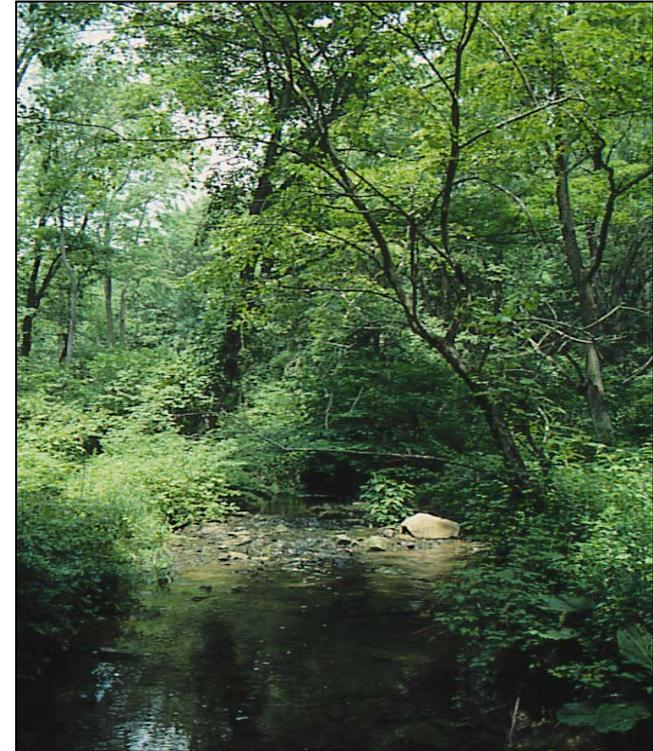


# Getting Started! The Study Design Process



Danielle Donkersloot, NJDEP  
Julie Vastine, ALLARM  
2012 NWMQC, Portland Oregon

# Overview

- Getting Started
  - Storytelling
  - Using VM data at the State
- Discussion groups
- Study Design
  - 10 Steps
  - Case Studies
- Conclusion





## Introductions

What Exit are You From?





Great Bay, Tuckerton, NJ





Oswego River, Pine Barrens, N J





Scott's Landing Creek, Leeds Point, NJ





- Population NJ 8.7 million people
- 7,505 square miles

18,126 miles of rivers & streams  
DEP's latest evaluation *18% of the  
State's Waters are fully assessed*



# PA: Community-based Stream Monitoring



Julie Vastine

Alliance for Aquatic Resource Monitoring

# ALLARM Background

- Empower communities with scientific tools to monitor, protect, and restore PA streams.



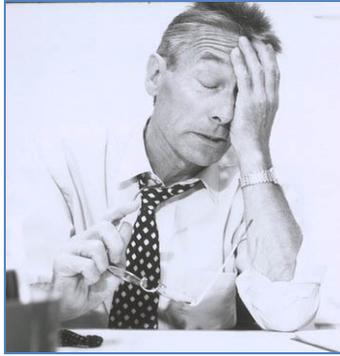
Educate. Engage. Empower.

# PA Volunteer Monitoring

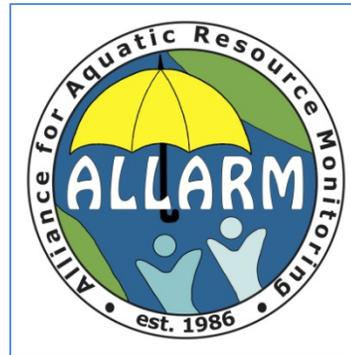
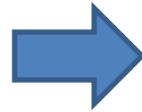
- Rich history



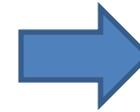
# ALLARM Approach



Community Concern



Technical Assistance  
(ALLARM)



Monitoring trainings



Data collection &  
quality verification



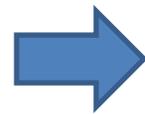
Data interpretation



Communities use data to  
protect and restore streams

# Example: Middle Spring Watershed Association

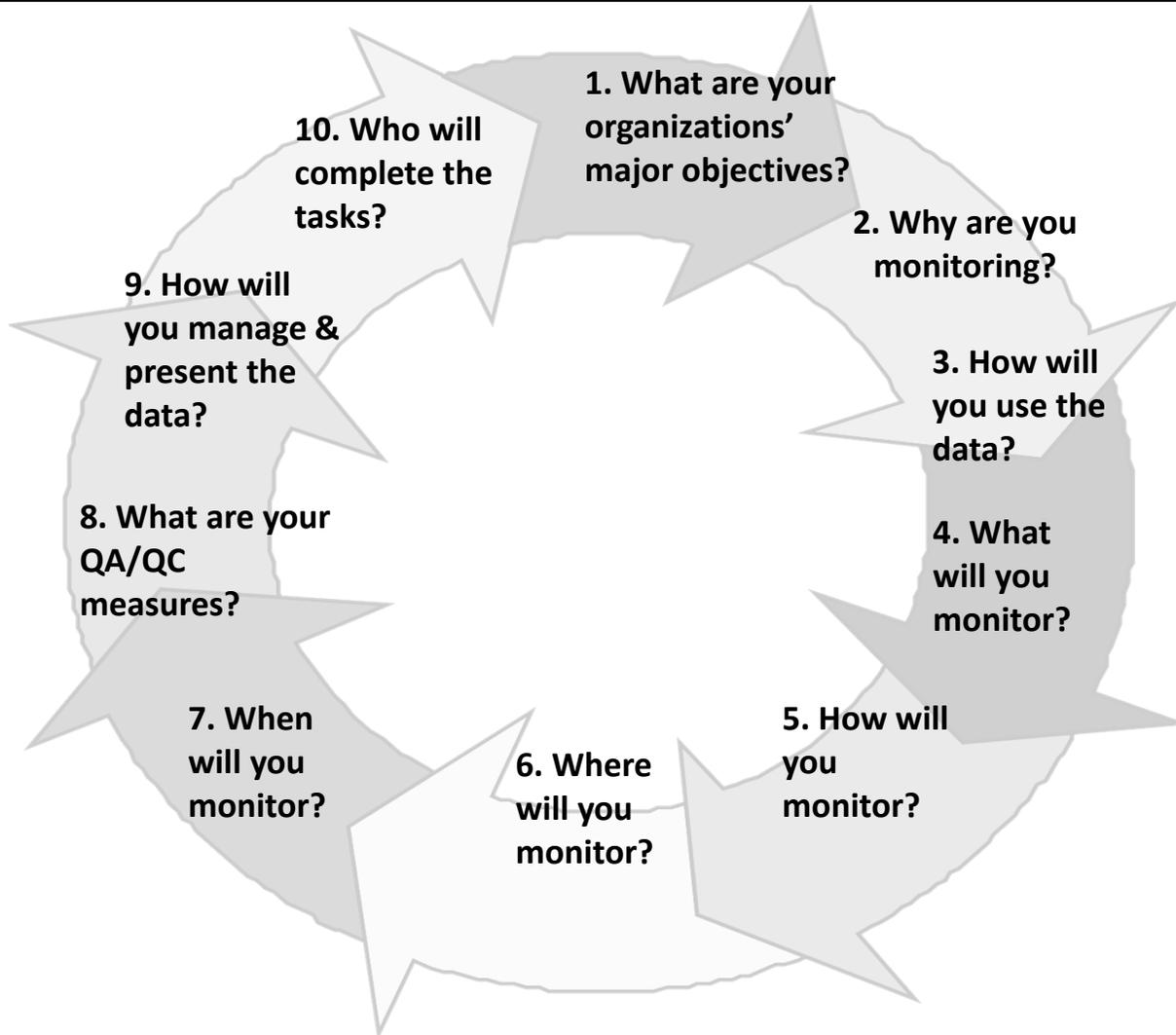
**Watershed Issue**



**Using Data in the Community**



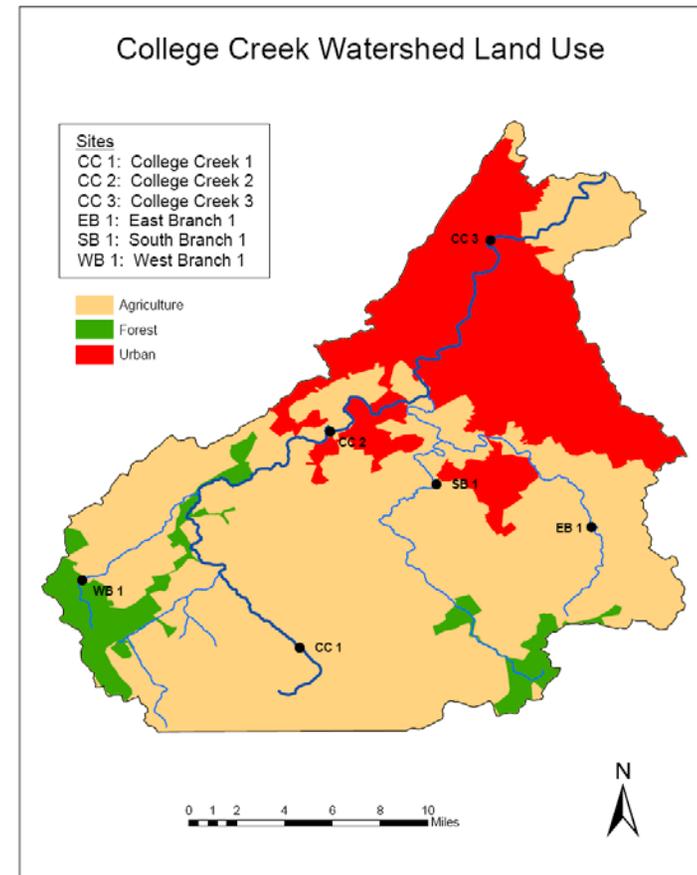
# Step 1: Study Design



# Step 2: Build Monitoring Capacity



# Step 3: Interpret the data



# Step 4: Use the data



- Riparian planting
- Dam removal
- TMDL needs assessment plan
- Developed Middle Spring Monitoring collaborative

# Additional Assets

- Strategic plan in 2010
- Volunteer recruitment
- Strong community partners



# NJ Watershed Watch Network

**≈ 30 River/Stream Monitoring Organizations**

**≈ 58 Lake Monitoring Organizations**



# Myths of Using Volunteer Collected Data

- Quality Assurance & Quality Control
- Volunteers have “hidden agendas”
- Volunteers are not scientists



# Reality of Using Volunteer Collected Data

- Need more data at a higher frequency
- EPA encourages the use of volunteer collected
- Volunteer groups are sophisticated
  - Trained
  - Well equipped
- Volunteers want to do it right



# Watershed Watch Network Council

- NGO, Volunteer Monitoring Coordinators
  - Watershed Associations
  - Riverkeepers
- Volunteers (paid and unpaid)
- EPA
- Office of Quality Assurance
- NJDEP, Water Monitoring & Standards



# Clean Water Act

- Does Not Say, *“Only Monitor Waters You Can Afford to Monitor”*
- It Does Say, *“States Must Consider using All Data of a Known Quality”*

# Potential Data Uses

- Education
- Identifying potential sources of pollution
- Local decision making
- Research
- NPS assessment
- TMDL
- Watershed planning/open space acquisition
- Monitoring the success/failure of restoration projects
- 303d & 305b Integrated Report



# THE STATE'S MONITORING MATRIX

NJ Water Monitoring & Assessment  
Strategy 2005-2014



# 2008 Integrated Report

## 85 volunteer monitored sites

- Pequannock River Coalition
- Pompeston Creek W A
- South Branch W A
- Stony Brook Millstone W A



# 4 Groups added to 2010 Report

- Craft's Creek & Spring Hill Brook WA
- Great Swamp WA
- Musconetcong WA
- Upper Raritan WA



# Addressing Data Quality Issues

- Quality Assurance Criteria
- QAPP or Study Design is needed
- Program Specific Training & Support
- **Individual** Evaluation of each Monitoring Program
- There needs to be “*translator*” between volunteer community & regulatory agency
- **Communication, Communication, Communication**



# Data Use

- Organizations need to *Take Ownership* of their Information
- Organizations need Guidance on Different Types of Data Use
- *Sometimes it may take another person to find your story....*
  - share success and failures stories
  - get the word out-articles, press releases
  - find examples of data uses at all levels, local, state, & national



# Your role... service provider/state coordinator

- Determine your model, couple of options:
  - Standardized state program
  - State general guidelines, communities define program
  - Technical assistance to communities
  - Combination



# Key Steps

- Develop comprehensive monitoring plan;
- Build groups' capacity to carry out water quality assessments;
- Verify the quality of data collected;
- Diminish the data road block; and
- Facilitate data use.



Anticipate major concerns/road blocks and have tools for communities to troubleshoot.

# Discussion Groups

- What are your monitoring goals?
- How do you want collaborate with communities/volunteer monitors?



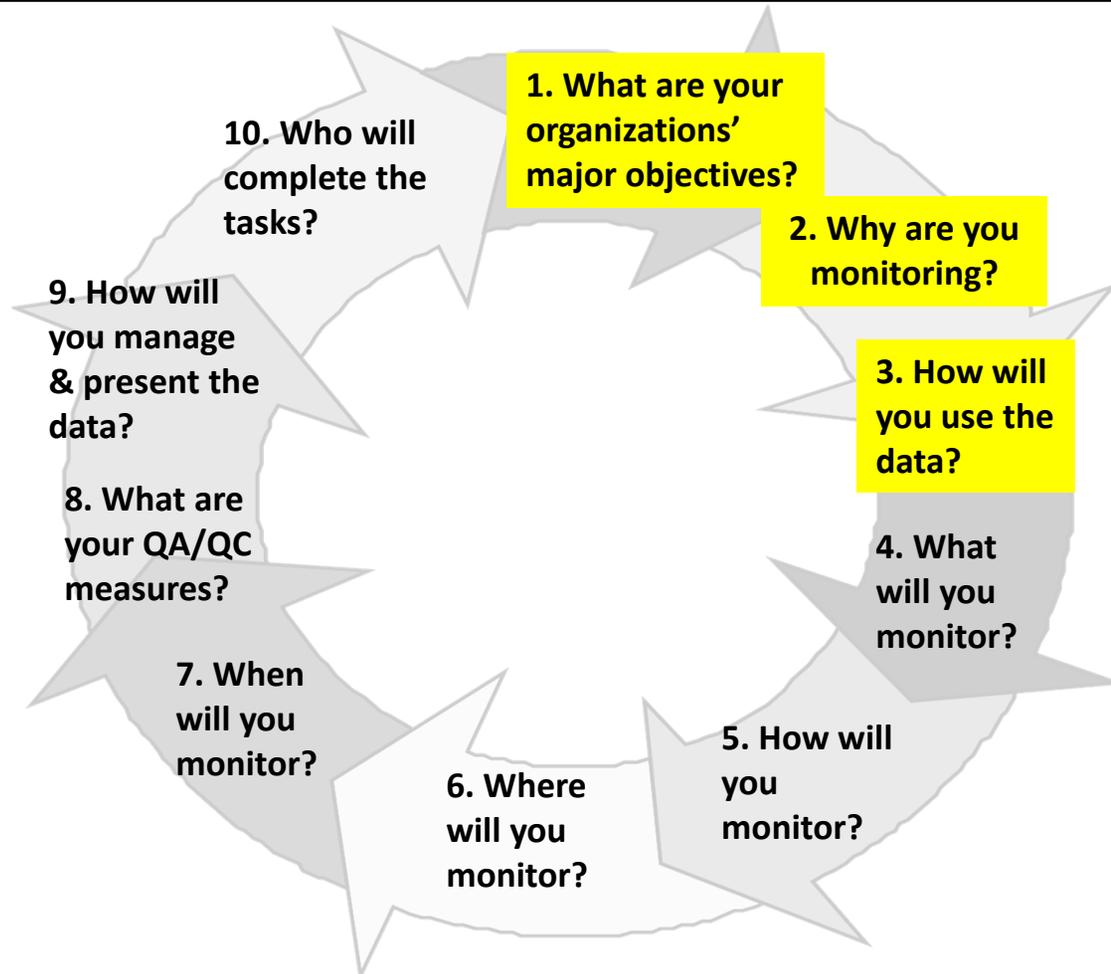
# Study Design Process



# Study Design VS Quality Assurance Project Plan

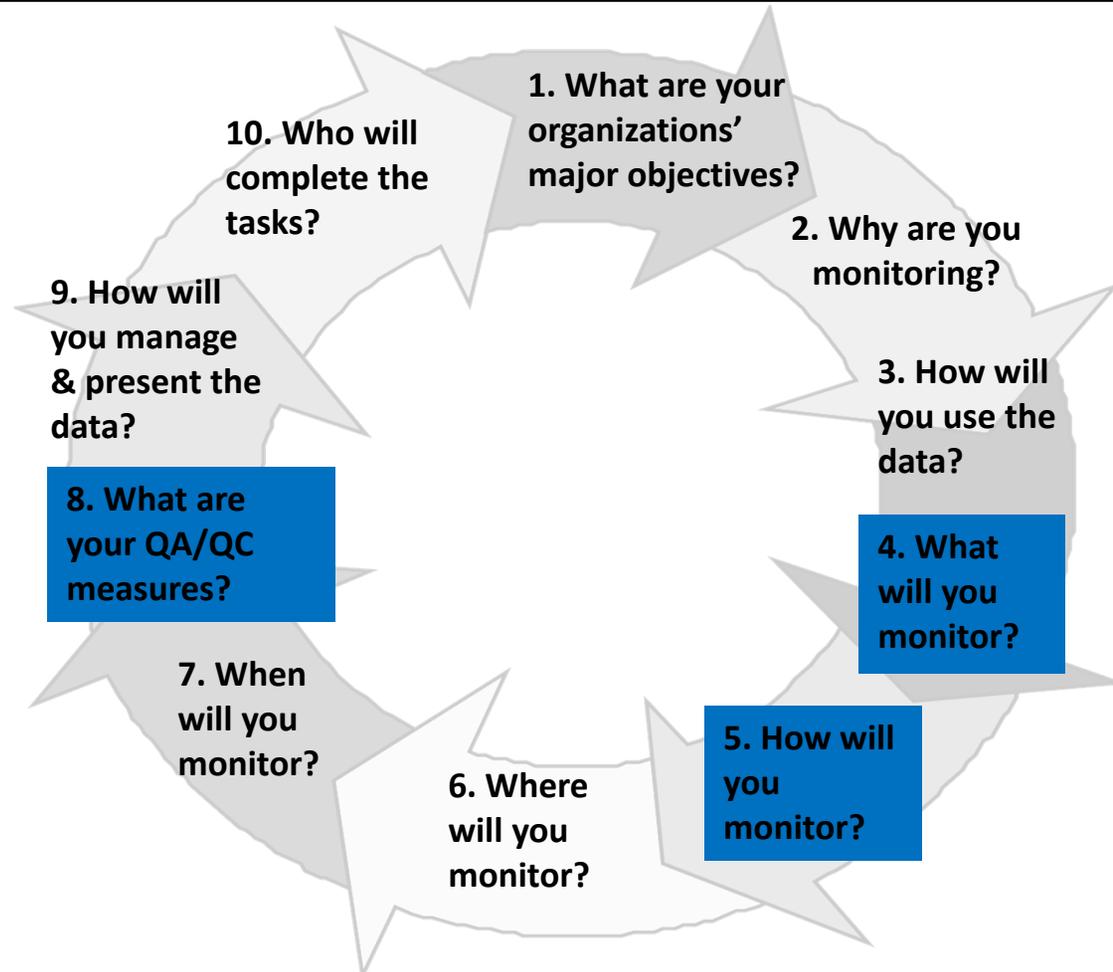
- Study Design
  - Objectives
  - Data Users
  - Design Rational
    - Why you are doing the study
    - Why you are picking certain sites
  - Data analysis procedures
  - QA/QC
  - Written plan, not official
- QAPP
  - Analytical Methods
  - Data Quality Requirements
  - Corrective Actions for Errors
  - Chain of Custody
  - Certified Labs
  - Data Storage
  - Data Validation
  - Official document

# Study Design Overview



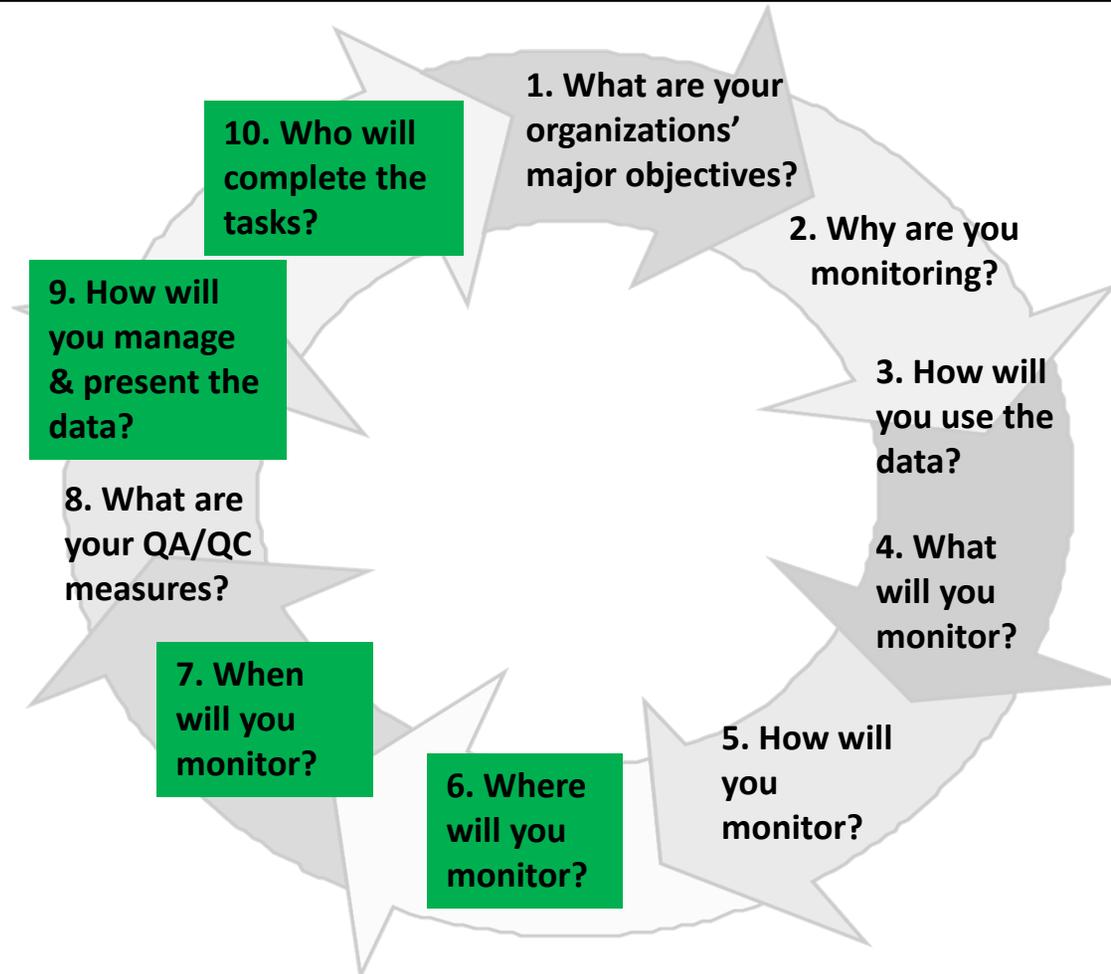
Facilitating the study design process .

# Study Design Overview



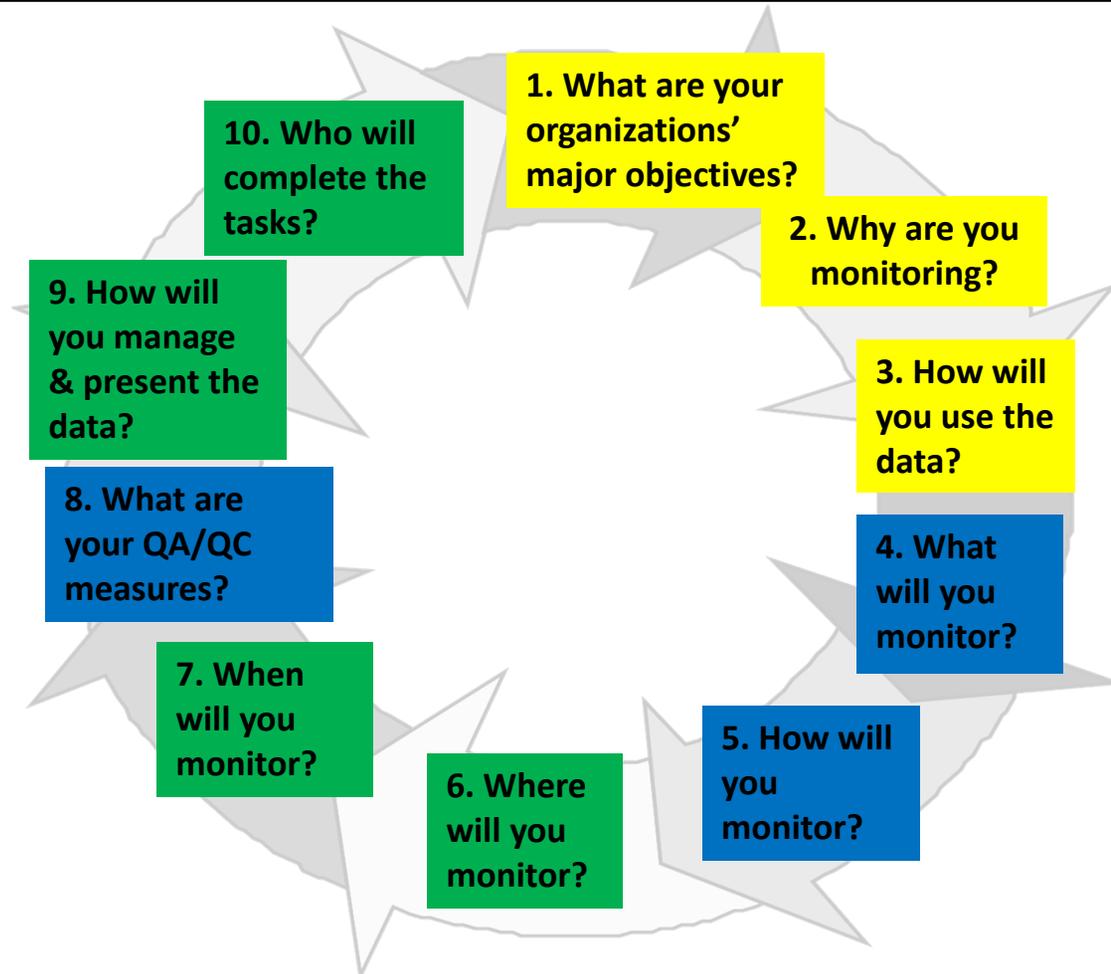
Facilitating the study design process .

# Study Design Overview



Facilitating the study design process .

# Study Design Overview

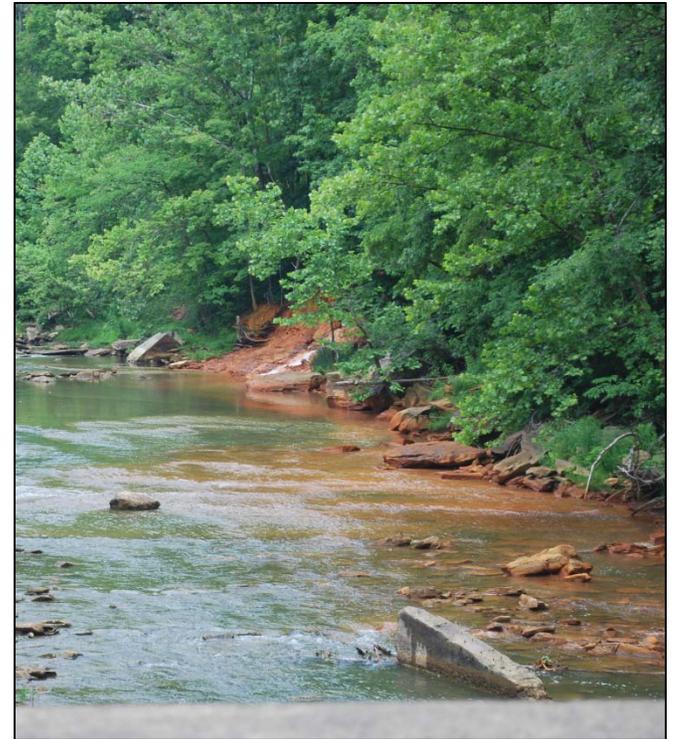


Facilitating the study design process .

# First Question: Do you really need a study design?

**Preparing a study design is the most important step in organizing your monitoring effort because:**

- It forces you to focus on what you are trying to accomplish;
- It helps you to select the most appropriate monitoring strategy to address the issues that are important to you and your community;
- It clearly documents your sampling and analysis methods; and
- It minimizes the impact of changing personnel on the continuity of your monitoring activities.



# Step 1: What are your organization's major objectives?

- Strategic visioning
- Role of monitoring



Considering these questions helps to consider monitoring in the context of the overall objectives of your group.

## Step 2: Why are you monitoring?

- Identifying your research question.



It is important that your group reaches a consensus about the purpose of your monitoring program. Identify questions that, if answered, could provide information to influence decision-makers. Then, determine how monitoring can help answer these questions and achieve your groups' goals.

## Step 3: How will you use the data collected?



- This question will impact the rest of your monitoring choices
- Examine what action you expect to be taken with the data and who will use the data.
- *Keep in mind how your data fit in with your monitoring objectives*



# NJ's 4 Tiered Approach

Allows for volunteers to choose level of monitoring involvement based on:

- *Intended purpose for monitoring*
- *Intended data use*
- *Intended data users*



# Tier A-Environmental Education

## Data Users

- **Participants**
- **Students**
- **Watershed residents**

## Data Use

- **Promote stewardship**
- **Raise their level of understanding of watershed ecology**

## Quality Needed

- **Low level of rigor, but use sound science**
- **Wide variety of study designs are acceptable**
- **Quality assurance (QA) optional**

# Tier B-Stewardship

## Data User

- Participants
- Watershed residents
- Landowners
- Local decision makers (optional)

## Data Use

- Understanding of existing conditions and how any changes over time
- Screen for and identify problems and positive attributes

## Quality Needed

- Low to medium rigor
- Variety of study designs is acceptable
- Training
- QAPP recommended

# Tier C-Community &/or Watershed Assessment

## Data Users

- Local decision-makers
- Watershed association
- Environmental organizations
- Possibly DEP

## Data Use

- Assess current conditions
- Track trends
- Source track down of Nonpoint source pollution

## Quality Needed

- Medium/high level of rigor
- Data needs to reliably detect changes over time & space
- QAPP approved & on file w/ intended data user.
- Training required

# Tier D-Indicators & Regulatory Response

## Data Users

- NJDEP
- Local decision-makers
- Watershed associations
- Environmental organizations

## Data Use

- Assess current conditions
- Supplement agency data collection
- Research
- Evaluate best management practices (BMP) measures
- Regulatory Response

## Quality Needed

- High level of rigor
- Study design & methods need to be equivalent & recognized by agencies using data
- Training required
- QAPP approved by Office of Quality Assurance & data user, annual recertification
- Possible audit



Education/  
Awareness



Problem ID,  
Assess  
Impairment,  
Local  
Decisions



Legal &  
Regulatory

Increasing Time - Rigor - QA - Expense \$\$

# Step 4: What will you monitor?

## Watershed Indicators

- Biological
- Physical
- Chemical



## Practical Considerations

- Do you have the human & financial resources to measure it?
- How difficult is it to monitor?
- Does it help you understand a major component of the ecosystem?
- Is it understandable and explainable to the target audience?

# Step 5: How will you monitor?

Determining how you will monitor involves making choices as to the appropriate sampling methods that meet your data quality objectives.

What sampling and analysis methods will you use?



Examples:

- Accuracy & Precision – LaMotte/HACH kits vs. lab analysis
- Grab samples, integrated samples, direct measurement samples
- Qualitative net collection or semi-quantitative net collection
- Maximum holding times, reporting units, transport to lab

# Biological Monitoring Examples

## Tier B

Field Id

order level

quick protocols

presences/absences

## Tier D

Lab Id

family or genus spp

more time intensive

approved metrics



# Step 6: Where will you monitor?

Consider safety & accessibility, potential water quality impacts, reference locations, stream designated uses.

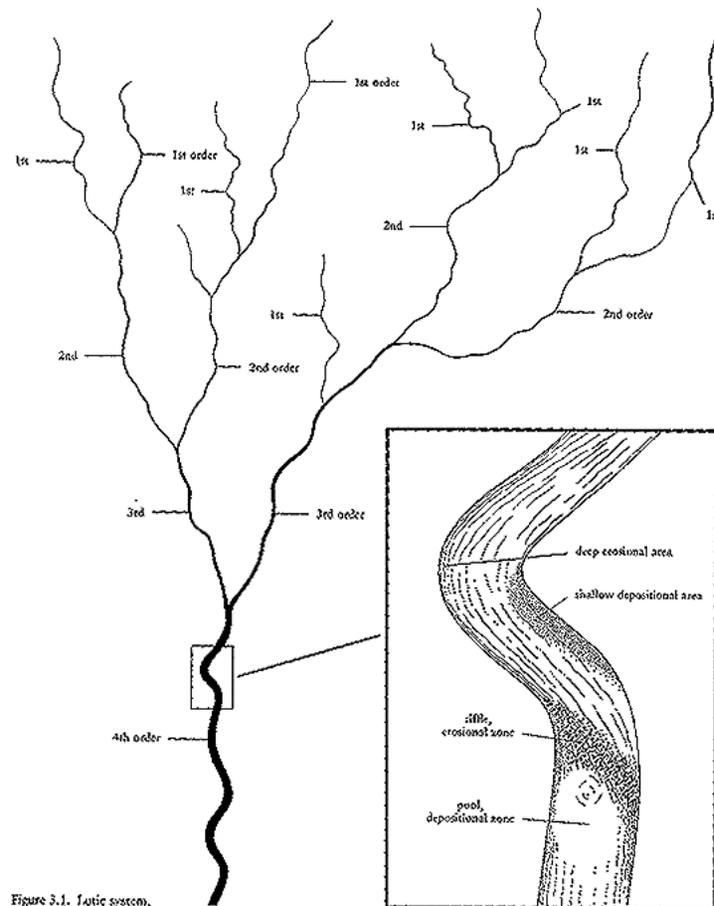


Figure 3.1. Lotic system, depicting stream orders and lotic zonation.

# Step 7: When will you monitor?

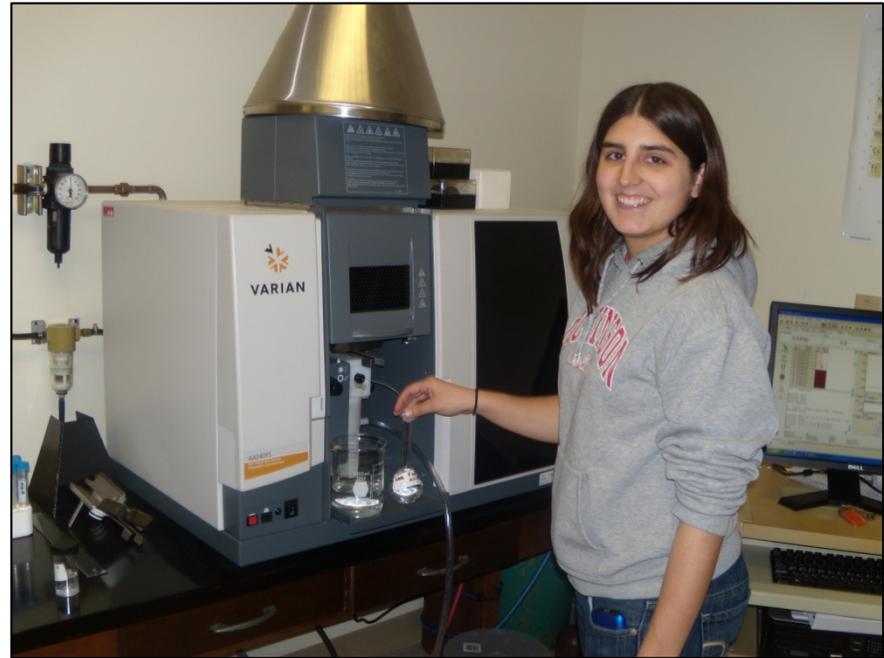
- What time of year?
- What time of day?
- Special Weather Conditions – storm events, drought, etc.
- Frequency of sampling?  
– consider resources and data requirements



## Step 8: What are Your Quality Assurance Measures?

Quality control management includes most aspects of your monitoring program:

- Organization and Planning: Training requirements of volunteers?
- Sampling and Analysis: How will you care for and calibrate your monitoring equipment?
- Internal and External QA/QC measures: How will you ensure that the data are credible?



**Documentation, documentation, documentation!** QAPPs, manuals, study design, datasheets, equipment and supplies records.

# QA Considerations

## Tier B

- Experimental Sampling or Analysis
- Study Design
- Training
- Annual equipment inspections

## Tier D

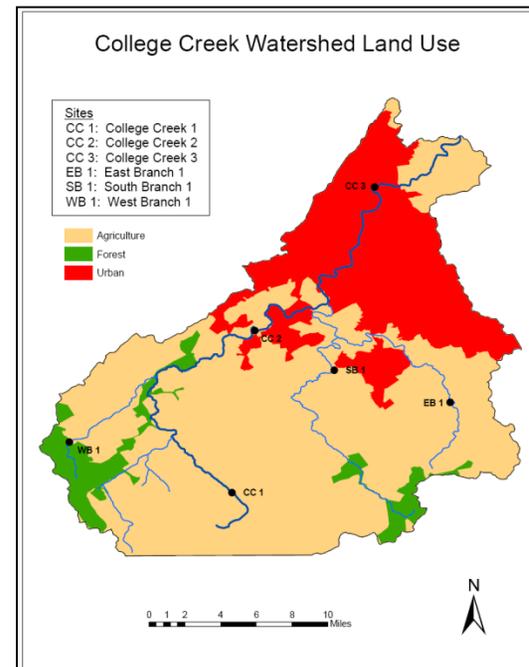
- EPA Approved Methods for Sampling & Analysis
- Approved QA plan
- Annual Review of QAPP
- Chain of Custody
- Accurate Sampling Locations
- Certified Volunteers through Proficiency Sampling
- Documented QAPP changes

# Step 9: How will you manage & present the data?

Dealing with data involves converting raw data into useful information that sheds light on the answers to your monitoring questions.



|    | A  | B       | C    | D    | E      | F    | G    | H     | I        |  |
|----|--|---------|------|------|--------|------|------|-------|----------|--|
| 1  | <b>Nitrate</b>                               |         |      |      |        |      |      |       |          |  |
| 2  | Site   | Jan     | Feb  | Mar  | Apr    | May  | June | July  | Aug      |  |
| 3  | Site 1                                       | 0.00    | 0.00 | 0.00 | 0.00   | 0.00 | 0.00 | 0.00  | 0.00     |  |
| 4  | Site 2                                       | 0.00    | 0.00 | 0.00 | 0.00   | 0.00 | 0.00 | 0.00  | 0.00     |  |
| 5  | Site 3                                       | 0.00    | 0.00 | 0.00 | 0.00   | 0.00 | 0.00 | 0.00  | 0.00     |  |
| 6  | Site 4                                       | 0.00    | 0.00 | 0.00 | 0.00   | 0.00 | 0.00 | 0.00  | 0.00     |  |
| 7  | Site 5                                       | 0.00    | 0.00 | 0.00 | 0.00   | 0.00 | 0.00 | 0.00  | 0.00     |  |
| 8  | Site 6                                       | 0.00    | 0.00 | 0.00 | 0.00   | 0.00 | 0.00 | 0.00  | 0.00     |  |
| 9  | Site 7                                       | 0.00    | 0.00 | 0.00 | 0.00   | 0.00 | 0.00 | 0.00  | 0.00     |  |
| 10 | Site 8                                       | 0.00    | 0.00 | 0.00 | 0.00   | 0.00 | 0.00 | 0.00  | 0.00     |  |
| 11 | Site 9                                       | 0.00    | 0.00 | 0.00 | 0.00   | 0.00 | 0.00 | 0.00  | 0.00     |  |
| 12 | Site 10                                      | 0.00    | 0.00 | 0.00 | 0.00   | 0.00 | 0.00 | 0.00  | 0.00     |  |
| 13 | Site 11                                      | 0.00    | 0.00 | 0.00 | 0.00   | 0.00 | 0.00 | 0.00  | 0.00     |  |
| 14 |  |         |      |      |        |      |      |       |          |  |
| 15 | <b>Nitrate- Annual Summary for Each Site</b> |         |      |      |        |      |      |       |          |  |
| 16 | SITE   | Average | Min  | 25th | Median | 75th | Max  | Range | IQ Range |  |
| 17 | Site 1                                       | 0.00    | 0.00 | 0.00 | 0.00   | 0.00 | 0.00 | 0.00  | 0.00     |  |
| 18 | Site 2                                       | 0.00    | 0.00 | 0.00 | 0.00   | 0.00 | 0.00 | 0.00  | 0.00     |  |
| 19 | Site 3                                       | 0.00    | 0.00 | 0.00 | 0.00   | 0.00 | 0.00 | 0.00  | 0.00     |  |
| 20 | Site 4                                       | 0.00    | 0.00 | 0.00 | 0.00   | 0.00 | 0.00 | 0.00  | 0.00     |  |
| 21 | Site 5                                       | 0.00    | 0.00 | 0.00 | 0.00   | 0.00 | 0.00 | 0.00  | 0.00     |  |
| 22 | Site 6                                       | 0.00    | 0.00 | 0.00 | 0.00   | 0.00 | 0.00 | 0.00  | 0.00     |  |
| 23 | Site 7                                       | 0.00    | 0.00 | 0.00 | 0.00   | 0.00 | 0.00 | 0.00  | 0.00     |  |
| 24 | Site 8                                       | 0.00    | 0.00 | 0.00 | 0.00   | 0.00 | 0.00 | 0.00  | 0.00     |  |
| 25 | Site 9                                       | 0.00    | 0.00 | 0.00 | 0.00   | 0.00 | 0.00 | 0.00  | 0.00     |  |
| 26 | Site 10                                      | 0.00    | 0.00 | 0.00 | 0.00   | 0.00 | 0.00 | 0.00  | 0.00     |  |
| 27 | Site 11                                      | 0.00    | 0.00 | 0.00 | 0.00   | 0.00 | 0.00 | 0.00  | 0.00     |  |



# Turning Data Into Information

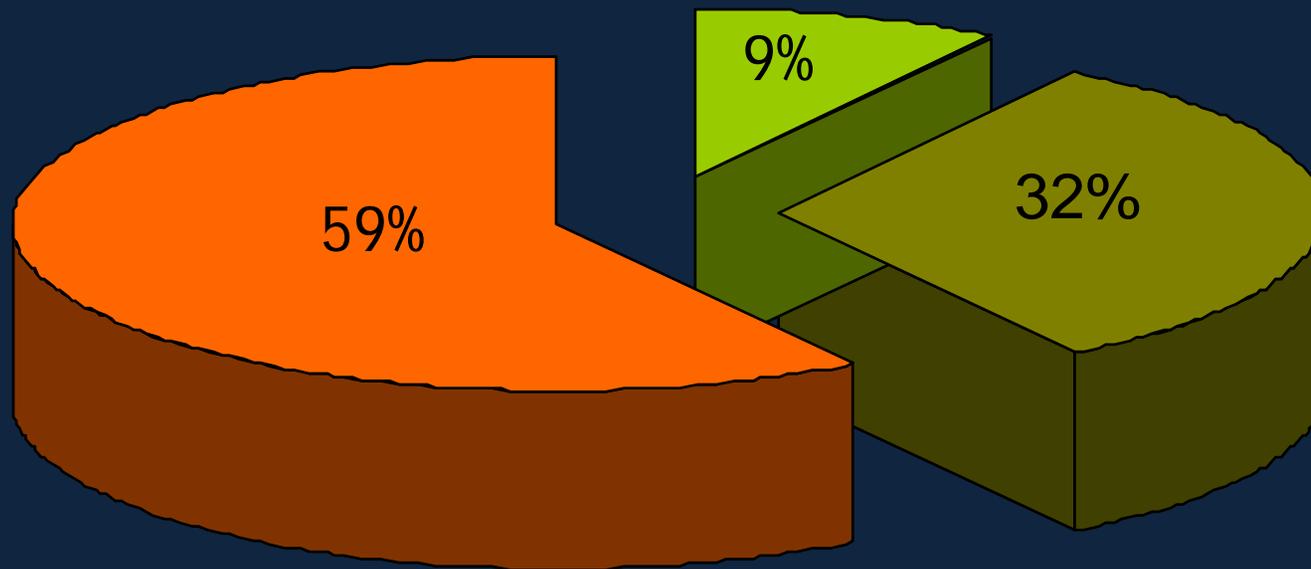
- Data Summary
- Data Interpretation
- Data Presentation
- Action and/or Further Monitoring

# Communication Plan

- What is the story in your data?
- What do you want to communicate to your data users (identified in step 3)?
- Other audiences to consider?
- Identify communication outlets, appropriate for your audience (reports, newspaper articles, town meetings).
- Evaluate response to data story and outcomes – how are the data used?



# What People Remember



■ Oral ■ Visual Alone ■ Visual & Oral

# Step 10: What Are the Tasks and Who Will Do Them?

Develop written job descriptions for positions to accomplish various tasks

## Major Monitoring Tasks

- Program Coordinator
- Quality assurance
- Purchase equipment
- Analyze data
- Recruit and organize volunteers
- Report findings
- Train field and lab volunteers
- Monitoring
- Evaluate your study design



# Case Studies!



# Volunteer Monitoring: Cost Effective – Not Cost Free

- Staff (incredibly hard-working, usually underpaid)
- Field and lab equipment and supplies
- Laboratory space or analytical services
- Office supplies
- Communication and mailing
- Publications
- Conferences / workshops
- Transportation (personnel or samples)
- Insurance
- Special events / volunteer recognition



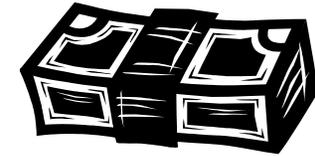
# Volunteer \$\$\$ As Match for a Grant

- Volunteer time can often be used as match
- Document effort
  - Start/end time on data sheets
  - Survey average time per sampling event
- Identify acceptable 'hourly rate' equivalent
  - 2011 is \$21.79 per hour
- Independent Sector  
[www.independentsector.org/volunteer\\_time](http://www.independentsector.org/volunteer_time)

## Corporation for National & Community Service

62.7 million Americans, or 26.5 percent of the adult population, gave 8.1 billion hours of volunteer service worth \$173 billion in 2010

For the latest information, please see [www.volunteeringinamerica.gov](http://www.volunteeringinamerica.gov)



# Dollar Value of a Volunteer Hour, by State: 2010

|                            |                        |                         |                         |
|----------------------------|------------------------|-------------------------|-------------------------|
| Alabama: \$18.06           | Indiana: \$18.04       | Nebraska: \$16.86       | South Carolina: \$16.91 |
| Alaska: \$21.69            | Iowa: \$17.22          | Nevada: \$18.82         | South Dakota: \$15.60   |
| Arizona: \$19.71           | Kansas: \$18.13        | New Hampshire: \$21.29  | Tennessee: \$19.21      |
| Arkansas: \$16.48          | Kentucky: \$17.65      | New Jersey: \$25.64     | Texas: \$21.91          |
| California: \$24.18        | Louisiana: \$19.06     | New Mexico: \$17.44     | Utah: \$17.92           |
| Colorado: \$22.03          | Maine: \$16.84         | New York: \$27.32       | Vermont: \$17.77        |
| Connecticut: \$27.77       | Maryland: \$22.77      | North Carolina: \$18.80 | Virginia: \$22.60       |
| Delaware: \$22.34          | Massachusetts: \$26.84 | North Dakota: \$17.49   | Washington: \$21.01     |
| Dist. of Columbia: \$33.61 | Michigan: \$20.07      | Ohio: \$18.87           | West Virginia: \$17.01  |
| Florida: \$18.66           | Minnesota: \$21.62     | Oklahoma: \$17.49       | Wisconsin: \$18.20      |
| Georgia: \$20.38           | Mississippi: \$15.43   | Oregon: \$18.85         | Wyoming: \$18.97        |
| Hawaii: \$18.08            | Missouri: \$18.80      | Pennsylvania: \$20.86   | Puerto Rico: \$11.41    |
| Idaho: \$15.93             | Montana: \$15.28       | Rhode Island: \$19.57   | Virgin Islands: \$16.29 |
| Illinois: \$22.77          |                        |                         |                         |

## Wrapping up...

*Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it's the only thing that ever has."*--  
Margaret Mead