

What is Representativeness, and why are we confused?

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State Water Resources Control Board

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Why am **I** talking about it? Speaker's biosketch

Grew up in **Hebrew**

Teenager in CA in **English**

University days in **Scientese**

(Tri-Lingual and happy)

.....hard time with **Agentese!**

Why am I **talking** about it?

Today's objectives:

- **Make some distinctions**
- **Suggest words to communicate**
- **Try to do some confusion abatement**

Googled it 4/20/06

Found 2,410,000 hits

The hypothesis that people evaluate **probabilities** by **representativeness** ...
by **intuitive statistical heuristic**..

similar effect of the **gambler's fallacy**...

The question of the **representativeness** of the **organizations** is fundamental
...to hold a **Representative town meeting**

Representativeness refers to **judgments based on stereotypes**

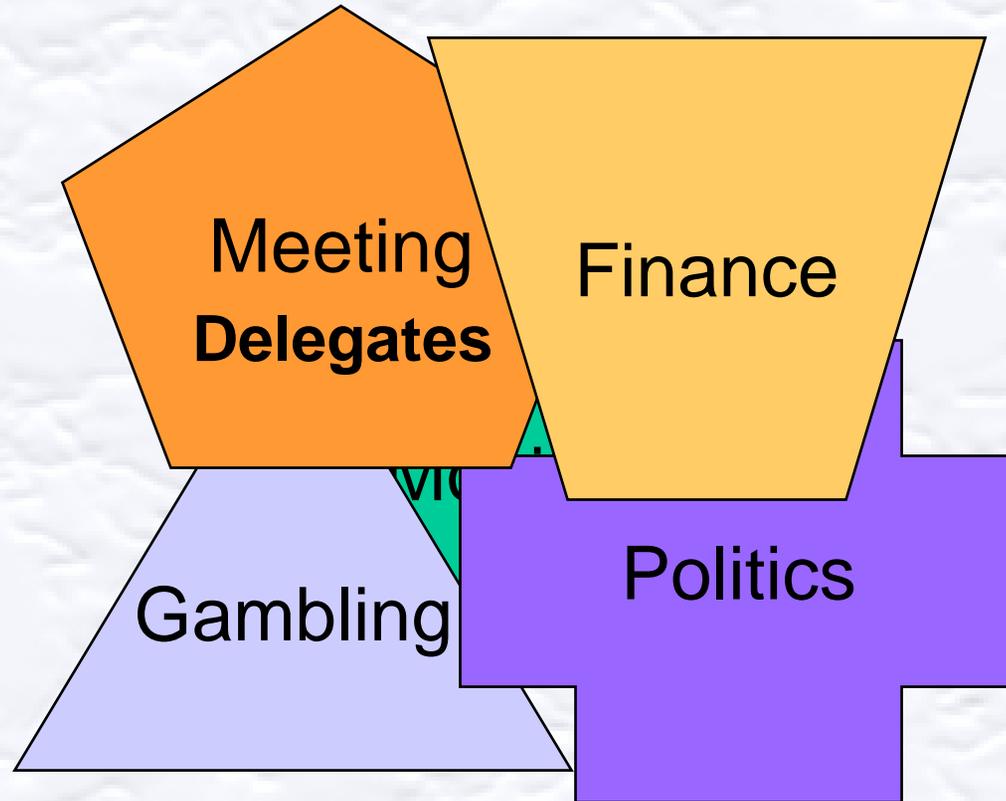
The legal concept of union **representativeness** implies a **process of selection**...

Behavioral **finance, representativeness bias**, overreaction, earnings announcements

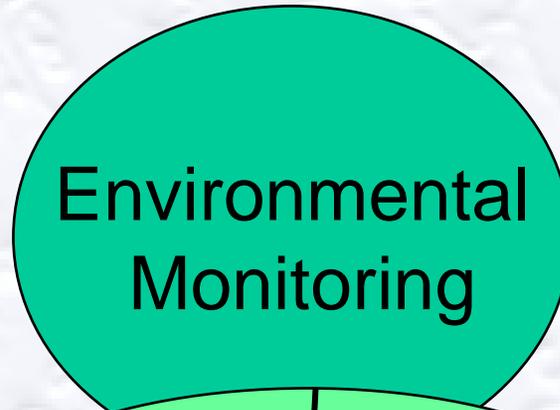
And finally...

..sites that have a '**typical**' **species composition** for the considered ecosystem

Different meanings



Focus: Environmental



Confusion Item # 1:
One sample or many?

Statistical meaning
non-representative 'sample'
= statistically biased

Sample properties
Different meanings for
'Representative sample'

Environmental Monitoring

Many Grabs

One Grab

Confusion Item # 2:

How the sample represents **itself**, versus the environment

'Analytical Quality':

Sample integrity

Lack of contamination

Lack of deterioration

Sample homogeneity

Uniformity of aliquots

The Environment

Representative sample and what it represents in the environment

[next 7 slides]

‘The Environment’: an example



Alameda Creek, April 2006

The Environment

Representative sample
and what it represents
in the environment



Confusion Item # 3:

A representative sample
versus what it represents

How the sample is collected –
e.g., bottle dipped in the **centroid** of
the flow rather than at the edge, so it is
representative of the bulk of the flow

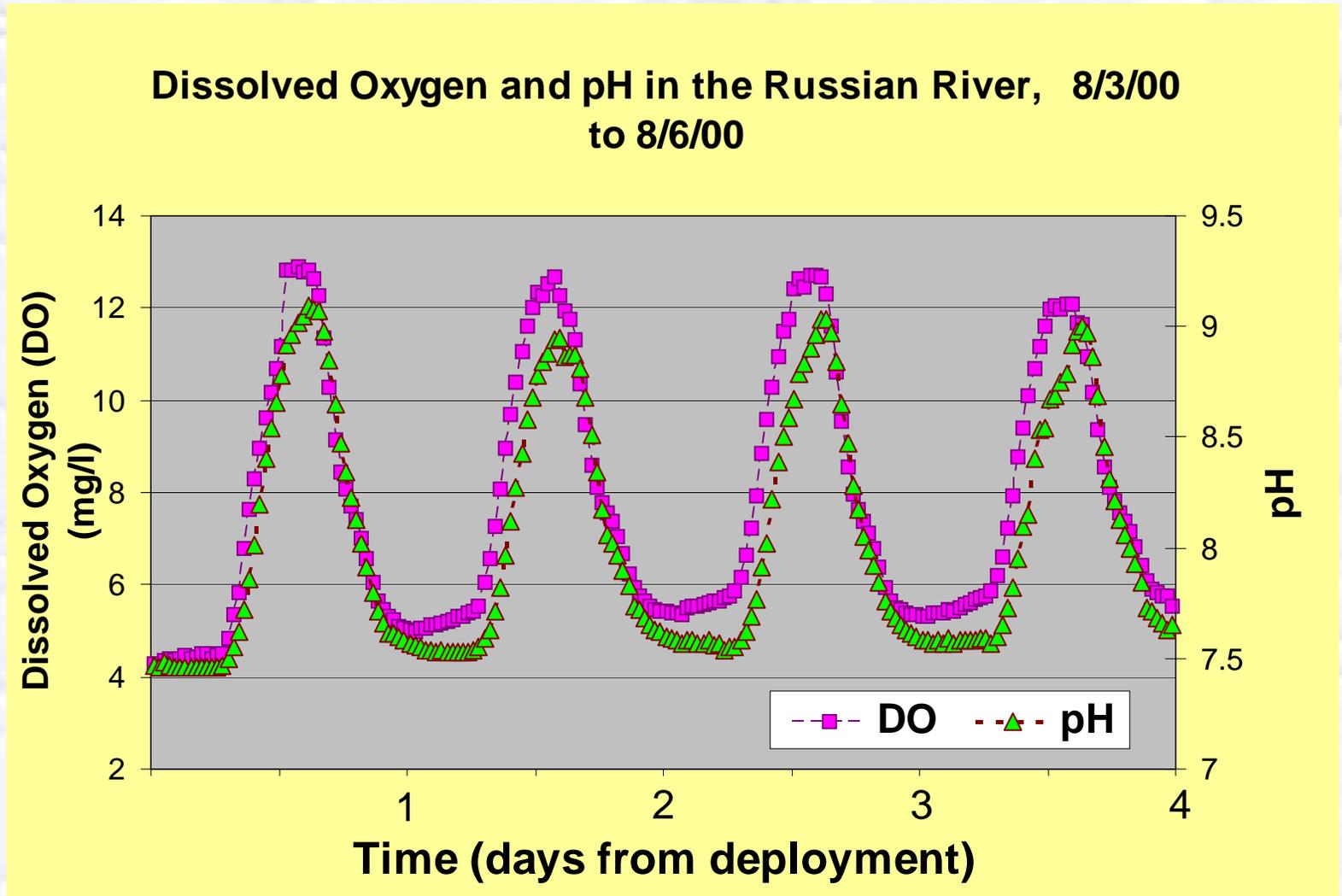
Centroid



**What the sample represents
in the environment** in the
context of inherent environmental
variability [**next slide and later**]

What the sample represents in the environment in the context of inherent environmental variability

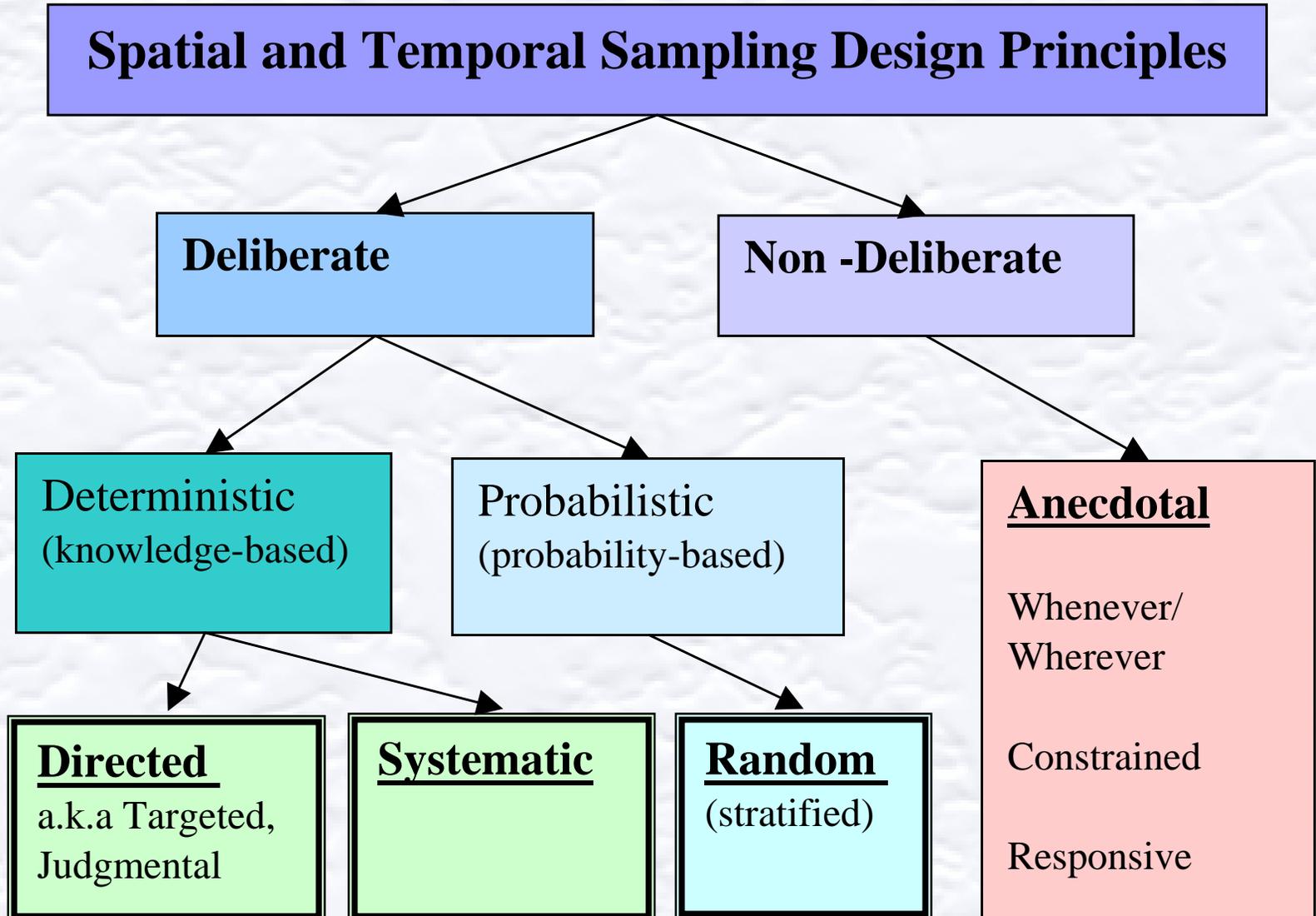
Temporal Variability



What time of day is more representative?

Or - does each time represent something else? What is YOUR intent?

How will you select monitoring location and timing?
In other words, which sampling design principle will you apply?



Useful Words

Spatial descriptors

Station Type : **Creek, Outfall, Ditch**

Station Selection Intent: **Impact assessment, Source ID**

Reach Selection Design: **Systematic, Directed, Random, or Non-Deliberate (Anecdotal)**

Station Selection Design: (same options)

Temporal descriptors

Flow Conditions: **Storm runoff flows (wet) or base flow (dry) weather**

Sample Timing Intent: **Worst case, Snapshot, Routine Monitoring**

Seasonal Sampling Design: **Systematic, Directed, Random, etc.**

Diurnal Sampling Design: **(same options)**

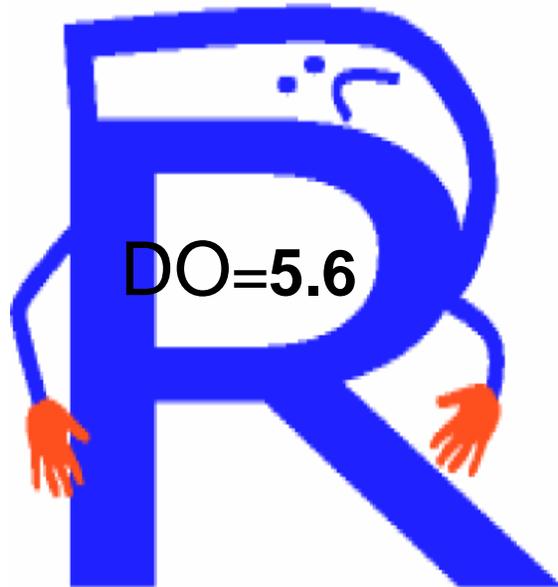
Season of interest: **Summer, Fall**

Applications of these words

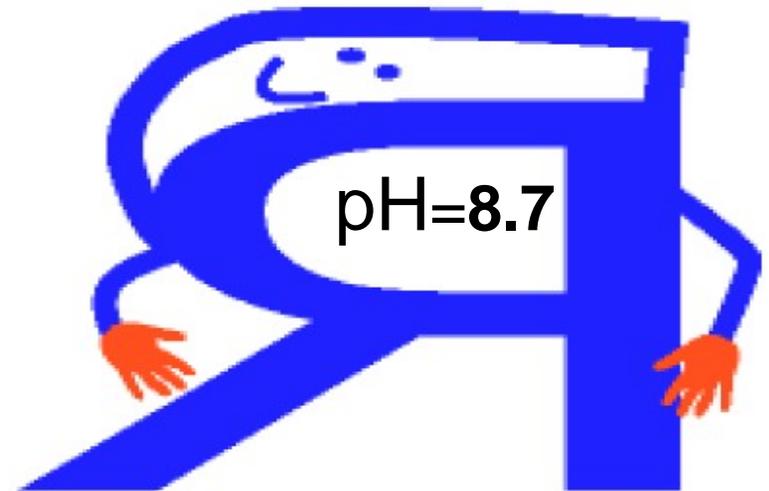
- Training tool to teach the basic concepts of variability;
- Planning tool to hone in on the intent and the design of the study;
- Dialogue tool to solicit feedback from experts;
- Instruction tool to guide Project operators; and
- Communication tool to inform data users what each result represents in the environment.

Let Monitoring Results Speak for Themselves!

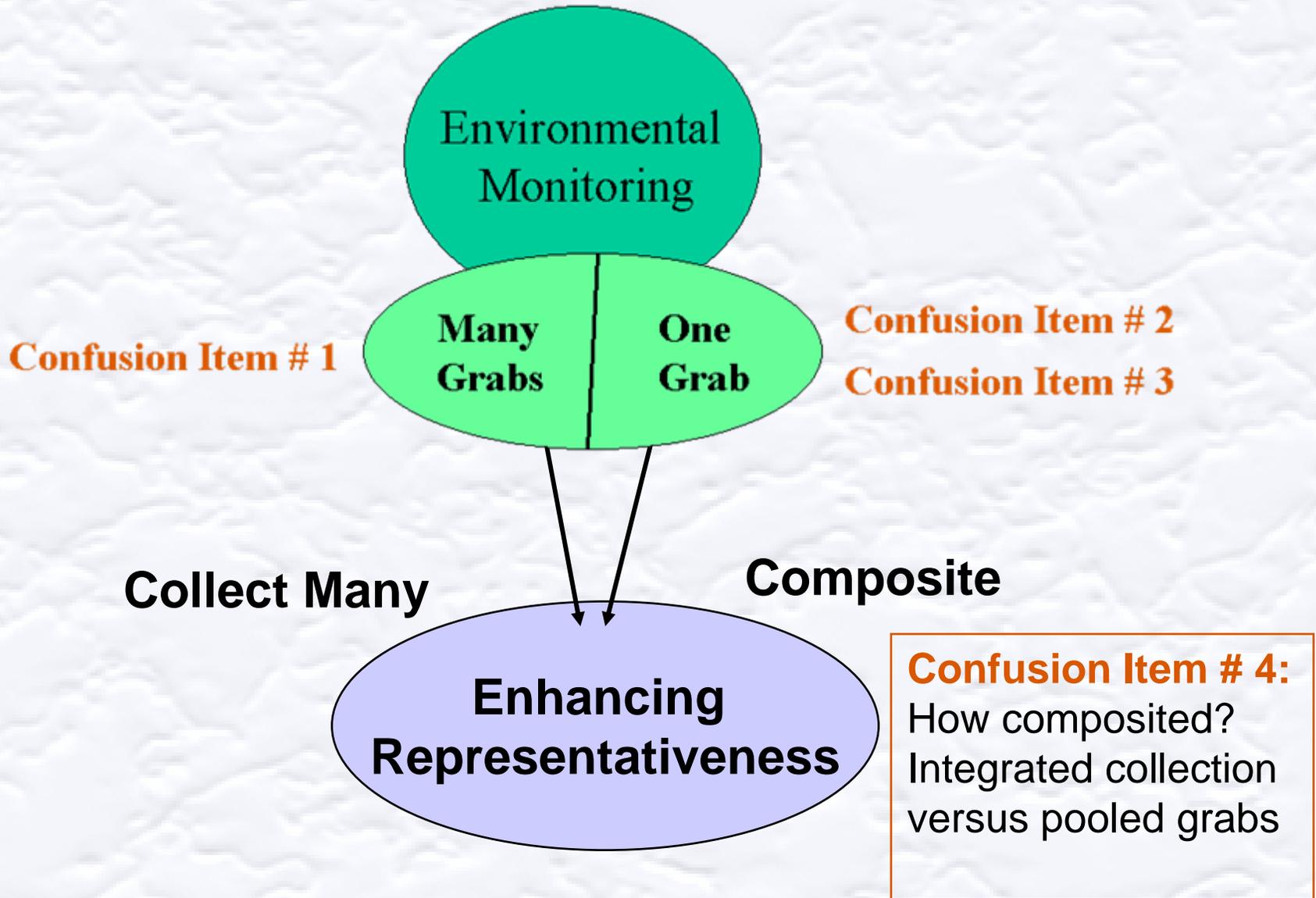
I *am* the worst case scenario

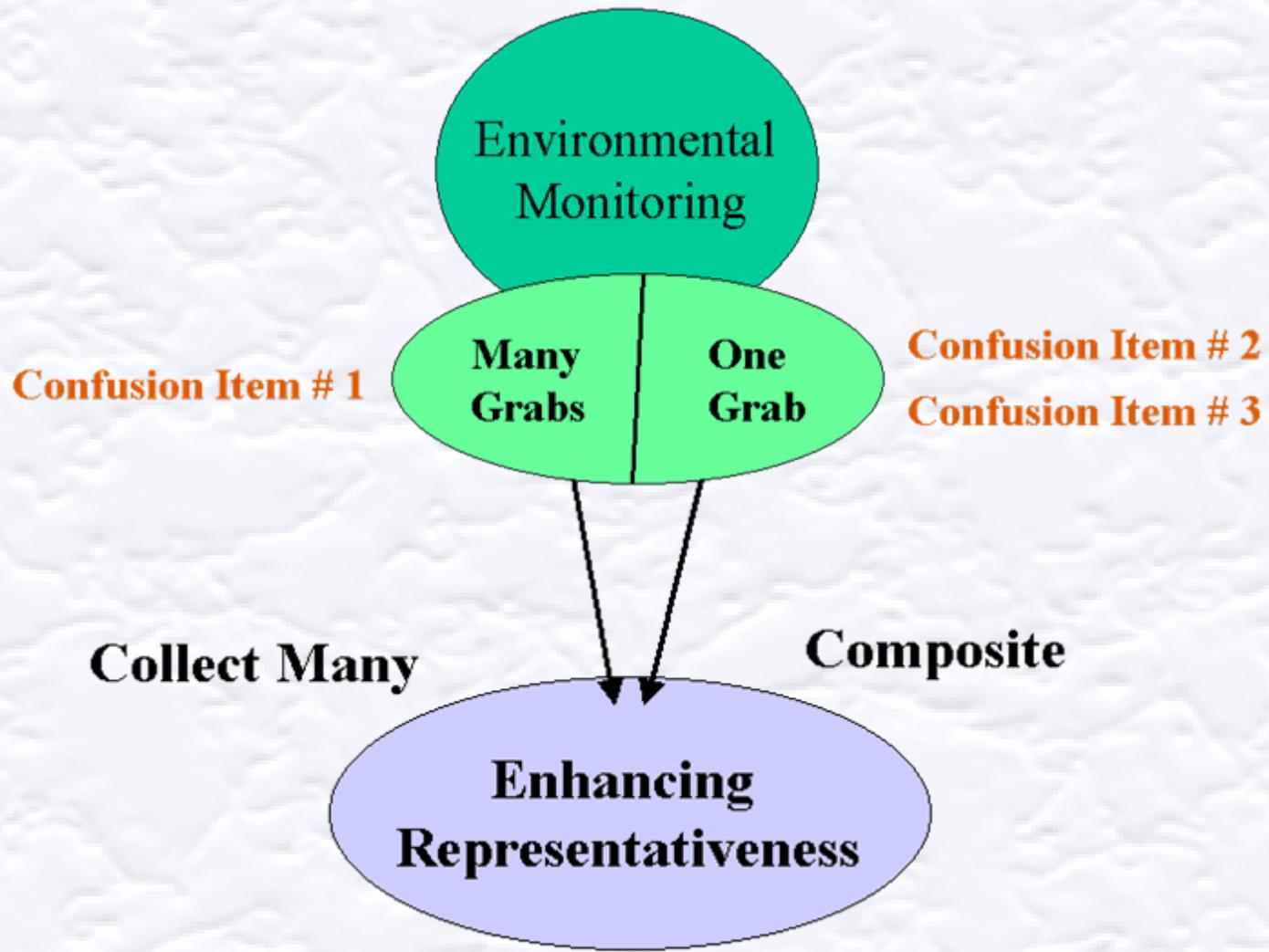


I have been collected in a stagnant ditch at 14:00



Back to Representativeness...





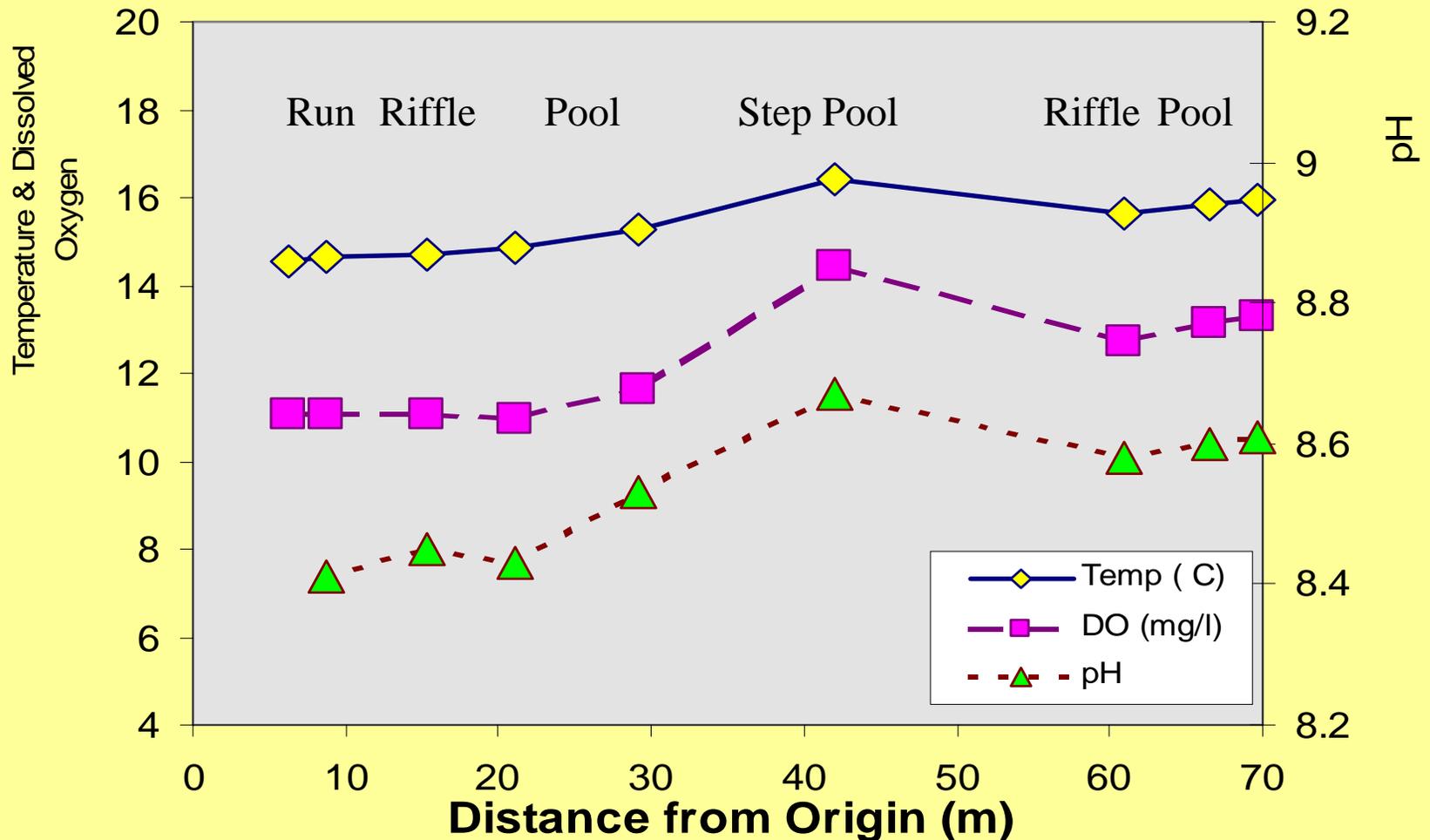
Bonus Confusion Item!

What the sample represents in the environment in the context of inherent environmental variability

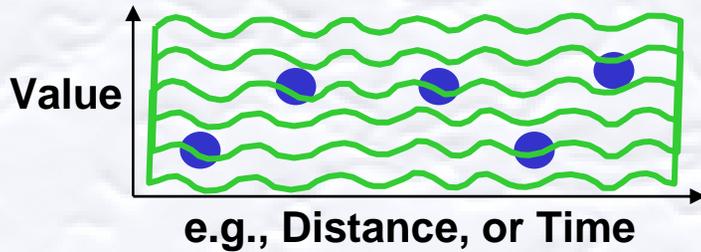
Spatial Variability

Wildcat Creek Walk 6/22/03 10:45 - 12:00

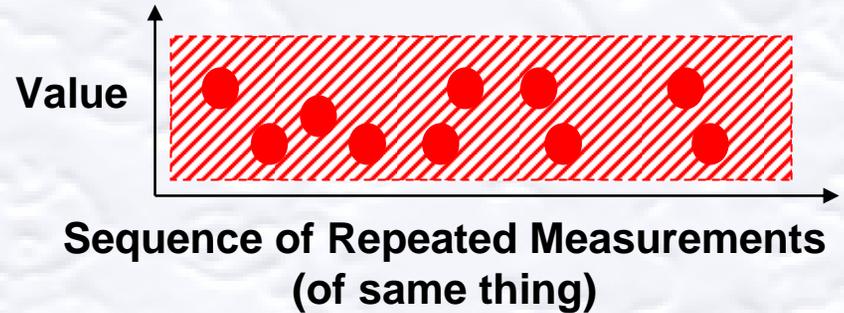
The Monitoring Team walked upstream, and stopped at the different habitats to take measurements



Inherent Variability (Field Variability)



Measurement Precision Error (Lab Variability)



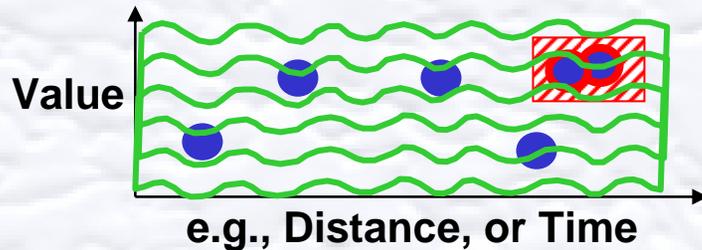
 = One Grab Sample

 = Repeated Measurement (Rep, Dup)

 = Environment

 = Error Range,
e.g., Lab Control Chart

Do... (w field measurement or Sample)



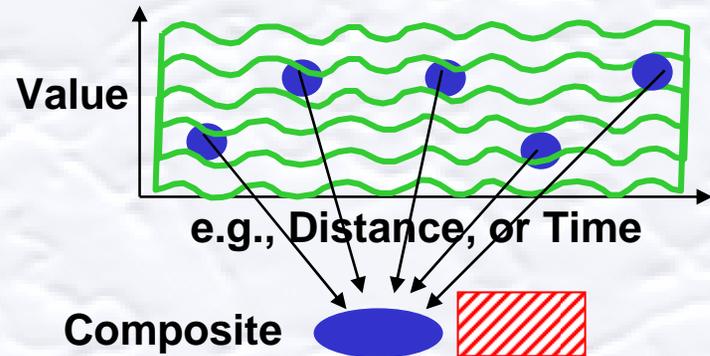
Do.... Collect as many individual samples as you can, and analyze separately!

Collect paired samples often (at the same time and place), and calculate measurement precision.

You will know both:

- + the measurement error
- + and the inherent variability

Or... (w Sample only, if less \$\$)



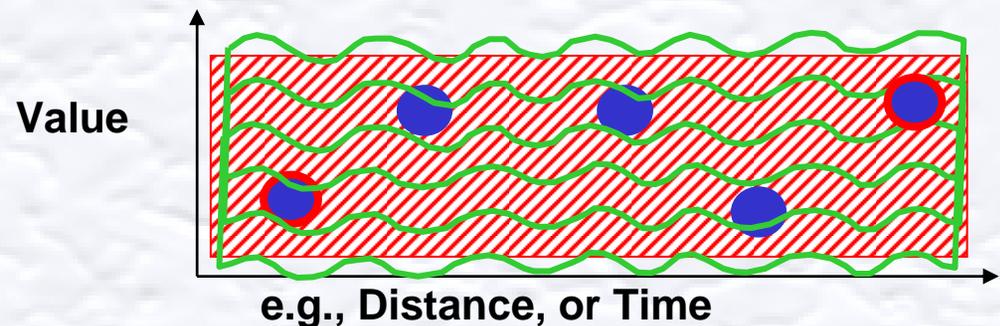
Or.... Create a composite sample and analyze it (preferably in two lab reps). Calculate or apply lab measurement precision. You will know:

- + the measurement error
- But not the inherent variability

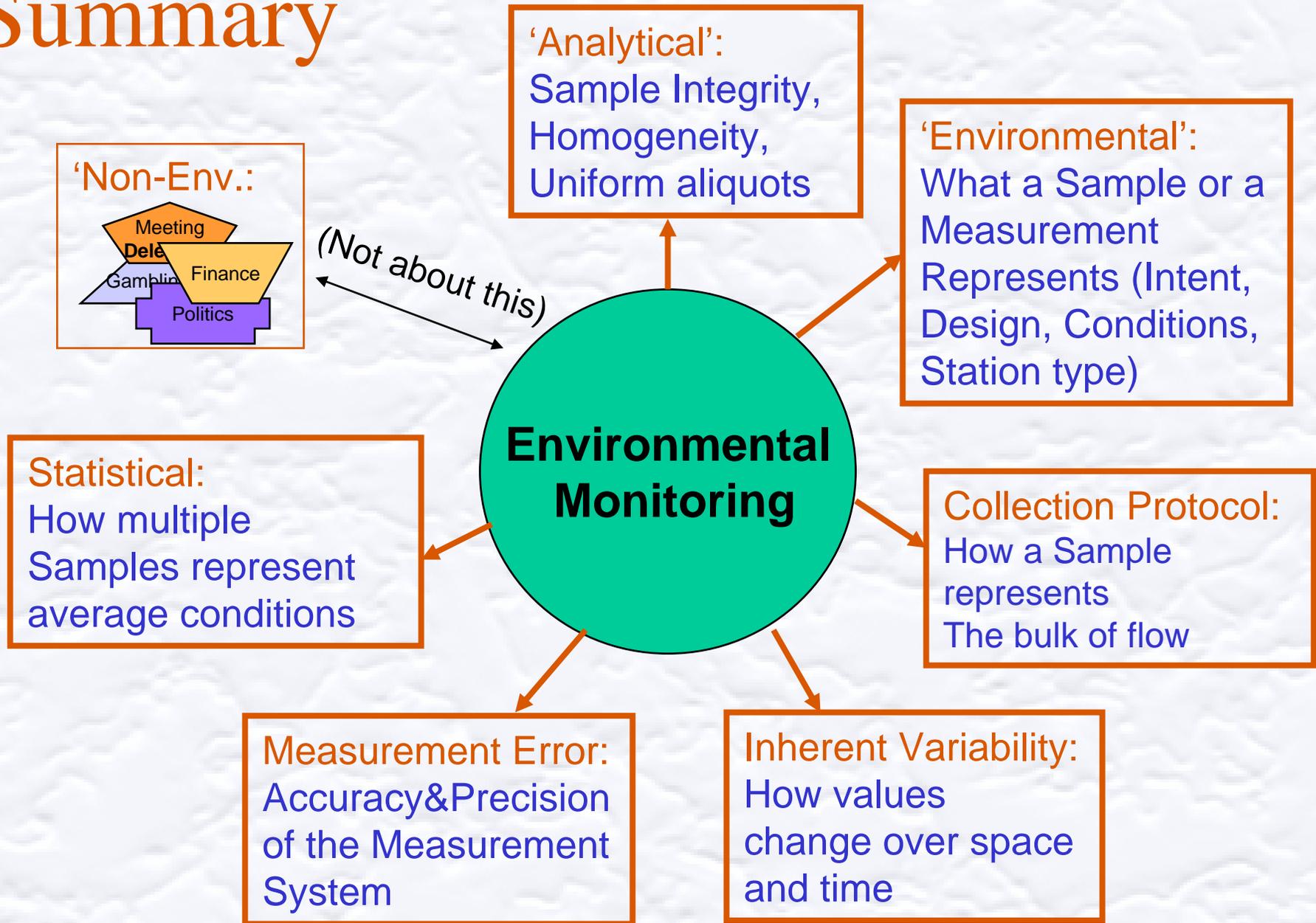
But Please Don't Lump Inherent Variability with Measurement Error

If your individual samples are used as repeated measurements to calculate measurement precision, you will **NOT** know either:

- the measurement error
- Or the inherent variability



Summary



Thanks for Listening! You...

Knew it already? I hope it was
good to meet a kin spirit.

Learned something useful?
Welcome!

Feel like I have just opened...

A can of worms? My apologies...

But there is help!

SWAMP Field Modules,
(check out Common Element C)
<http://unexdlc.ucdavis.edu/cfmxDLC/demos/swampFT/index.html>

Clean Water Team
Guidance
(check out DQM-IP-8.2.4)
<http://www.waterboards.ca.gov/nps/cwtguidance.html>

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