ESSENTIAL BUILDING BLOCKS FOR EFFECTIVE MONITORING

EPA’s National Advisory Council for Environmental Policy and Technology = NACEPT COMMITTEE

barb.horn@state.co.us
TOP CHALLENGES FOR VM/CS

1. Volunteer Recruitment or Retention
2. Data Not Used
3. Consistent Resources

TOP AGENCY CHALLENGES WORKING WITH VM/CS

1. Communication
2. Beliefs – Experience
3. Resources or Capacity
A CLOSER LOOK AT THE PROBLEM

NOT RESOURCES

Monitoring is the End
Abdicate Decision Power – not targeting right decision maker

Alignment of Purpose, Data Use, User, Information Needs, Products and ROI

NOT RESOURCES

Difference Between Ed/Inform and Behavior Change

No Evaluation
Not generating, delivering or communicating information

Effective and Appropriate Study Design or Monitoring Plan
EFFECTIVE MONITORING PROGRAMS

Produce Measurable, trackable or identifiable:

ESSENTIAL BUILDING BLOCKS

<table>
<thead>
<tr>
<th>Outputs</th>
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<tr>
<td>Active Study</td>
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<td>Design</td>
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<td>VM/ CS Mngmt Program In Service of Plan</td>
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Outputs, Results, Outcomes, Impacts
NOT ALL DESIGNS OR PLANS ARE EQUAL

DURATION

RIGOR

QUALITY

FORMALITY

RESOURCES

COMPLEXITY
Continuum of Study Purposes
Condition /Trend – Impact – Effectiveness – Use Support

Continuum of Uses or Management Decisions
Education – Inquiry – Advocacy – Planning – Regulatory - Legal

Continuum of Users
Youth, Adults, Farmers, Managers, Districts, Local G, State G, Fed G

Continuum of ROI’s
Behavior Change-Uses Met-Regulation-Policy-Health-Economy

Each Monitoring?

Data Pathway
Or
Information Blue Print
Info needs & Products
Evaluation
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**Are Rivers Healthy?**

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### A. Condition and Trend Investigation
1. ???
2. ???

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### C. Effectiveness Investigation

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RW VOLUNTEERS
WS GROUPS
## MONITORING QUESTION 1:

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RESULTS - OUTCOMES – IMPACTS YOU WANT TO SEE:

- Because you answered that monitoring question
- Specific to these data users/decisions/management uses and users
Continuum of Study Purposes
Condition / Trend – Impact – Effectiveness – Use Support

Continuum of Uses or Management Decisions
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Continuum of Users
Youth, Adults, Farmers, Managers, Districts, Local G, State G, Fed G

Continuum of ROI’s
Behavior Change-Uses Met-Regulation-Policy-Health-Economy

Each Monitoring?

Data Pathway
Or
Information Blue Print
Info needs & Products
Evaluation
Program
Technical
Information
Evaluation

Study Design or Monitoring Plan

PLANNED DESIGNS THAT COVER ESSENTIAL BUILDING BLOCKS
Who, Why & Info needs = DRIVER

What, When, Where, Data Quality & Management

Data to Info Via Analysis, Interpretation, Reporting & Communication

Will it Work How will You Know?

Program

Technical

Information

Evaluation
## Program Design - The Who and Why

1. **Shared Vision** and Outcomes
   - 1a. Impact, Results and Value Alignment
   - 1b. Who Needs to be Involved and Role
   - 1c. Volunteer Management Program

2. **Scope and Inventory**
   - 2a. Geographic and Waterbody
   - 2b. Existing Data, Gaps and New Data Needs
   - 2c. ID Threats and Opportunities to waterbodies
   - 2d. Policies, Legislation & Regulation to Consider
   - 2e. Water and Land Uses (historic, current, cultural)
   - 2f. Benchmarks, standards and criteria (formal or informal)
Volunteer Monitoring Program should be designed to serve data objectives not visa versa
# Program Design - The Who and Why Continued...

## 3. Monitoring Reasons, Uses or Purposes

- 3a. Role in meeting Vision, Outcomes, Organization Objectives
- 3b. Monitoring Questions
- 3c. Study Purpose
- 3d. Targeted **Data Users / Decision Makers** and Decisions
- 3e. Identify Information Needs of Decision Makers - **Data Quality**
- 3f. Summarize – **Information Blue Print**, Logic Model

## 4. Capacity and Prioritization Check

- 4a. Budget and Capacity Assessment
- 4b. Scalability
- 4c. Summarize, Document & Communicate (**Blue Print, Logic Model**)
Steps for each of these four designs as well as detailed program evaluation is available if contact me at:

Barb.horn@state.co.us
EFFECTIVE MONITORING PROGRAMS

Produce Measurable, trackable or identifiable:

ESSENTIAL BUILDING BLOCKS

Active Study Design
Quality Assurance
Data Management
Generate & Deliver Information
Evaluation
VM/CS Management

Program In Service of Plan

Outputs  Results  Outcomes  Impacts
Who, Why & Info needs = DRIVER

What, When, Where, Data Quality & Management
DATA READINESS: READY TO CREATE INFORMATION PRODUCTS

Plan/Gather

Camp 1
Data not Organized, Used or Making a Difference

Camp 2
Data Organized
Not Shared
Not at Potential

Camp 3
Data Shared but not at Potential

Make A Difference
Evaluate
EFFECTIVE MONITORING PROGRAMS

Produce Measurable, trackable or identifiable:

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Active Study

Quality Assurance

Design

Data Mngmt

Generate & Deliver Information

Evaluation

VM/ CS Mngmt

Program In Service of Plan

Outputs

Results

Outcomes

Impacts
Who, Why & Info needs = DRIVER

What, When, Where, Data Quality & Management

Data to Info Via Analysis, Interpretation, Reporting & Communication
IDENTIFY INFO NEEDS, INFORMATION PRODUCTS & DELIVERY.

INFO PRODUCTS ARE:

- Raw Data
- Design for Information Delivery Exit Points
- Information Products
- Analyses
- Interpretation
- Recommendations
DATA USED > 1 TIME = FOREVER SONG

Valued Property

Data sets become assets if:

1. Can be found - Available, accessible, discoverable, shared
2. Contain minimum necessary information to inform user of purpose, data objectives, methods, quality, extent
3. Format friendly

ASSETS =
CAMP 2 – WHAT MAKES DATA AN ASSET A “FOREVER SONG”

1. Plan for it to be in Study Design
2. Manage Raw Data and Information Products
3. Document Data Management
4. Delivery & Communicate Info / Document
5. Publish Data to Shared Portals (> than your website)
6. Evaluate, adjust and document monitoring program
Technical Design - The What, When, Where, Data Quality & Management

5. What Monitor
   5a. Waterbody type
   5b. Activity Media
   5c. Methods and Equipment to meet Data Quality Objectives

6. Where Monitor

7. When Monitor

8. How fulfill Data Quality Objectives (SOP, QAPP)

9. Who is Collecting, Processing and Analyzing

10. Access, Transportation & Safety

11. Manage Raw Data to Verified Data (Data Management Plan)

12. Capacity and Prioritization Check (Budget, Scalability, Document &...
Information Design - Data to Information through Analyses, Interpretation, Reporting & Communicating

13. Identify Information Products Needed by Targeted Decision Makers
14. Data Analyses & Summary
15. Interpretation, Conclusions & Recommendations
16. Communication and Delivery (Communication Plan)
17. Data Management of Information Products (Data Management Plan)
18. Who and Support
19. Capacity and Prioritization Check (Budget, Scalability, Document & Communicate)
EFFECTIVE MONITORING PROGRAMS

Produce Measurable, trackable or identifiable:

ESSENTIAL BUILDING BLOCKS

Active Study | Quality Assurance | Data Mngmt | Generate & Deliver Information | Evaluation | VM/ CS Mngmt Program In Service of Plan

Outputs | Results | Outcomes | Impacts
## Evaluation Design - Will it Work and How Will I know?

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<td><strong>Final Study Design</strong>, Task and Timeline, Budget, Capacity and Scalability, <strong>Sub Documents</strong></td>
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<tr>
<td><strong>21.</strong></td>
<td>How answer Monitoring Questions?</td>
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<td><strong>22.</strong></td>
<td>Evaluation of Effectiveness, Plan &amp; Implementation</td>
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<td><strong>23.</strong></td>
<td>How Capture and Document Success, Changes &amp; Story</td>
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<td><strong>24.</strong></td>
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**Each Monitoring?**

- Data Pathway
- Or
- Information Blue Print

**Info needs & Products Evaluation**
EFFECTIVE MONITORING PROGRAMS

Produce Measurable, trackable or identifiable:

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A Citizen Water Science Framework: Powered with Open Data and Technologies

STEP 1: PREPARING FOR DATA COLLECTION
- Study objectives
- Monitoring questions
- Study Design (how, what, where, why)
- Adoption of technologies
- Data Management / Analysis Design
- Program Evaluation Design

STEP 2: MONITORS COLLECT DATA
- Paper datasheets
- App exports
- Lab reports

STEP 3: LOCAL DATA STORAGE
- Excel
- Relational database (Access, SQL, GIS)
- Online

DATA PORTALS
- WQX -> STORET -> Water Quality Portal
- CUAHSI - Hydroshare
- Others (Continuous, real-time, flow, state, program)

ONLINE SCIENCE WEB SERVICES

STEP 4: ANALYZE & VISUALIZE DATA
- DATA VIS SERVICES
  - (Tableau, Plotly, DataHero, ChartJS, Consultants)
- DIY DATA AN/ VIS
  - (Excel, R, R Shiny, SAS, Python, d3.js, GITHUBs, etc.)

STEP 5: DATA INFORMS ACTION
- MODELING
- PLANNING
- PRIORITIZATION
- TRACKING
- REGULATORY

STEP 6: DATA TO ACTION
- COMMUNICATE SCIENCE
- Story maps
- Report cards
- Social media
- Apps
- Website
- Data dashboards

SHARE DATA/PRODUCTS
- Public
- State 303(d)
- TMDL
- County
- Ag districts
- Etc.

OPEN DATA PORTALS AND DATA RESOURCES
- Upload standard data
- Download data to use
- Share data/analysis with users

EVALUATION AND ADAPTIVE MANAGEMENT
- Evaluation and Adaptive Management

ADAM GRIGGS – WATER DATA COLLABORATIVE c/o RIVER NETWORK
SPIT BATH ASSESSMENT

Monitoring Design

What Are Your Expectations (Reference Conditions)?

What Are Current Conditions?

How Do Current Conditions Compare with Expectation?

Impairment

Restoration

High Quality

Protection
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**TYPE OF INVESTIGATION = PURPOSE/USE/REASON:**

**COMMUNITY OR AGENCY: USERS**

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<th>Education Inquiry</th>
<th>Engagement</th>
<th>Advocacy</th>
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**DELIVERED INFORMATION PRODUCT**

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**EVALUATION**
UNIVERSAL ACROSS DATA USE/PURPOSE:

Community Engagement → Education → Condition Indicator → Research → Management → Regulatory Decisions → Regulatory Standard Setting → Compliance & Enforcement
Barb.horn@state.co.us

Waterdatacollaborative.org

THANK YOU!