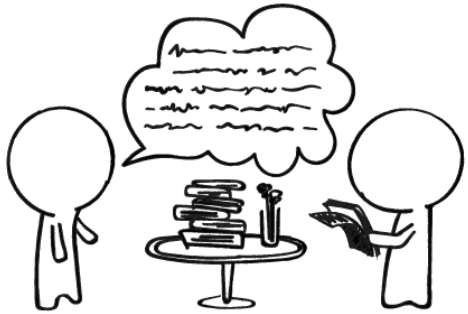
ADVANCING KNOWLEDGE AND STEWARDSHIP OF FRESH WATER SYSTEMS THROUGH RESEARCH, EDUCATION, AND RESTORATION

Monitoring Planning & Design

Most monitoring problems reflect of the failure to define

a **focused goal** or a **specific question,**

not bad data or poor methods



Clean Water Act - 1972

Choices & Decisions

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Safe Drinking Water Act - 1974

Choices & Decisions

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Delaware River Watershed Initiative

Choices & Decisions

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Delaware River Watershed Initiative

Theory of Change: More Clean Water

Choices & Decisions

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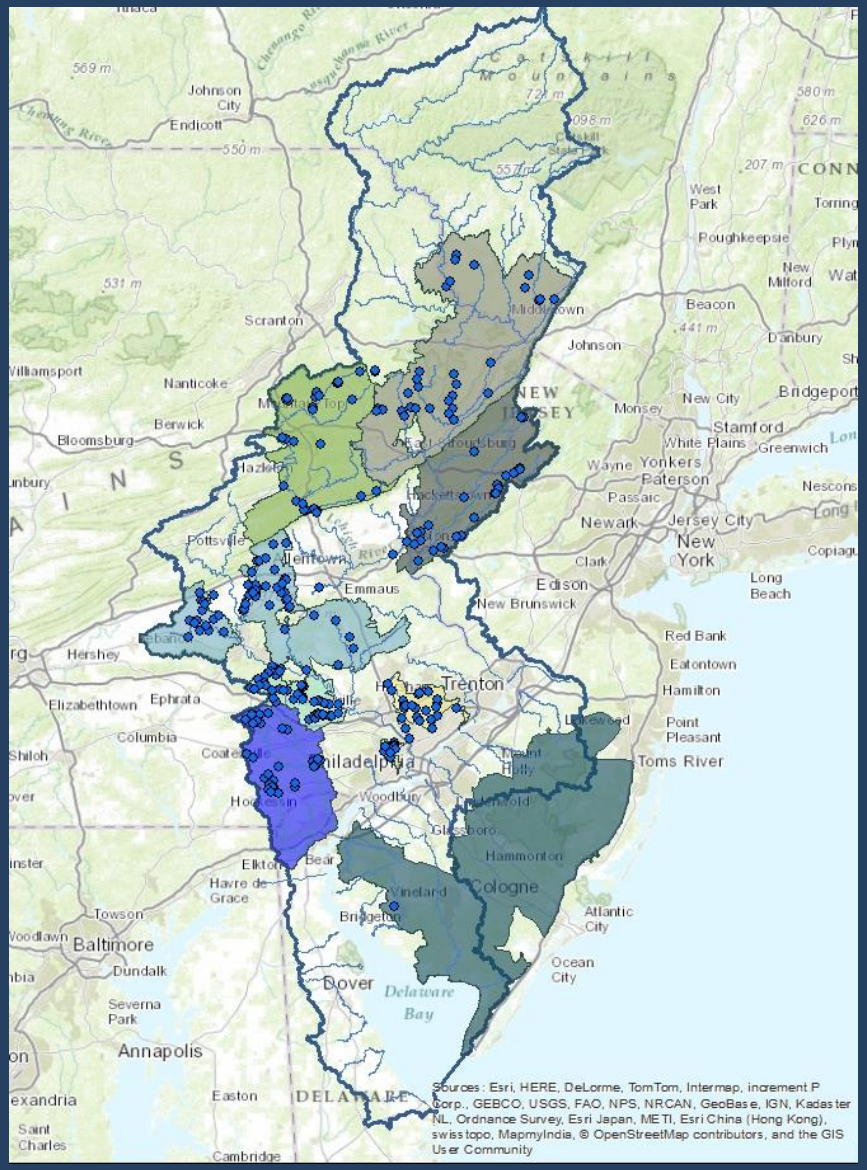
SCALE OF DRWI MONITORING

Where is the work being done?

2013-2015

- Integrative sites: 35
- Project sites: 57
- ANS research sites: 74
- ANS sampling events: **1000+**
- *Partner group sites: 200+*



MONITORING PARTNERS

Non-profits, Local Government, Universities

Upper Lehigh

Wildlands Conservancy
Moravian University

Poconos-Kittatinny

TNC (PA)
North Pocono CARE
Brodhead W.A.
East Stroudsburg Univ.

NJ Highlands

TNC (NJ)
Musconetcong W.A.
Wallkill River W'shed Mgmt. Group

Middle Schuylkill

Schuylkill Action Network
Miller Environmental
Stroud Water Research Center
Berks County Conservancy

Citizen Scientists

Students
Volunteers

Philadelphia

Tookany-Tacony Frankford W'shed Partnership
Wissahickon Valley W.A.
Lower Merion Conservancy
Pennypack Ecological Restoration Trust
Friends of the Poquessing
Villanova Univ. & Temple Univ.

Schuylkill Highlands

Green Valleys Association
French & Pickering Creeks Cons. Trust
Hay Creek W.A.
Berks County Conservancy
Chester County Water Resources Auth.
Stroud Water Research Center

Kirkwood-Cohansey

Association of NJ Env. Commissions
NJ Audubon
Pinelands Preservation Alliance

Brandywine-Christina

Stroud Water Research Center

THE ACADEMY
OF NATURAL SCIENCES
of DREXEL UNIVERSITY

Monitoring Planning & Design

Choices & Decisions

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Monitoring Planning & Design

Choices & Decisions

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Monitoring Planning & Design

Monitoring is generally not

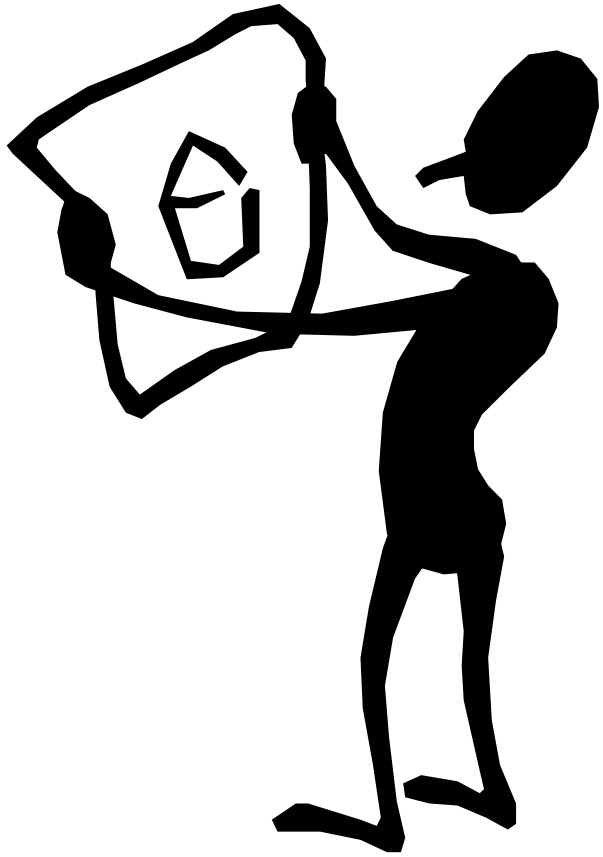
a primary goal or purpose,

but is generally done in support of

a primary goal or purpose

Monitoring Planning & Design

Monitoring – to observe and check the progress or quality of (something) over a period of time.



Monitoring – Keep under systematic review.

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Monitoring Planning & Design

Monitoring is about

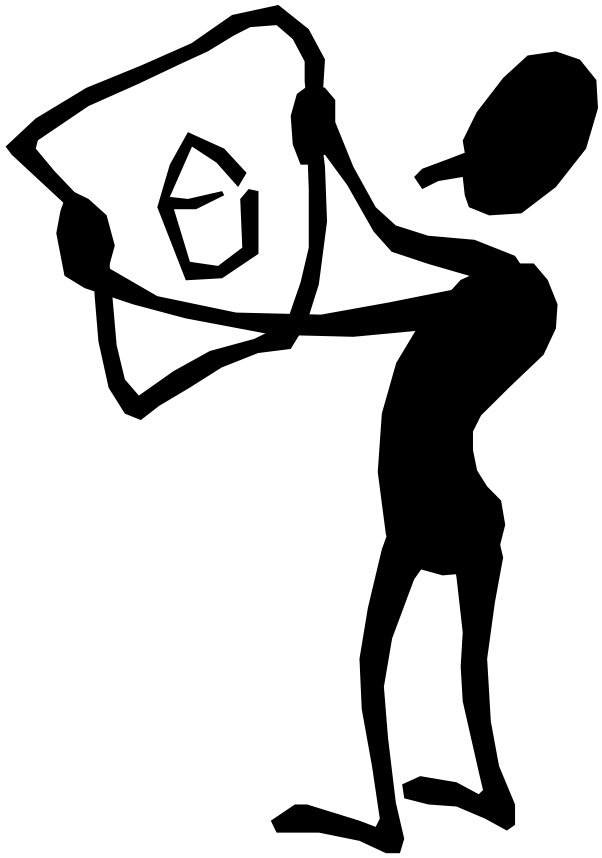
evaluating

progress toward a **goal**,

or

answering a **specific**

question



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Monitoring Planning & Design

The challenge is defining

a focused **goal** or a **specific question**

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Monitoring Planning & Design

The challenge is

defining a focused **goal** or

a **specific question**

Goal or **Question** defines – **Why** are you going to do all of this work, and **What** you are going to measure?

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Swimmable

Drinkable

Fishable

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QUALITY
QUANTITY

Monitoring Planning & Design

Examples of Goals & Questions:

Goal: to reduce pollution – restoration

Goal: to prevent pollution – preservation

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Monitoring Planning & Design

Examples of Goals & Questions:

Question: Where are streams polluted?

Question: How degraded are streams?

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Monitoring Planning & Design

Goal: to prevent pollution – preservation

- What chemical pollutants are being prevented?
- How much of a pollutant change is acceptable – 0%, 10%...?
- As a biological variable being protected?
- How much of a biological change is acceptable?

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Goal: to reduce pollution – restoration

- What chemical pollutants are to be reduced?
- How much of a pollutant reduction is predicted or needed – 25%, 50%...?
- Is there a the biological response desired?
- How much of a biological response is expected – delist an impaired stream, wild trout?

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Examples:

Goal: to reduce pollution – restoration

Goal: to prevent pollution – preservation

Question: Where are streams good?

Question: Where are streams bad?

It is all about the details!

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Project Planning & Design

- What is the goal of this project?
- Can that goal be achieved?
- Can that goal be quantified?
- Timing of project execution?
- Can progress toward goal be measured, with intermediate steps?

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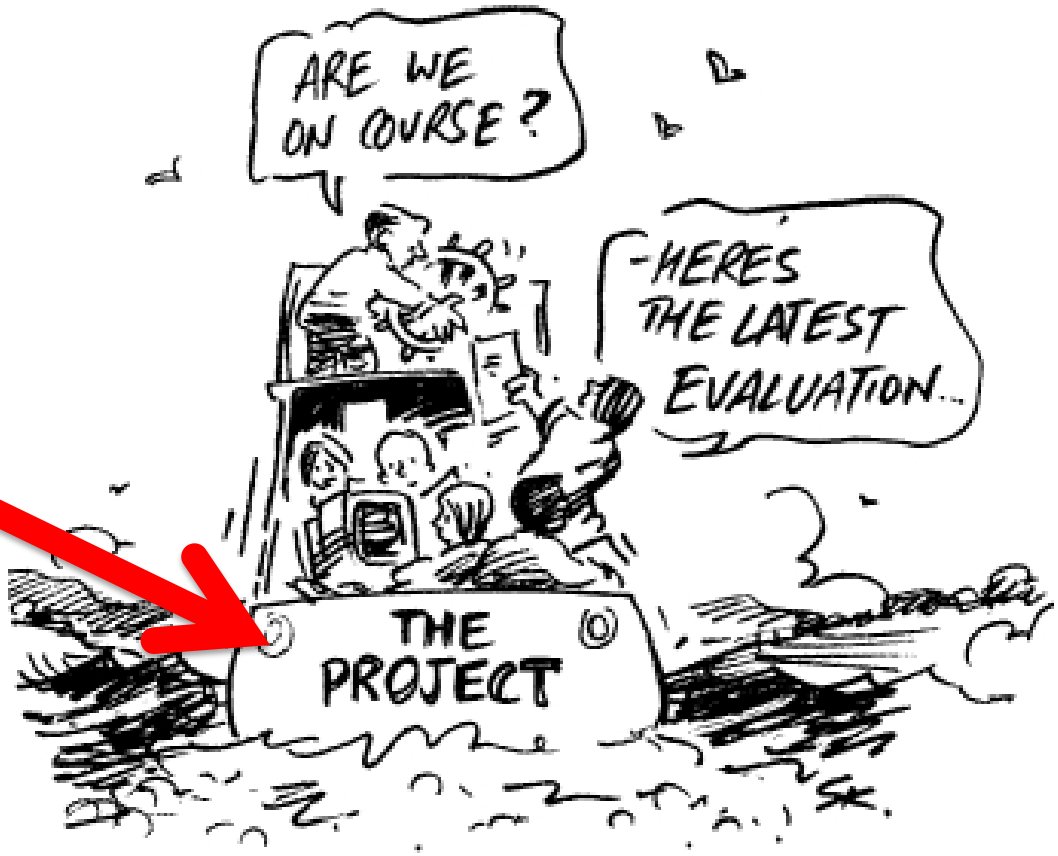
To monitor - Observe and check the progress or quality of (something) over a period of time

“WHY”



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Drinkable

Fishable

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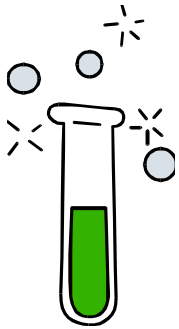
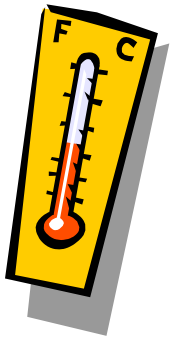
Measuring Progress

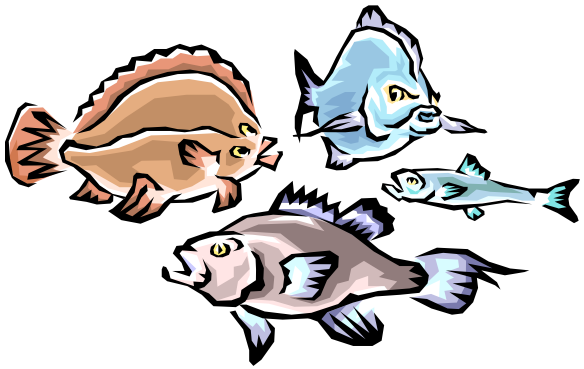
Chemical



Physical



Biological



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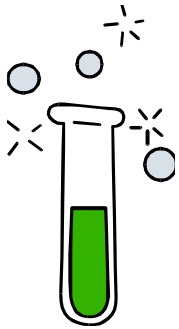
Measuring Progress

Chemical



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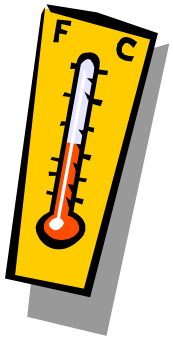

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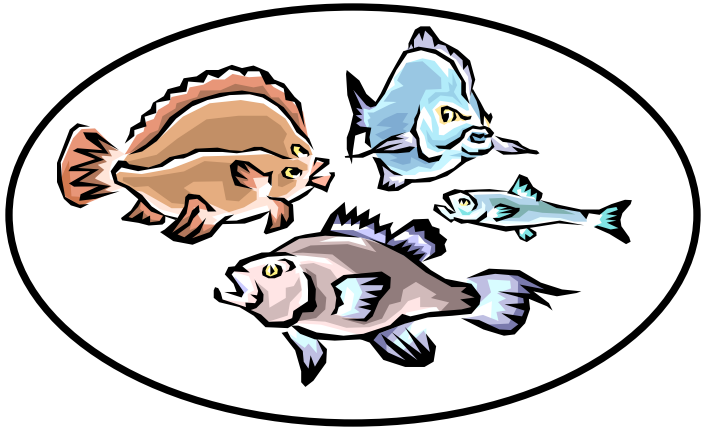

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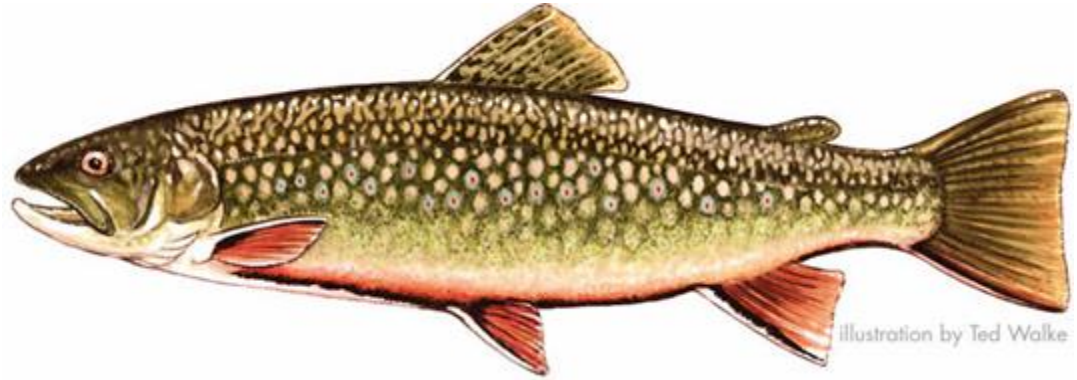

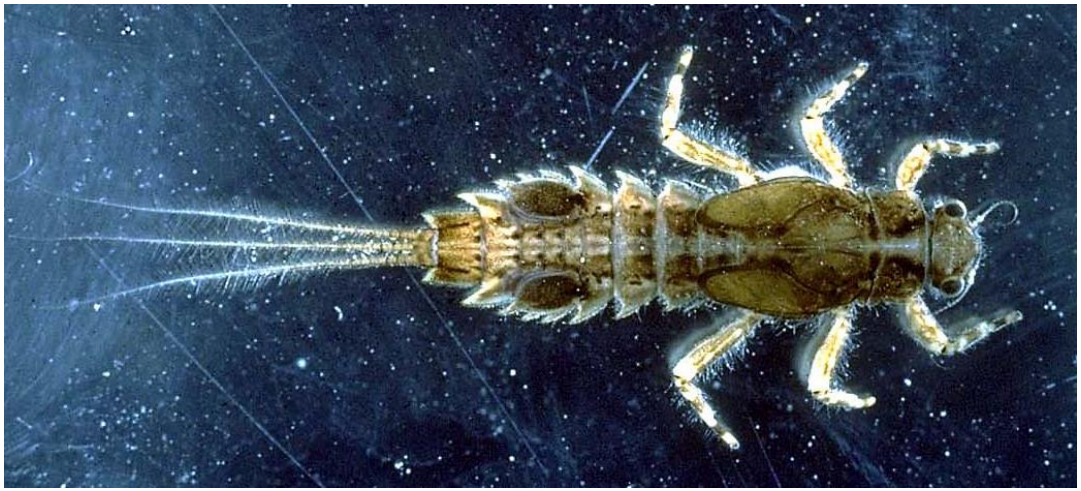

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Three tier approach

The three-tier approach to data collection allows the Academy to easily organize the vast DRWI dataset based on method of collection (ex. who, with what).

Tier	Chemistry	Chemistry Lab	Macro-invertebrate Sampling, ID level	Fish Sampling	Habitat Assessment
1	ANS or other designated lab, YSI sonde	Low detection levels	Surber sampler Genus/ species	Quantitative, multiple pass depletion sampling	EPA WSA, Habitat Index, Riparian Index
2	Hach kit or other kit; non-designated lab	Higher detection levels	Kick nets Family	Single-pass, trout presence/ absence	Habitat Index
3	Hach kit or other chemistry kit	No laboratory analysis	Kick nets Family, order	None	Habitat Index, None

Monitoring Planning & Design

Choices & Decisions

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Three tier approach

The three-tier approach to data collection allows the Academy to easily organize the vast DRWI dataset based on method of collection (ex. who, with what).

Tier level reflects data collection methods, not who collected the sample.

A group could collect at Tier 1 for water chemistry and Tier 2 or 3 for macroinvertebrates).

Monitoring Planning & Design

Most monitoring problems reflect of the failure to define

a **<u>focused goal</u>** or a **<u>specific question,</u>**

<u>not</u> bad data or poor methods

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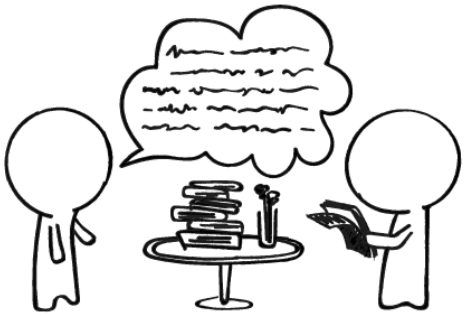
Monitoring Planning & Design

Data quality and collection methods (i.e., Tiers 1, 2, 3) are defined by the **<u>focused goal</u>** or **<u>specific question</u>** the data are, by design, to address



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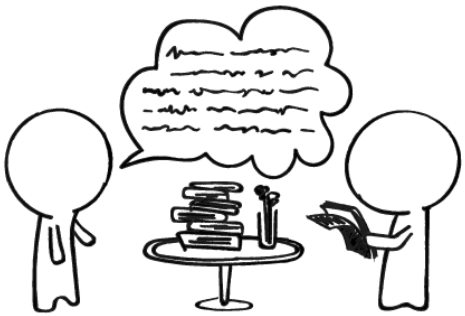
Monitoring Planning & Design

What do you want or need the monitoring/data to do?

Is that possible and reasonable?



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Challenge from William Penn Foundation:

To increase the impact of volunteers in the effort to collect and interpret data.

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Maximize data impact through Partnerships

Tier 1

Tier 2

Tier 3

Questions that determine data needed

What types of data are needed?

How good do the data need to be?

How do you get those data?

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Questions that determine data needed

What types of data are needed?

- Physical, chemical, biological
- Goals of project designed to change …

Swimmable

Drinkable

Fishable

What types of data are needed?

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Questions that determine data needed

How good do the data need to be?

- Meet specific protocols/requirements

Questions that determine data needed

How do you get those data?

- Can you collect it yourself (Tier, 1, 2, or 3)?
- Can volunteers partner with professionals?
- Can professionals partner with volunteers ?

Professionals
Volunteers, &
Everyone In-between

Partnerships

Tier 1

Tier 2

Tier 3

Questions that determine data needed

What types of data are needed?

- Physical, chemical, biological
- Goals of project design to change …

How good do the data need to be?

- Meet specific protocols/requirements

How do you get those data?

- Can you collect it yourself (Tier, 1, 2, or 3)?
- Can you partner with professionals?
- Can professionals partner with you?

Project Planning & Design

Fishable (aquatic life)

- Goal: Improve stream macroinvertebrate community
- Goal: Restore cold-water fish community

Drinkable (consumption)

- Goal: Protect drinking water quality in stream or reservoir

Swimmable (recreation, direct contact)

- Goal: Reduce bacteria, nutrient, and sediment load to downstream reaches

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Project Planning & Design

Fishable (aquatic life)

Goal 1: Improve stream macroinvertebrate community (increase pollution-sensitive species)

- Effort 1: Reestablish or improve riparian/stream-side forest (temperature, nutrients, sediments, toxins)
- Effort 2: Implement upland BMPs (farm or barn practices) to reduce pressure on riparian zone.
- Effort 3: Reconnect with higher quality landscapes (stream corridor connections)

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Project Planning & Design

Fishable (aquatic life)

Goal 2: Restore cold-water fish (all species, all trout or Brook trout) community (assume instream habitat is adequate or will self improve)

Effort 1: Reestablish or improve riparian/stream-side forest (temperature and sediments)

Effort 2: Implement upland BMPs (farm or barn practices) to reduce pressure on riparian zone

Effort 3: Reconnect with higher quality landscapes (stream corridor connections)

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Project Planning & Design

Drinkable (consumption)

Goal 3: Protect drinking water quality (taste, color, smell, pathogens) in stream or reservoir

Effort 1: Reestablish or improve riparian/stream-side forest (temperature and sediments)

Effort 2: Reduce farm and barn runoff (could be nutrients, sediment, toxins, bacteria) reaching tributaries directly or downstream reservoir indirectly

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Project Planning & Design

Swimmable (recreation, direct contact)

Goal 4: Reduce bacteria, nutrient, and sediment load to downstream reaches (larger tributaries and main stems, reservoir, estuary)

Effort 1: Reestablish or improve riparian/stream-side forest (temperature and sediments)

Effort 2: Reduce farm and barn runoff (could be nutrients, sediment, toxins, bacteria) reaching tributaries directly or downstream reservoir indirectly

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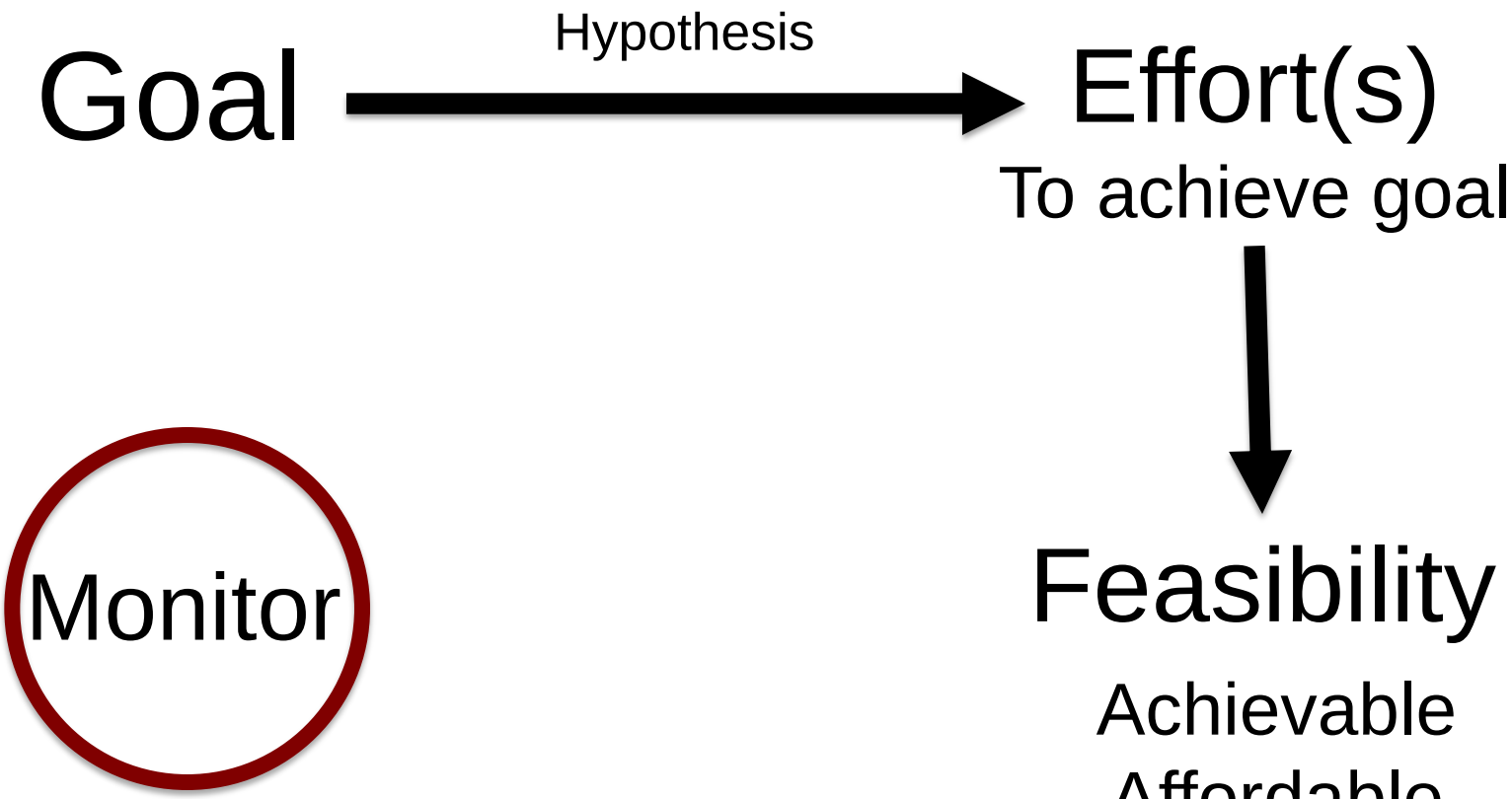

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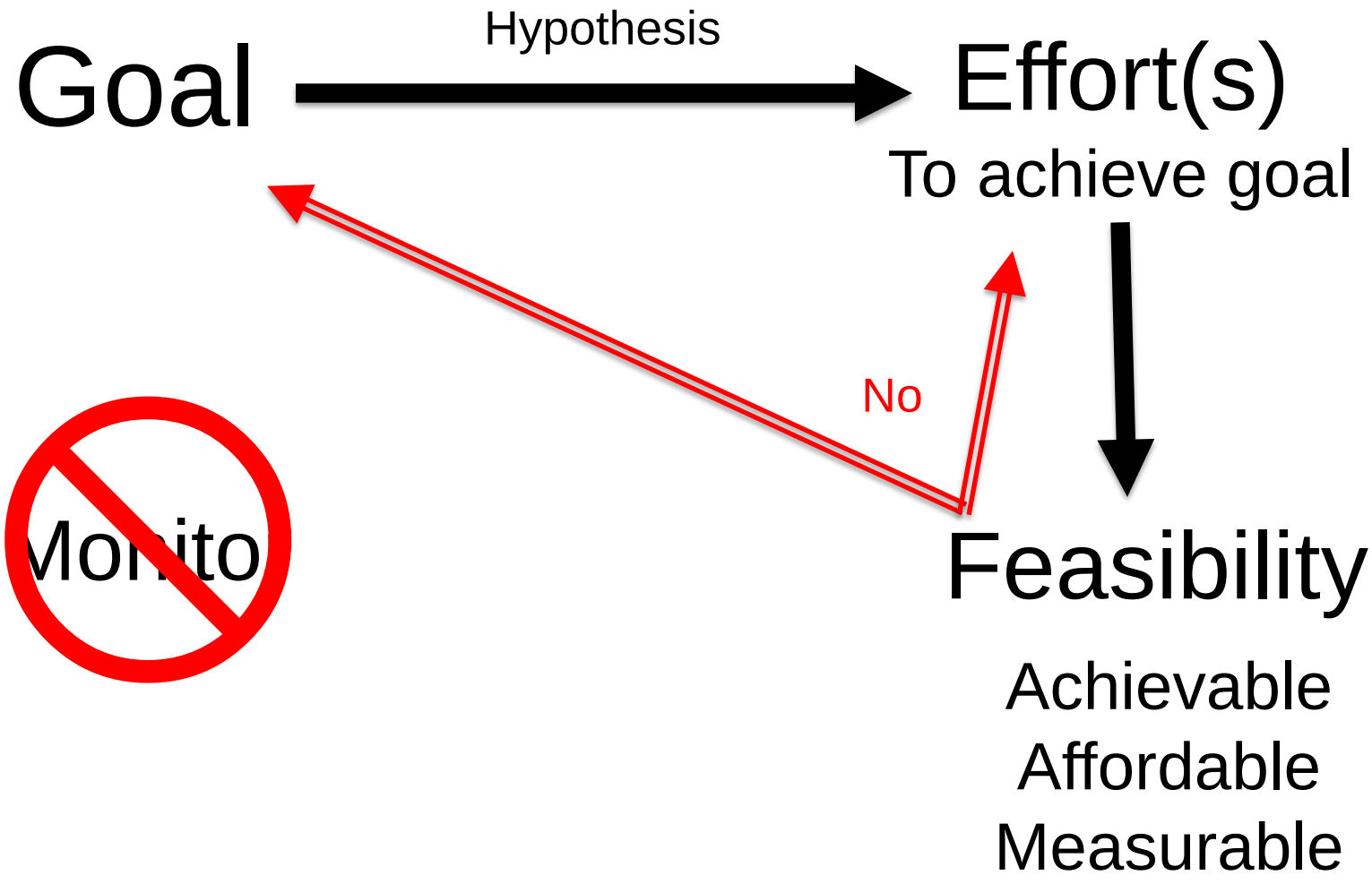

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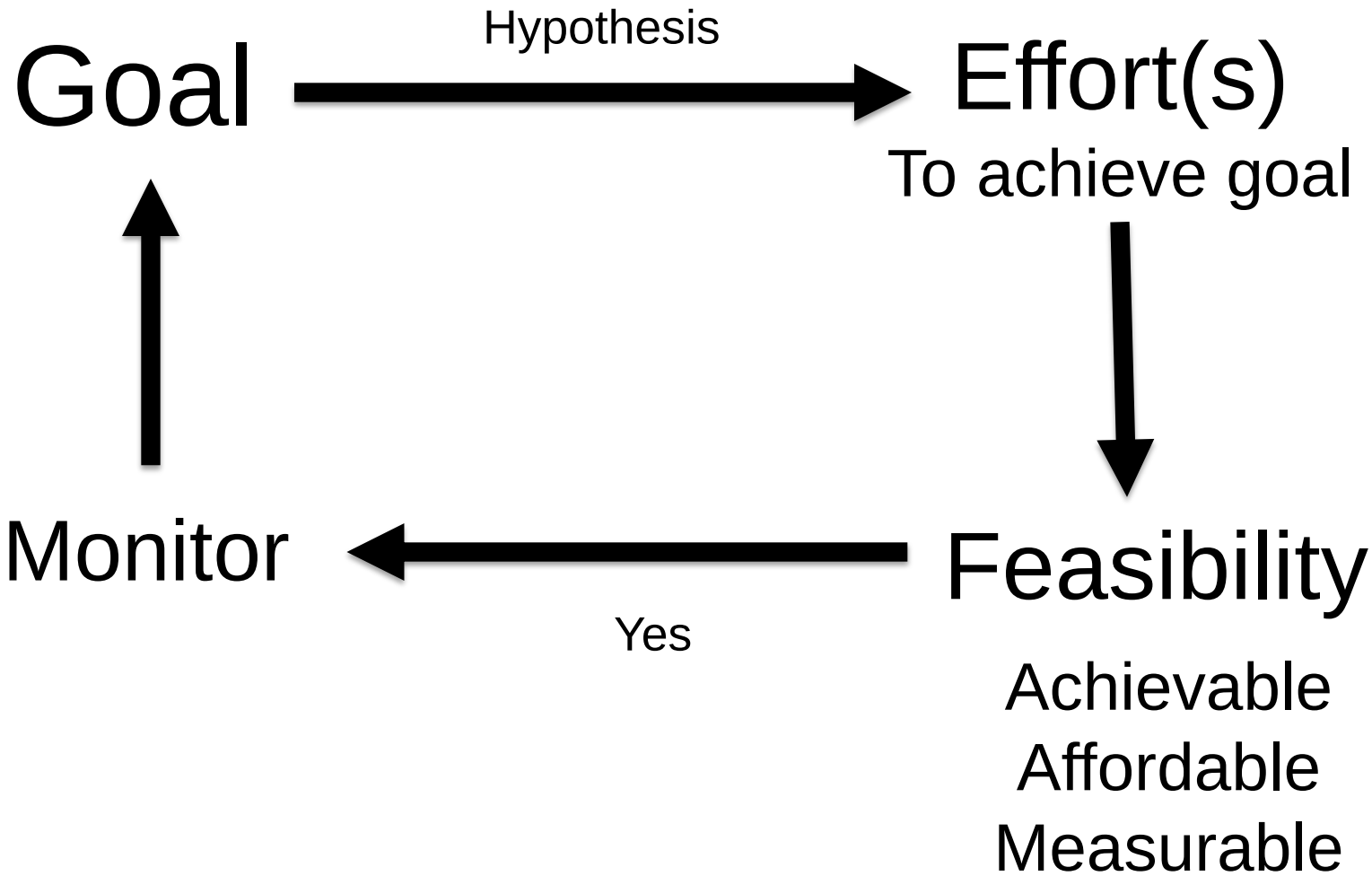

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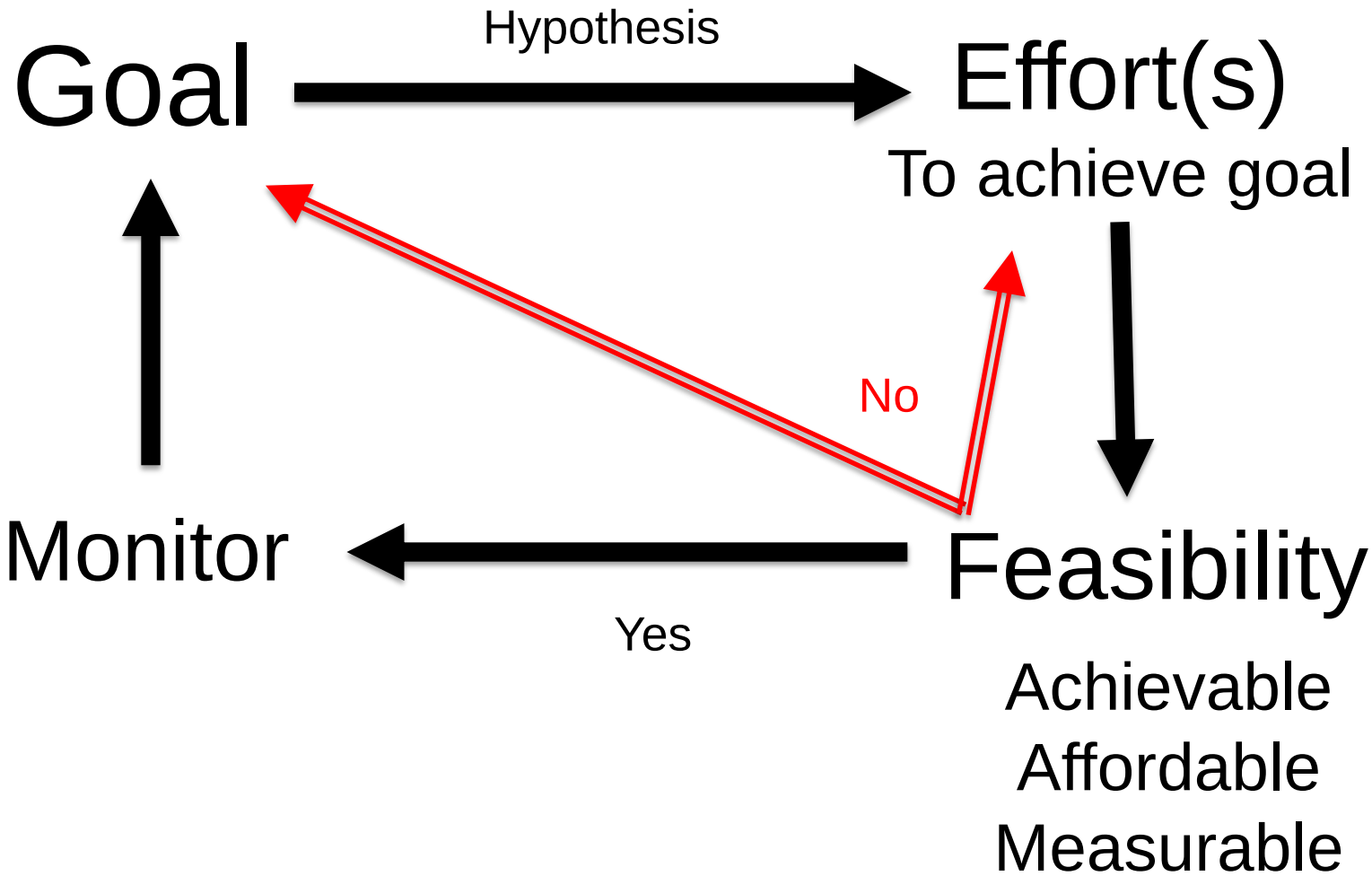

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Monitoring Planning & Design
10 Questions

1. Why is the monitoring taking place?
2. Who will use the monitoring data?
3. How will the data be used?
4. What parameters or conditions will be monitored?
5. How good do the monitoring data need to be?
6. What methods should be used?
7. Where are the monitoring sites?
8. When will monitoring occur?
9. How will monitoring data be managed and presented?
10. How will the program ensure that data are credible?

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Monitoring Planning & Design
10 Questions

1. Why?
2. Who?
3. How?
4. What?
5. How?
6. What?
7. Where?
8. When?
9. How?
10. How?

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Monitoring Planning & Design
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