# Proposed Adaptive Management Experiments on Small Semiarid Watersheds

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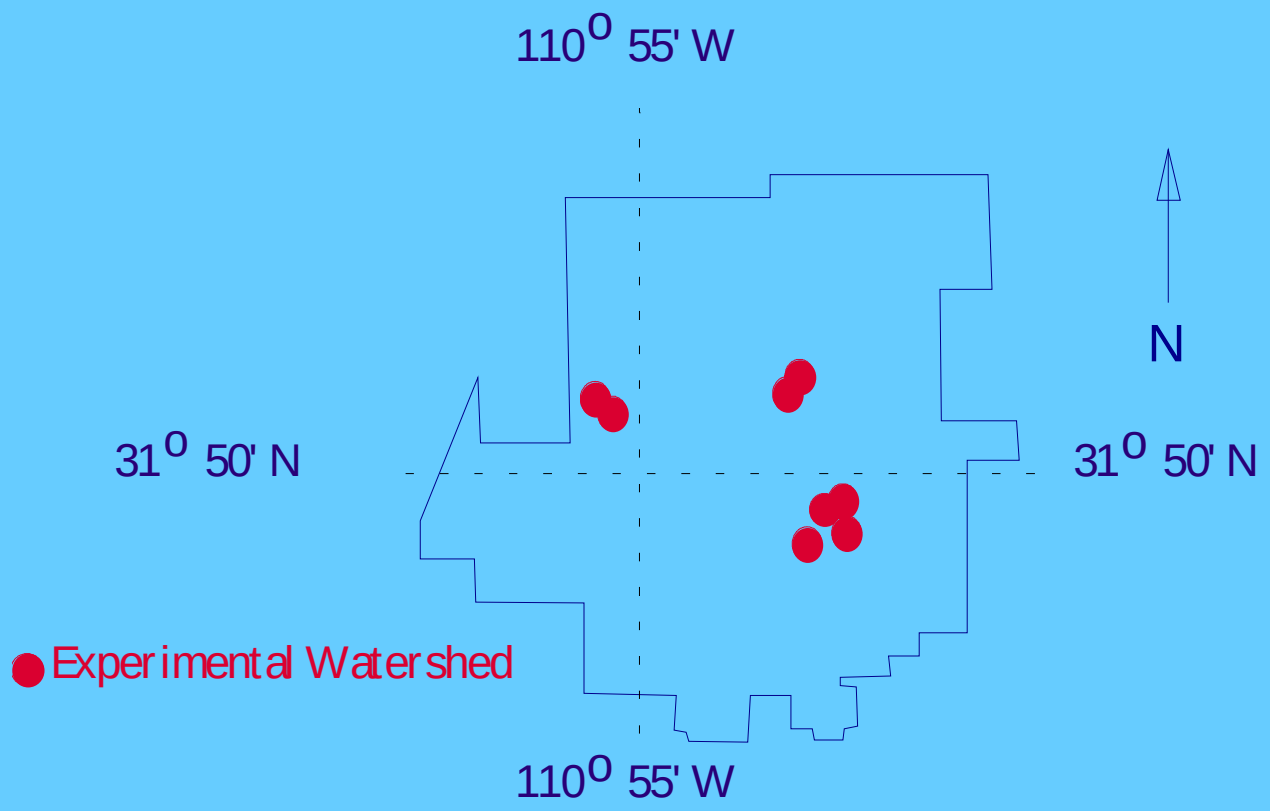
# ARS Experimental Watersheds




**Santa Rita Experimental Range**

# Santa Rita Data Sets

- Hydrology & Sediment
  - *Precipitation*
  - *Runoff*
  - *Sediment*
  - *Channel Volume*
- Soils
- Vegetation
- Climate
- Management
  - *Stocking Rates*
  - *Livestock Treatments*

Descriptive Characteristics

*Location Maps*

*Boundary Surveys*

*DEMs*

*Topo Maps*

*GPS Coordinates*

*Aerial Photographs*

Ecological Site Descriptions

Rangeland Health Evaluations

Bibliography

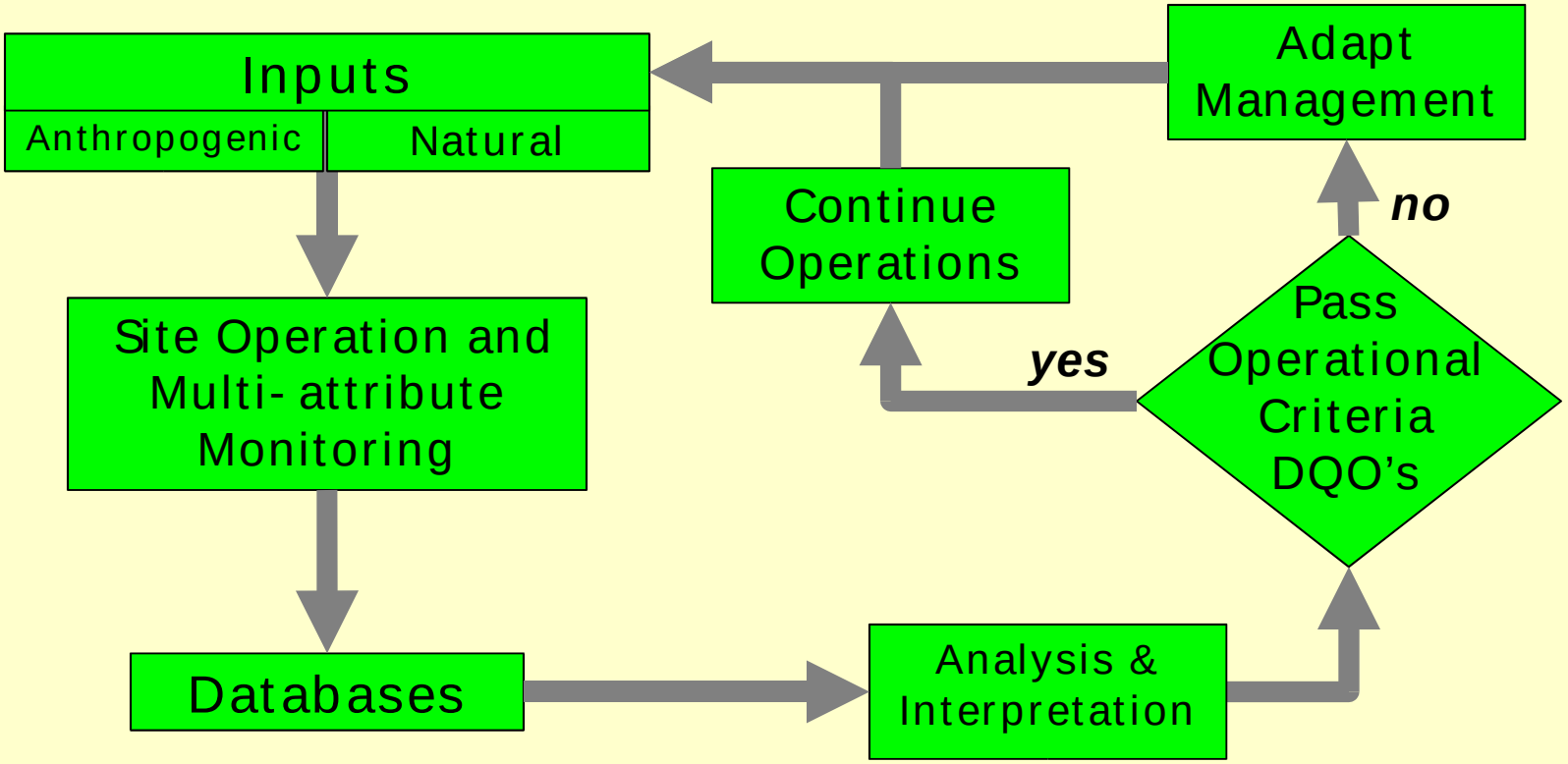
# Key Elements of Adaptive Management Strategies

**A Process for Integrated Natural Resource Management**

- **Mandate for Action – Stakeholders**
- **High Levels of Uncertainty**
- **Decisions, Actions, Evaluations, Adaptations all Documented**
- **Management Actions Measurable/Testable**
- **Decisions Open to Re-evaluation**
- **Communication-Good Science and Common Sense**

# Conceptual Model of the Process

**The integration of data, organizations and knowledge must be adaptive**



# Analyses and Interpretation

- Descriptive statistics of monitoring data
- Time series analyses of " "
- Double mass analyses of " "
- Simulation modeling

  Point/Plot Processes

  Upland Process

  Watershed Processes

# Role of Simulation Models

- To spatially and temporally integrate monitoring data (enhance interpretations)
- To summarize historical relationships
- To predict future responses

Assists in Comparison of Paired Watershed Responses (Point to Watershed Scales)

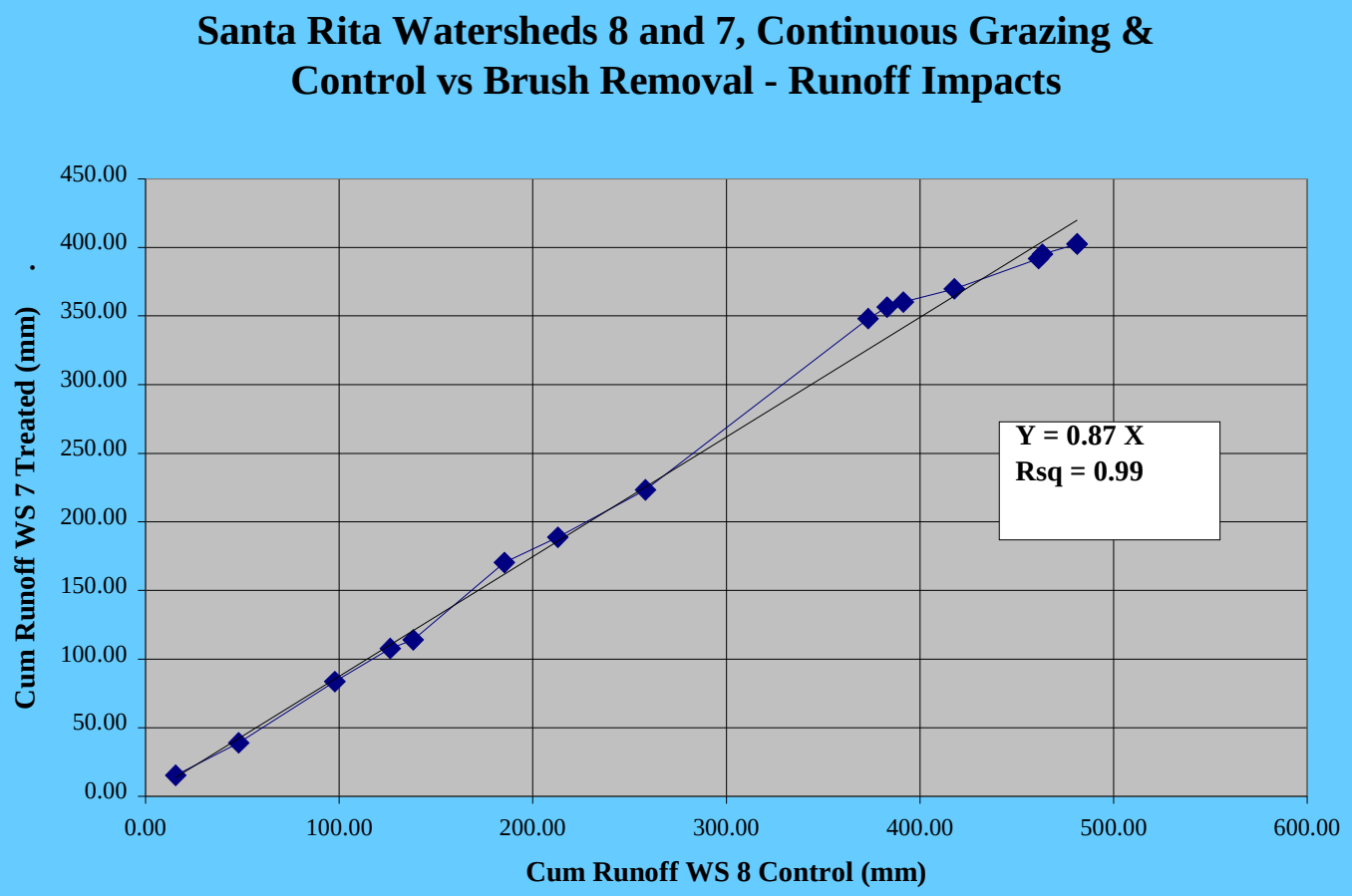
Assists in Designing New Adaptive Management Strategies

# Role of a Decision Support Component

- Integrate data, analyses, modeling, and expert judgment in decision making
- Ensure application of a repeatable, multi-objective decision making process
- Compare watershed management alternatives
- Assist in choosing a path forward—when and how to adapt the management

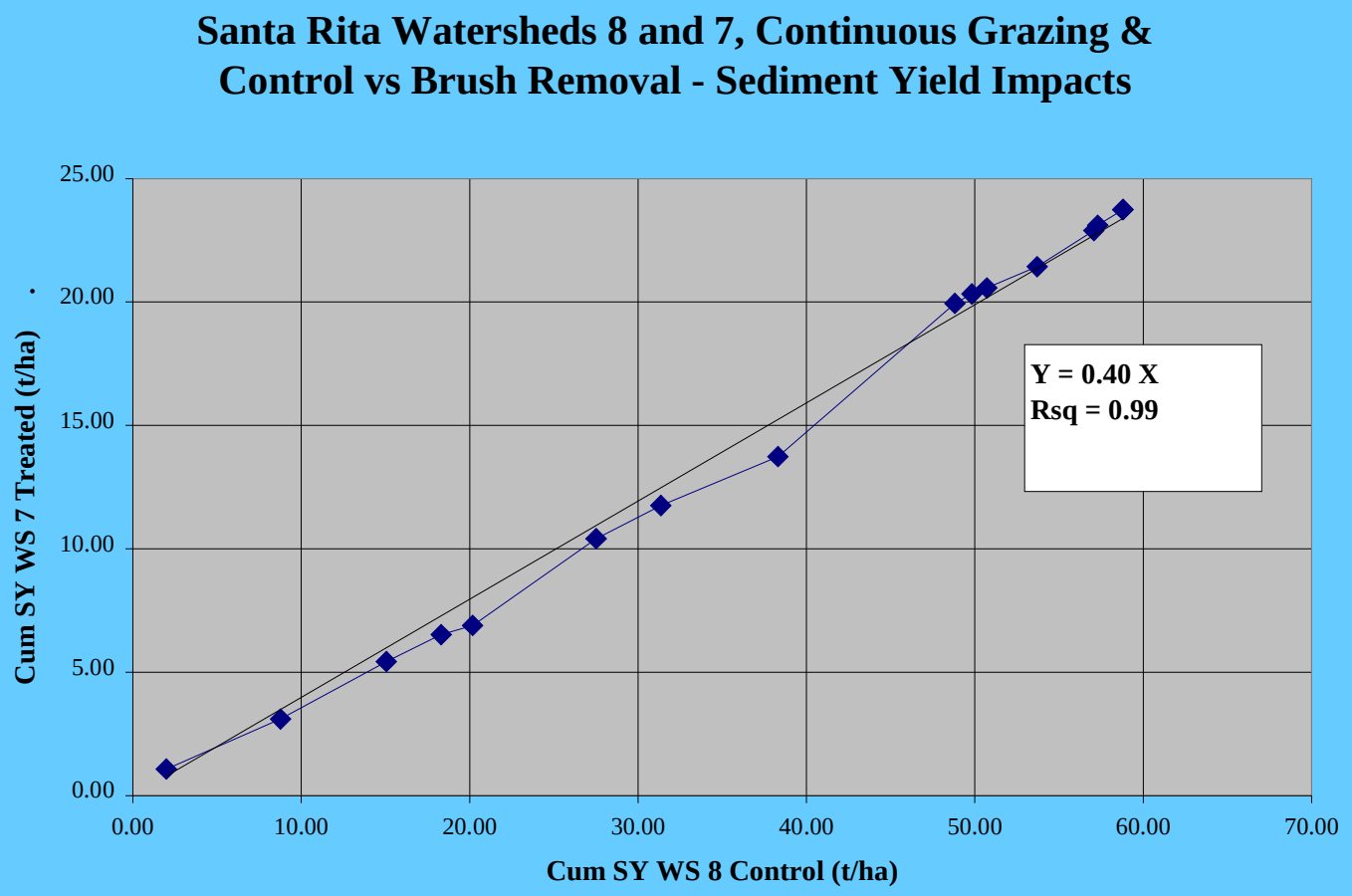
# Selected Examples:

## Double Mass Analyses - Runoff



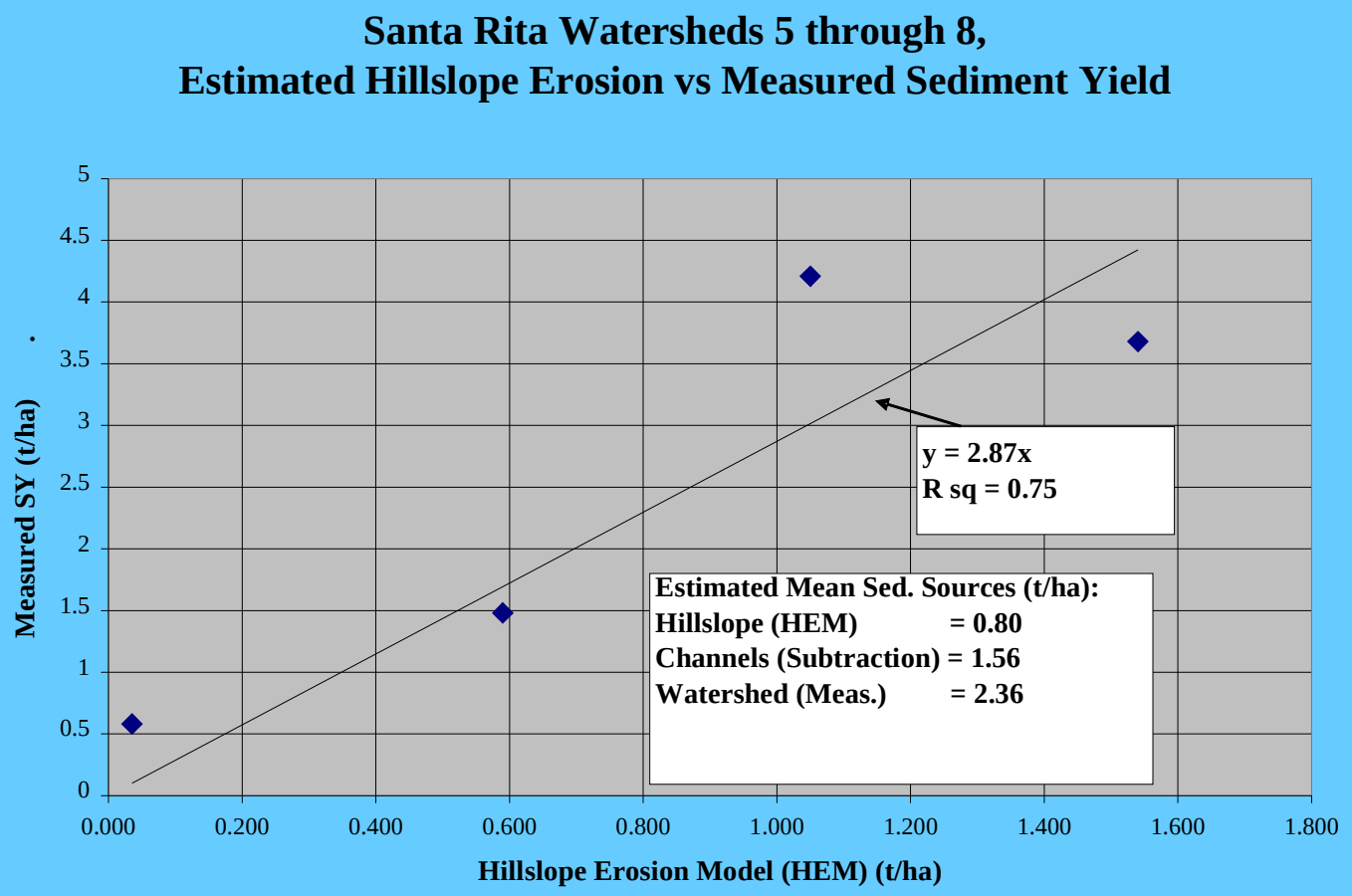
# Selected Examples:

## Double Mass Analyses – Sediment Yield



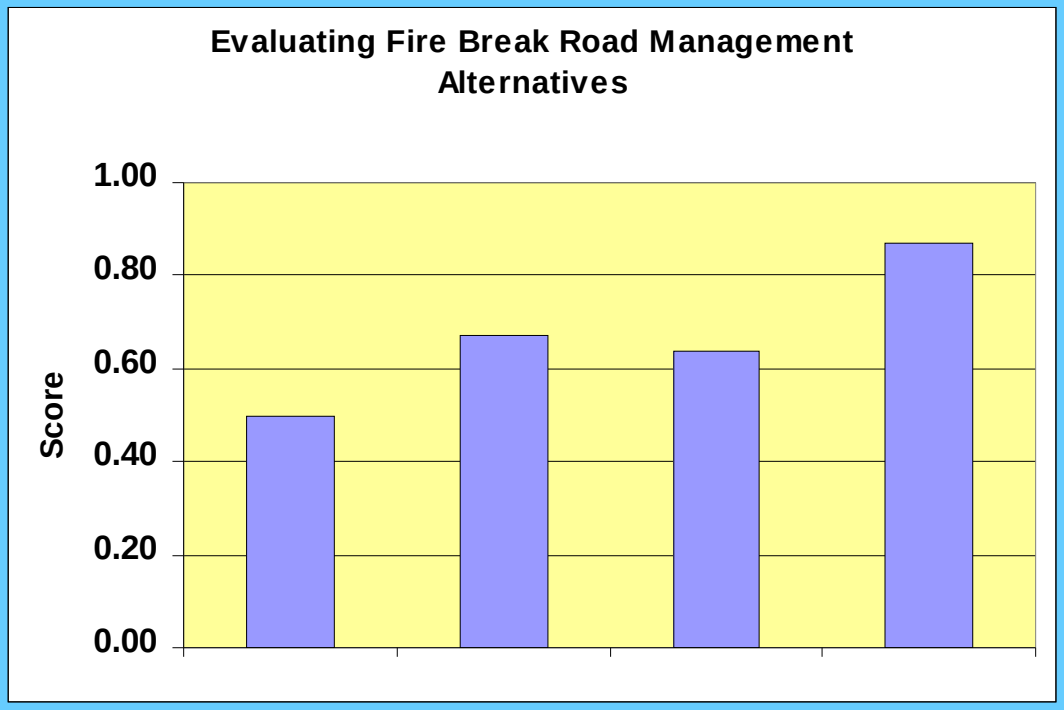
# Selected Examples:

## Upland Erosion Modeling vs Watershed SY



# Selected Examples:

## Using a Decision Support System




| Alternative | 1 Current | 2 Turnouts | 3 Turnouts + Gravel | 4 Turnouts + Herbicides |
|---|---|---|---|---|
| Score | 0.50 | 0.67 | 0.64 | 0.87 |

# Summary of Background and Data

- There is an extensive, multi- attribute database for the 8 small watersheds (4 treated and 4 control) at Santa Rita
- Nearly 3 decades of data can quantify control vs. treatment effects
- Simulation models add value to the interpretations and feed the Decision Support Systems
- Decision Support Systems help choose and evaluate Adaptive Management Alternatives

# Proposed Path Forward

## Get Current on Data & Analyses

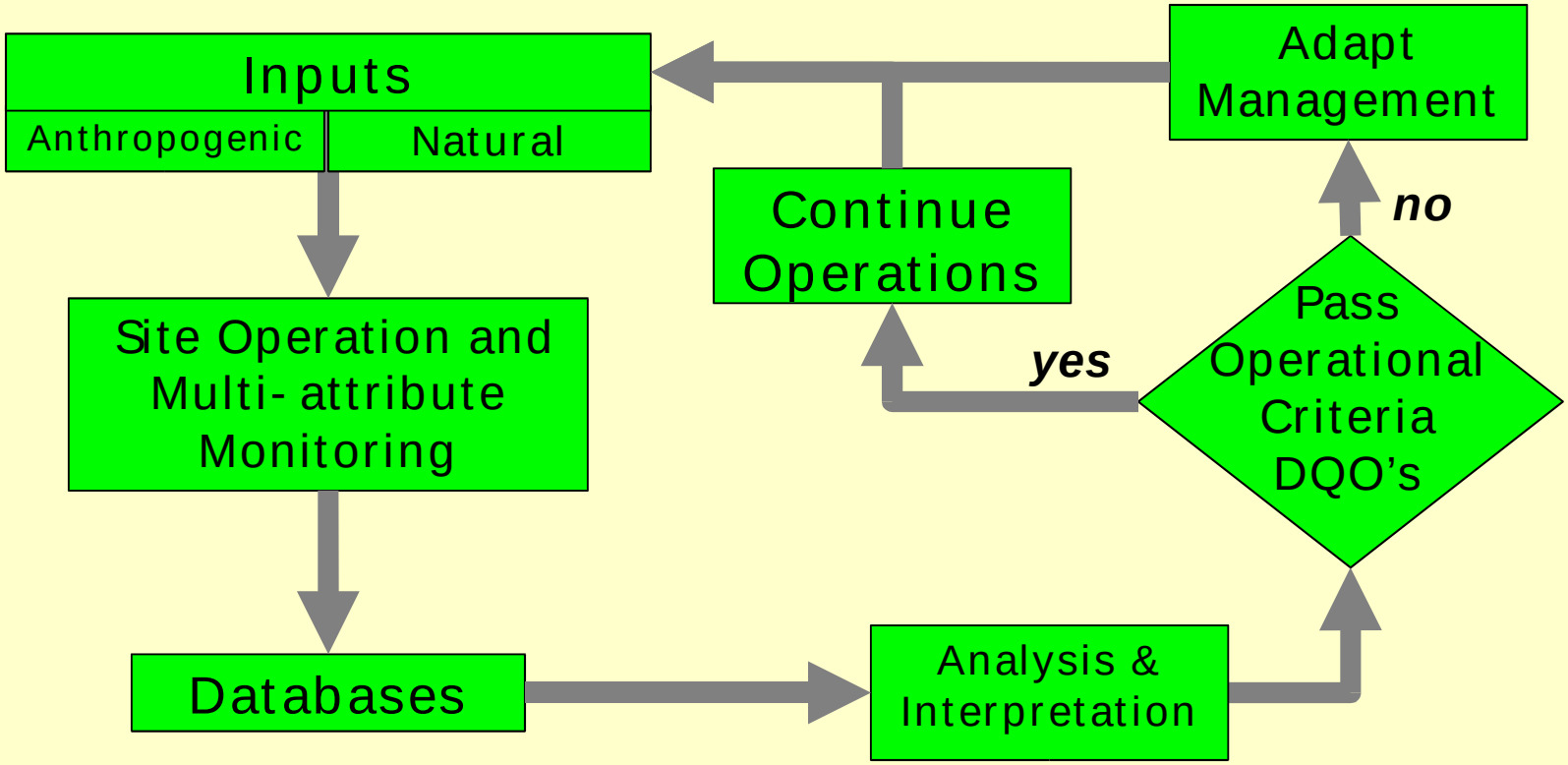
- Make all databases current
- Integrate the databases in a DBMS
- Analyze and interpret treatment effects for all 8 watersheds from 1976 – Present
- Document data, analyses, and interpretations

# Proposed Path Forward

## Adapt the Management

- Define a few alternative management systems for the 4 treated watersheds
- Use data, analyses, modeling, the DSS and expert judgment to select a new management practice to apply to the 4 treated watersheds
- Define the monitoring, analyses, modeling, objectives, and DSS, to use in Adaptive Management
- Document all of the above

# Proposed Path Forward

## Operate the Watersheds under New Treatments

- Begin new operations and monitoring
- Follow the Adaptive Management Process