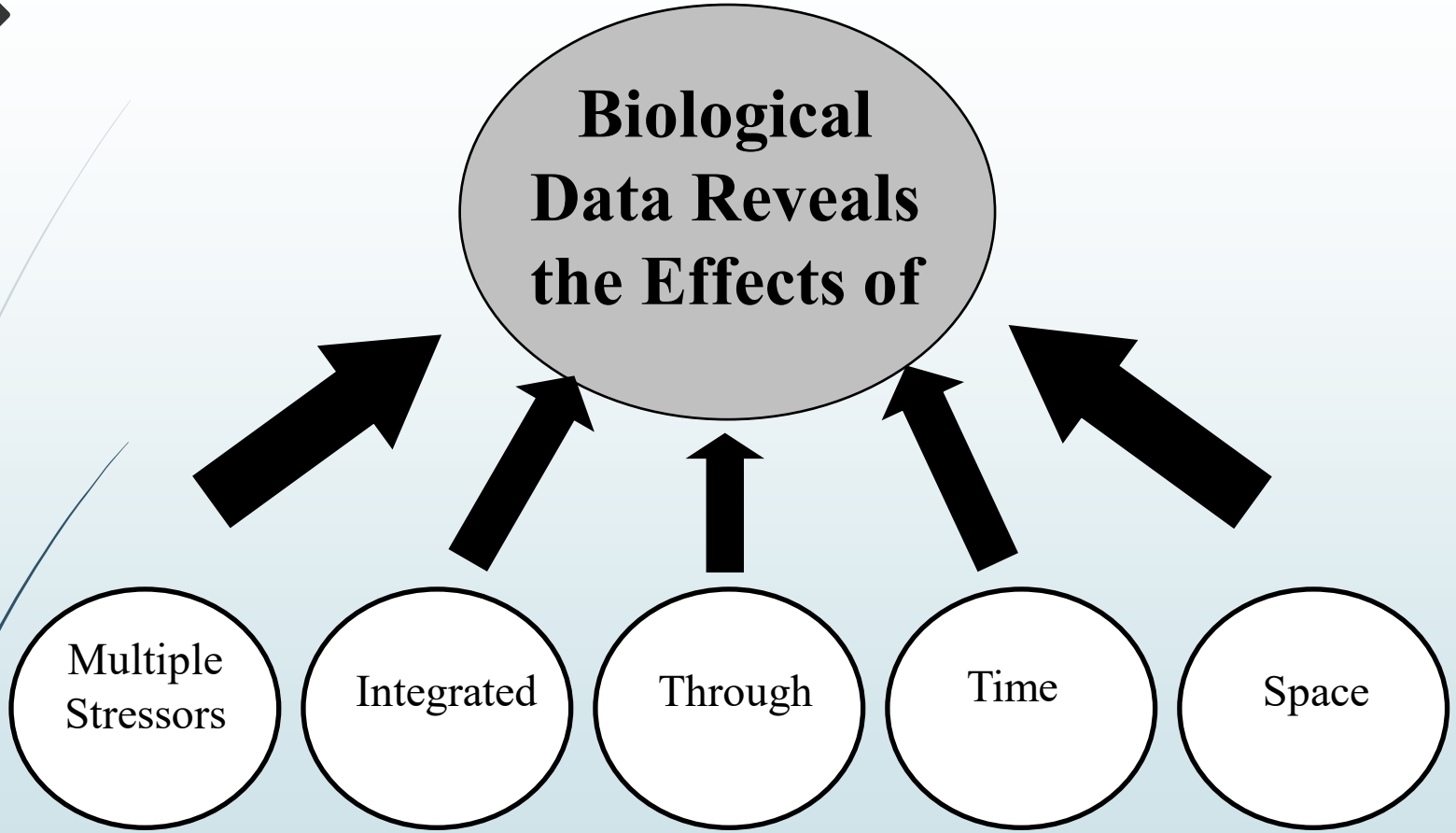
Stock Indexes

Doctors use multiple measures to assess human health

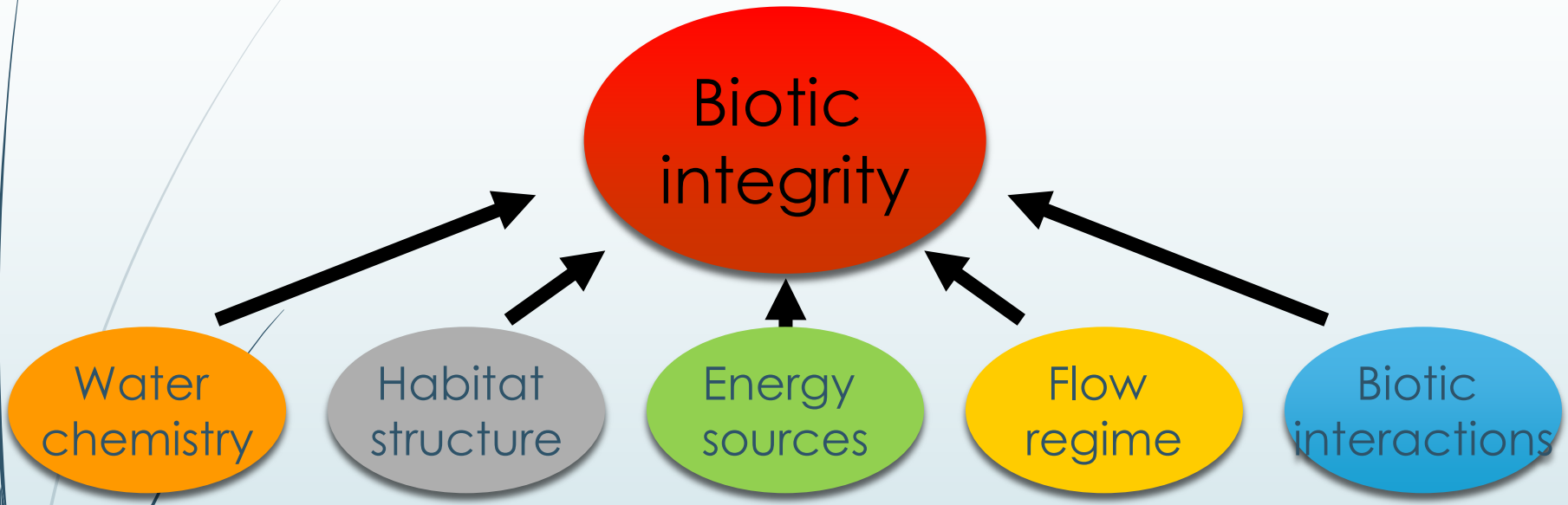
The Index of Biological Integrity (IBI)

- Biologists have developed the IBI as a multiple factor measure to assess the health of streams and wetlands.
- The factors (metrics) that comprise the IBI are measures of different components of the biological community that have been selected based on their ability to reflect human induced changes in the environment.
- The metrics give an indicator of the current health of the wetland, based on the cumulative impacts on the contributing watershed over time.




Biological Data Reveals the Effects of
Multiple Stressors
Integrated
Through
Time
Space

Multiple factors affect biological integrity



D.O.
pH
Turbidity
Hardness
Temperature
Metals
Nutrients
Organics

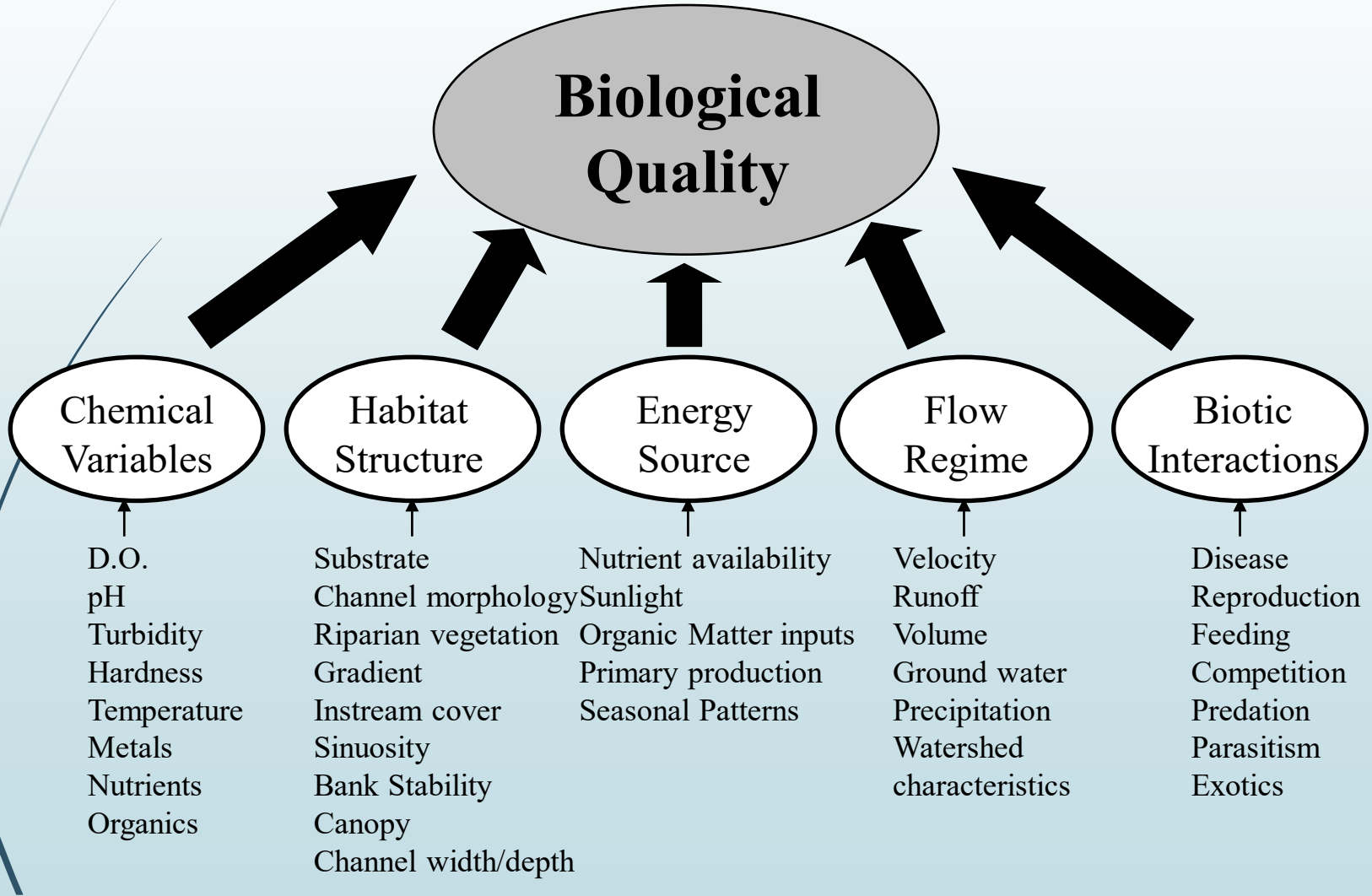
Substrate
Channel Morphology
Riparian vegetation
Gradient
Instream cover
Sinuosity
Bank Stability
Canopy
Channel width/ depth

Nutrient availability
Sunlight
Organic Matter inputs
Primary production
Seasonal Patterns

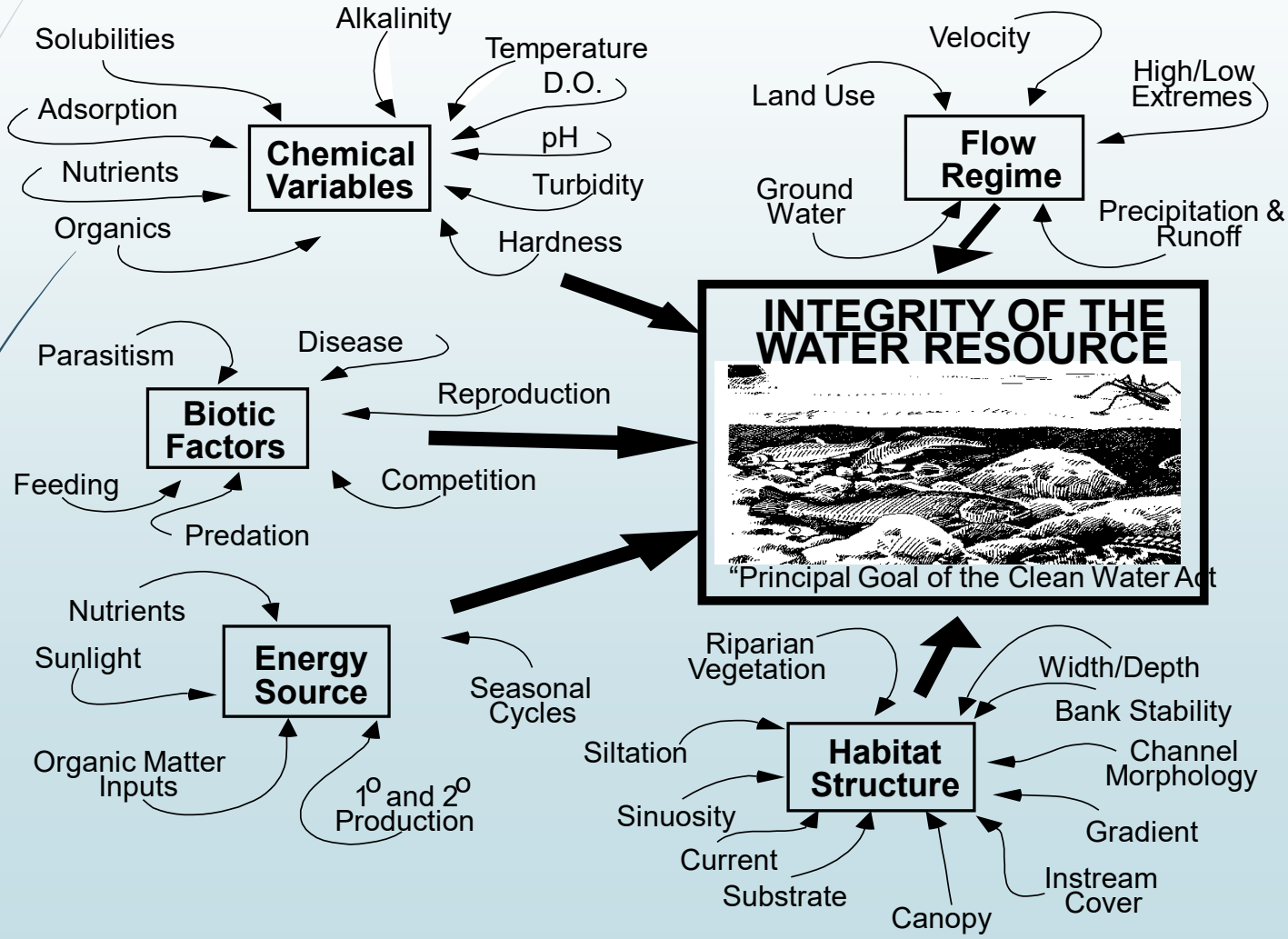
Velocity
Runoff
Volume
Ground water
Precipitation
Watershed characteristics

Disease
Reproduction
Feeding
Competition
Predation
Parasitism
Exotics

The Big Picture



The Five Major Factors Which Determine the Integrity of Aquatic Resources



IBI Metrics

- Taxonomic Diversity (biodiversity)
- Number of Intolerant Groups
- Percentage of Tolerant Groups
- Percentage of Dominant Groups
- Trophic Structure (feeding behavior)
- Individual Health

Invertebrate IBI Metrics

- **Leech Taxa Metric** – Number of kinds of leeches

Invertebrate IBI Metrics

- **Corixidae Proportion Metric** – Ratio of water boatman, to other hemipterans and beetles in the bottle trap sample

Invertebrate IBI Metrics

- **Dragonfly-Damselfly Metric** – Number of kinds of dragonflies and damselflies (odonata)

Invertebrate IBI Metrics

- **ETSD Metric** – Number of kinds of Mayflies and Caddisflies, and the presence of odonata and fingernail clams
- **Snail Taxa Metric** – Number of kinds of snails

Invertebrate IBI Metrics

- **Total Taxa Metric** – Number of kinds of invertebrates

When to sample?

- Invertebrates are sampled in the month of June or early July
  - Samples are taken during this "index period" in order to ensure that the macroinvertebrates are at size that makes them easy to identify
  - This index period also ensures that many of the invertebrates collected spent their lives maturing in the wetland being sampled and did not fly in from another nearby wetland.

Where to sample?

- Invertebrate samples are collected in the shallow, near-shore area not deeper than 3 feet.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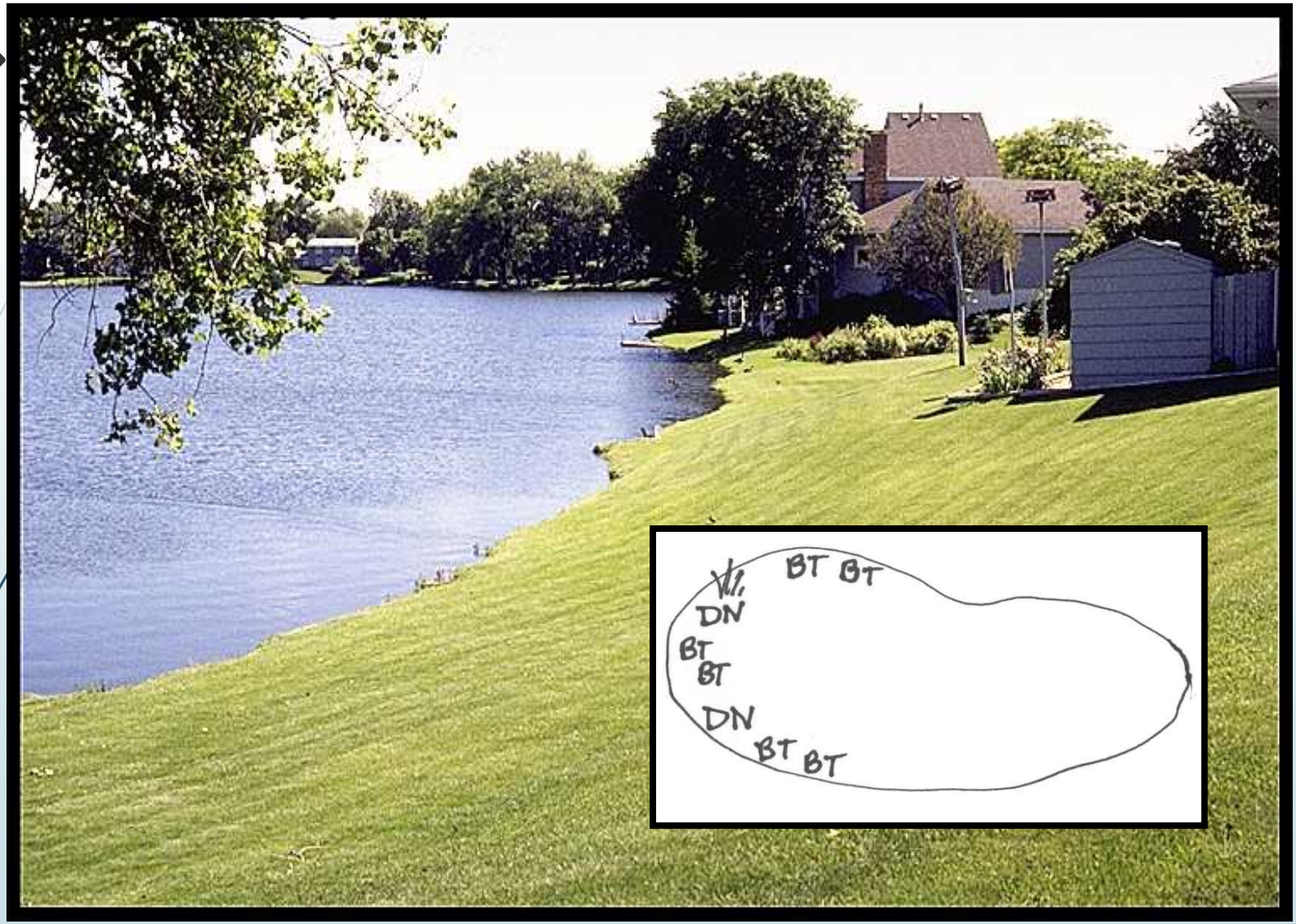
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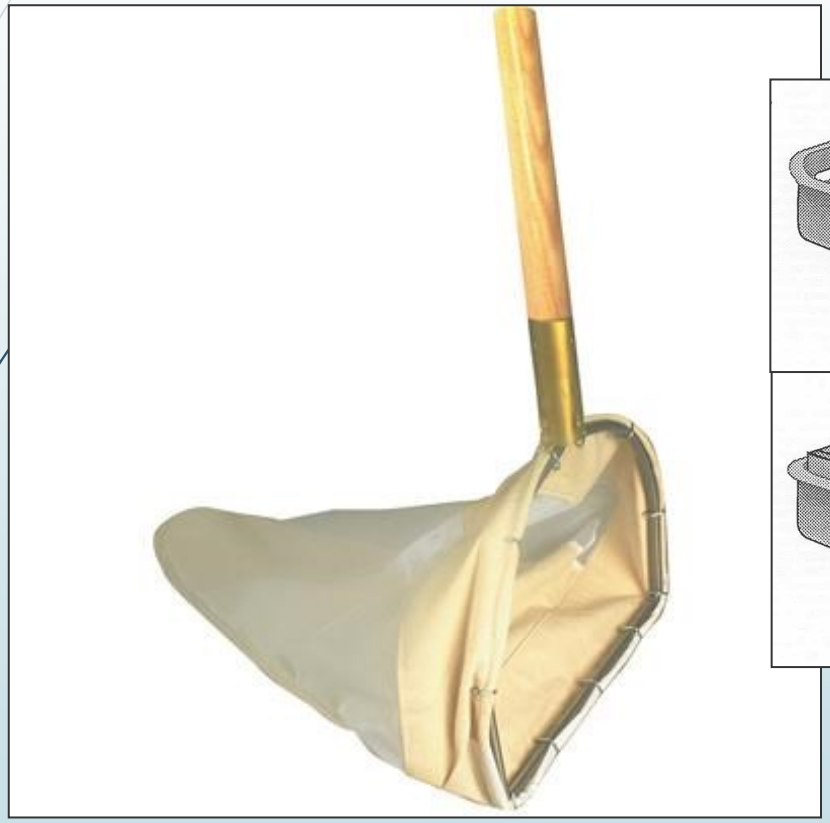
How to sample?

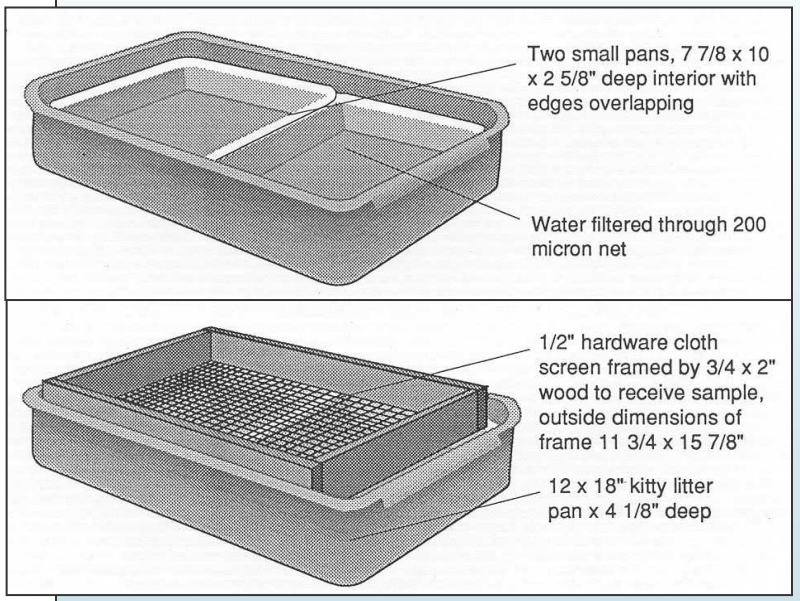
- Dipnet

- Bottle Trap

(activity trap)

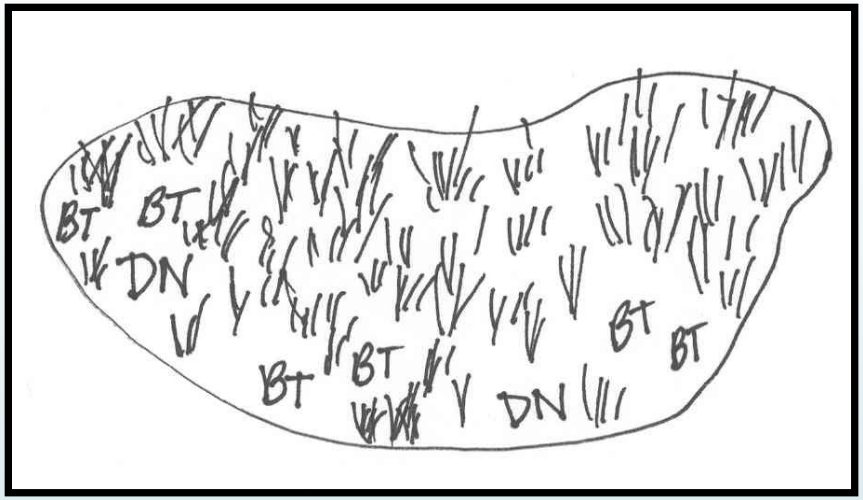
Dipnet Sample - Collection

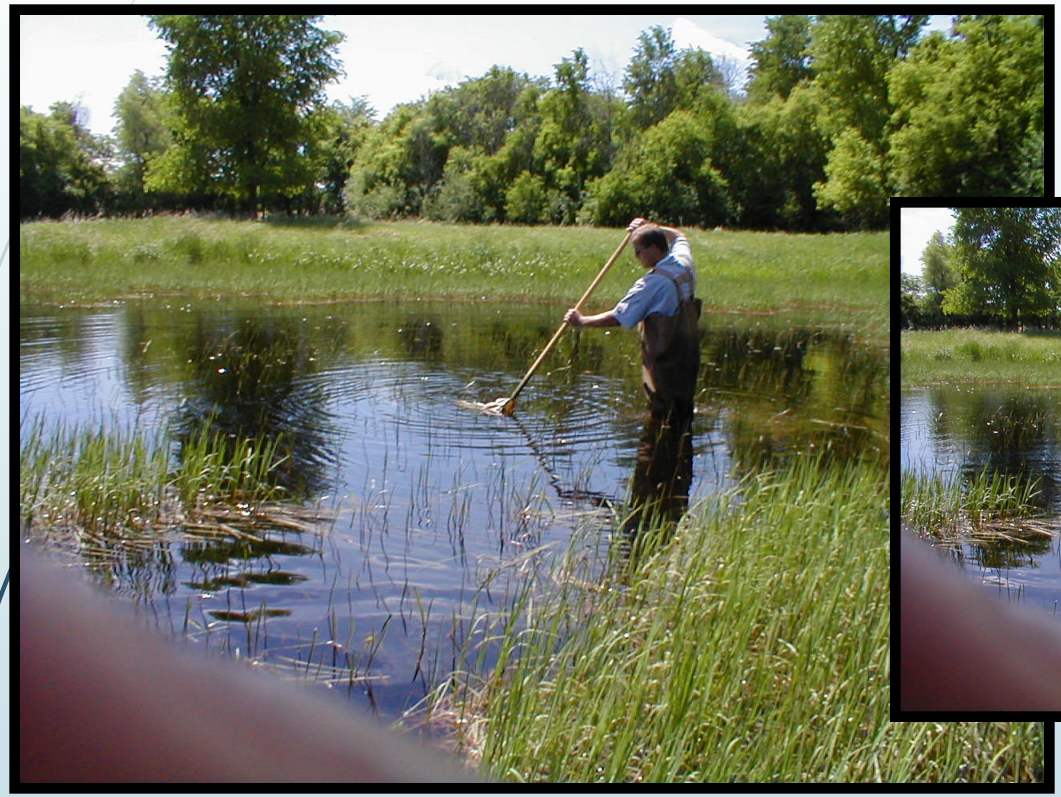




Dipnet Sample - Collection

- Each dipnet sample consists of two dipnetting efforts
- Dipnet in the near shore area in water up to one meter.
- Sample close to the edge and into vegetation.
- Using strong strokes, sweep the dipnet through the vegetation towards your body 3-5 times or until the net is full of vegetation





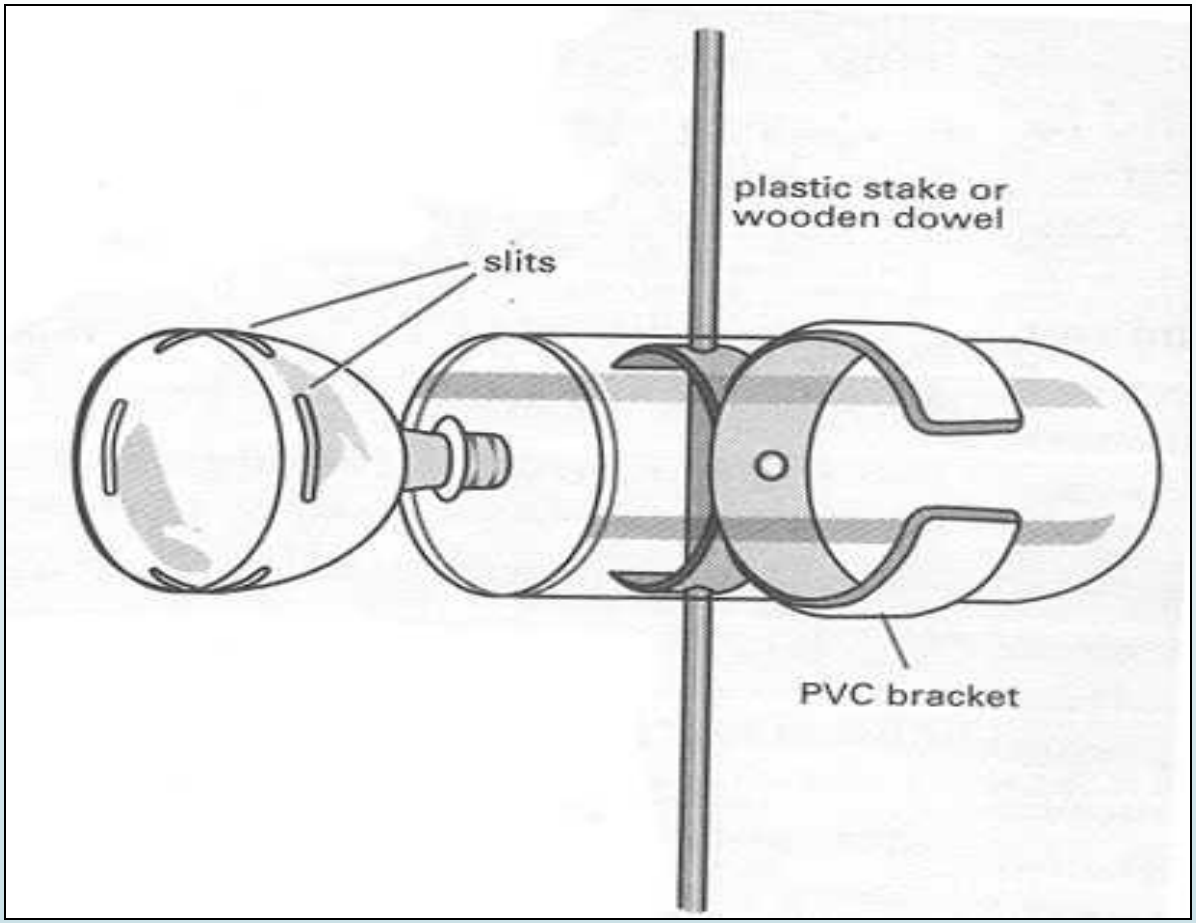
Dipnet Sample - Collection

- Empty the contents of the net on the framed screen.
- Spread the vegetation out, and pour some site water over it.
- Pick through the vegetation for 10 minutes. Remove the vegetation and repeat.

Dipnet Sample - Preservation

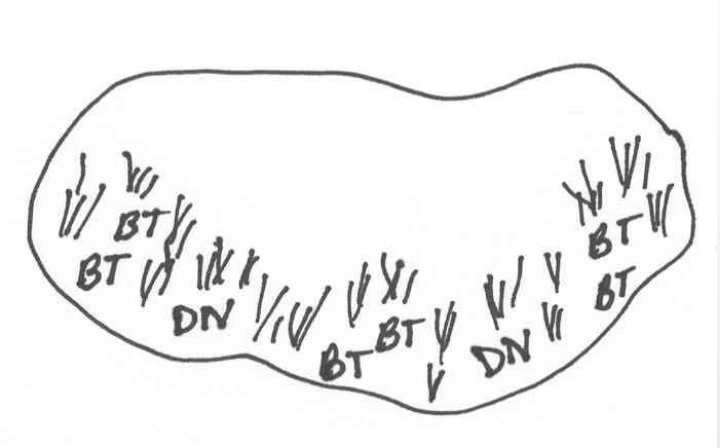
- After the second dipnetting process, empty the contents of the trays into a sieve.
- Backflush the sieve into a sample jar with 95% alcohol.
- If the sample takes up more than a third of the sample jar it should be split between two jars.
- Label the outside and the inside of the jar, using a media that resists alcohol (india ink or pencil)

Bottle Trap



Bottle Trap Sample - Placement

- Place 6 bottle traps along shoreline.
- They should be 6-8 feet apart.
- Depth should vary. At least two should be in shallow water (1 foot or less), the others should be in water 2-3 feet deep



Bottle Trap Sample - Placement

- Bottle traps are set out for 2 nights
- Bottle traps should be place in water horizontally with no air bubbles inside.
- Funnel should be snapped in securely, clamp should be tightened.
- The top of the bottle trap should be 3-5 inches below the water surface.

Bottle Trap Sample - Retrieval

- Collect bottle traps into one to three sample jars.
- Turn the bottle trap in the water until the opening is facing upwards.
- Raise the trap up dowel, remove the funnel, and pour the contents of the trap through a sieve.

Bottle Trap Sample - Retrieval

- Dislodge any critters stuck on the **inside** of the trap.
- Collect each consecutive trap similarly and pour into sieve.
- Flush the sieve a sample jar with 95% alcohol.
- If the bottle trap samples take up more than a third of the sample jar it should be split between two jars.
- Label the outside and the inside of the jar, using a media that resists alcohol (india ink or pencil)