WATER QUALITY MONITORING IN THE FORESTED WATERSHEDS OF CALIFORNIA: STATUS AND FUTURE DIRECTIONS

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PROBLEM STATEMENT:

"Data, Data, Data! He cried impatiently. I can't make bricks without clay"

(Doyle, 1892)

WHY MONITOR?

- Ensuring compliance with regulatory requirements
- Status and trend of resources of concern
- Optimization under uncertainty (i.e. adaptive management)
- Research

BASIC QUESTIONS

1. Who is doing the monitoring?
2. What is the statewide distribution of monitoring activities?
3. What are the objectives of the various monitoring activities?
4. What types of WQ monitoring activities are being implemented in the forested watersheds of California?

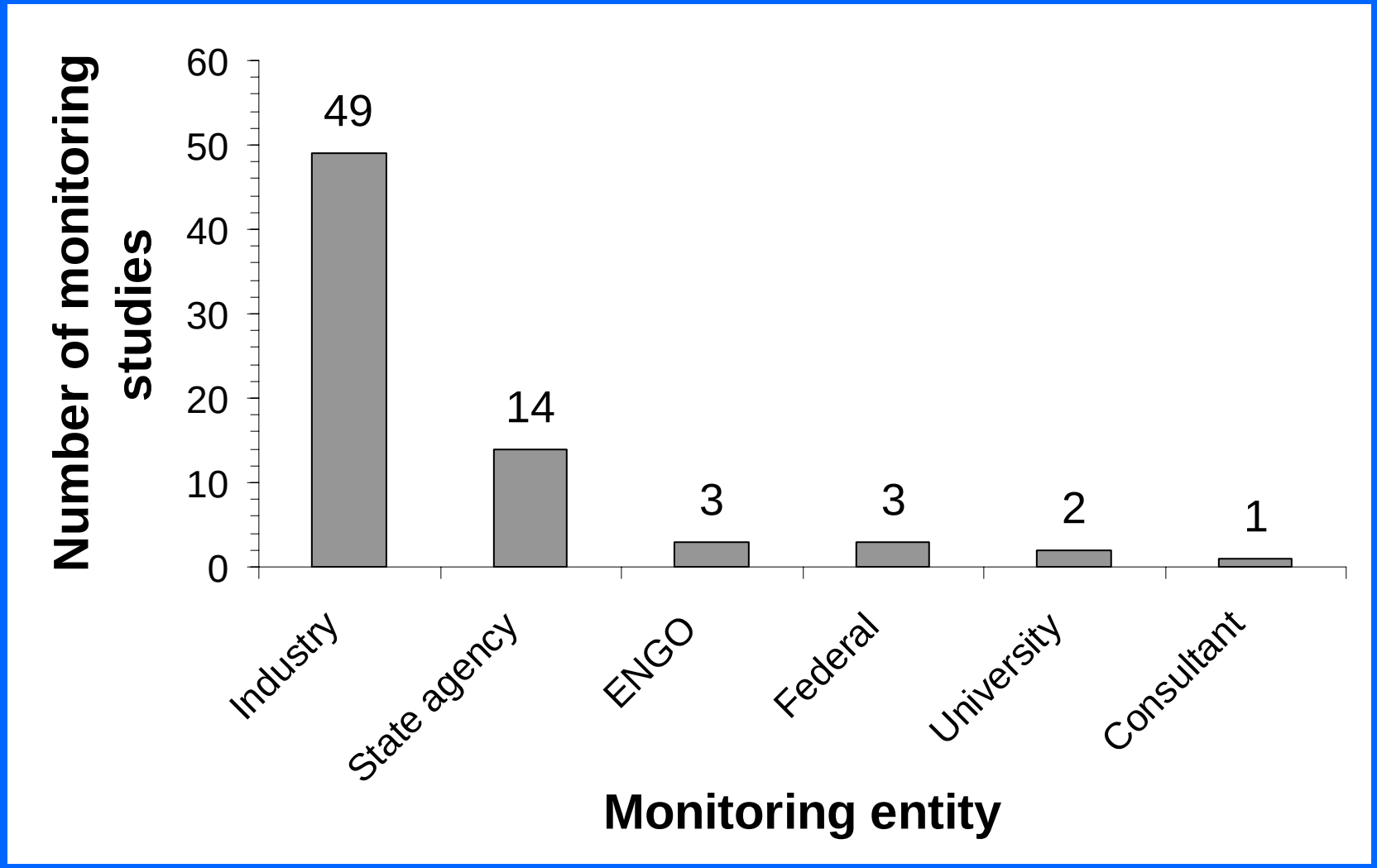
BASIC QUESTIONS

5. Are stakeholders achieving monitoring objectives and is data being used for management/regulatory purposes?

6. Are monitoring data accessible to stakeholders and/or the general public?

7. Are the various monitoring activities cost effective?

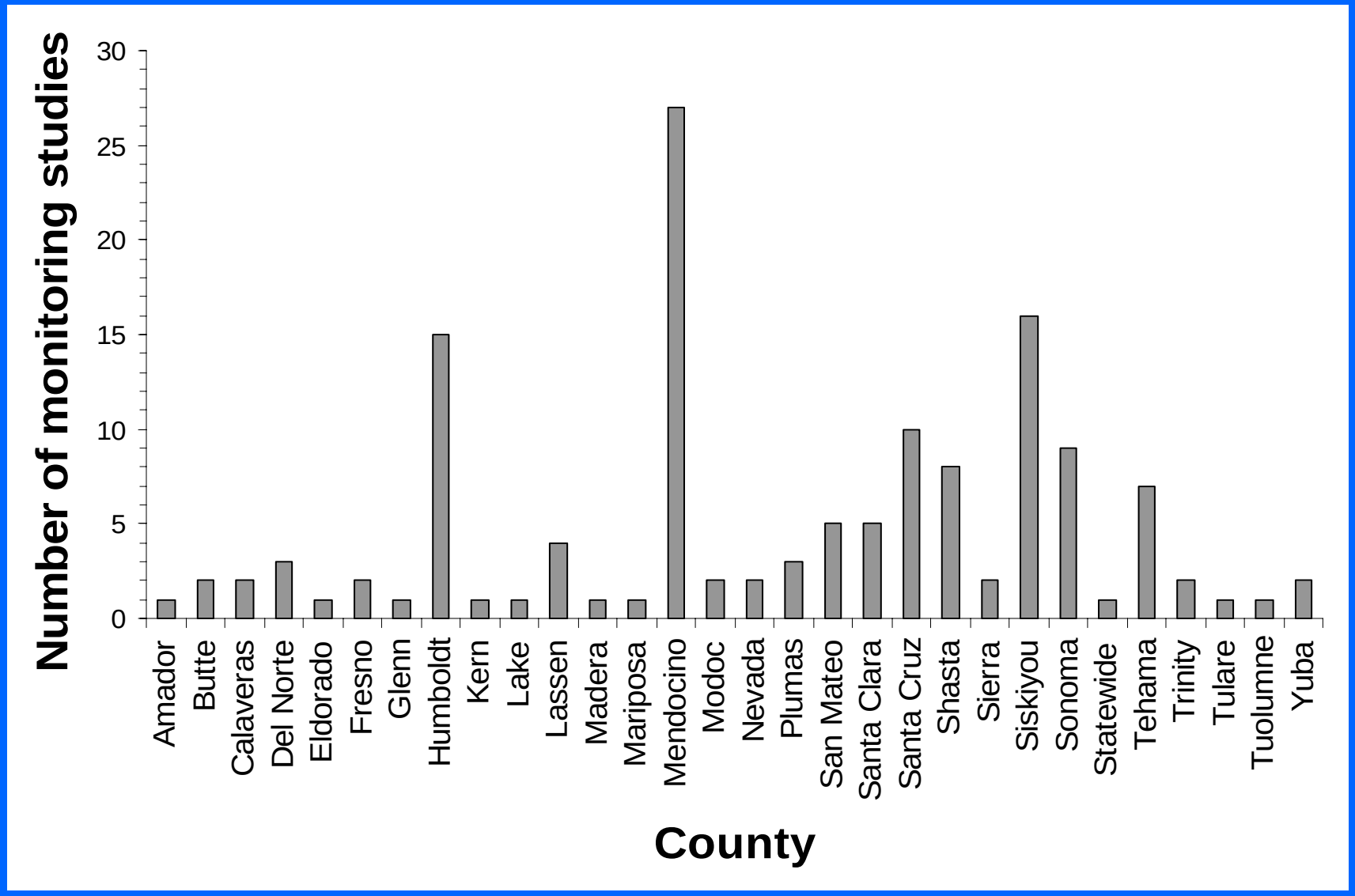
NUMBER OF STUDIES BY MONITORING ENTITY



… and the Top 10 respondents are:

Landowner/Affiliation	Number of Studies
Mendocino Redwood	9
Campbell Timberland	8
Green Diamond	7
Central Coast WQ	7
Fruit Growers Supply	5
Timber Products Co.	5
CALFIRE	4
Sierra Pacific Ind.	4
CDFG	3
Mattole Restoration Council	3

WHERE IS MONITORING OCCURING?



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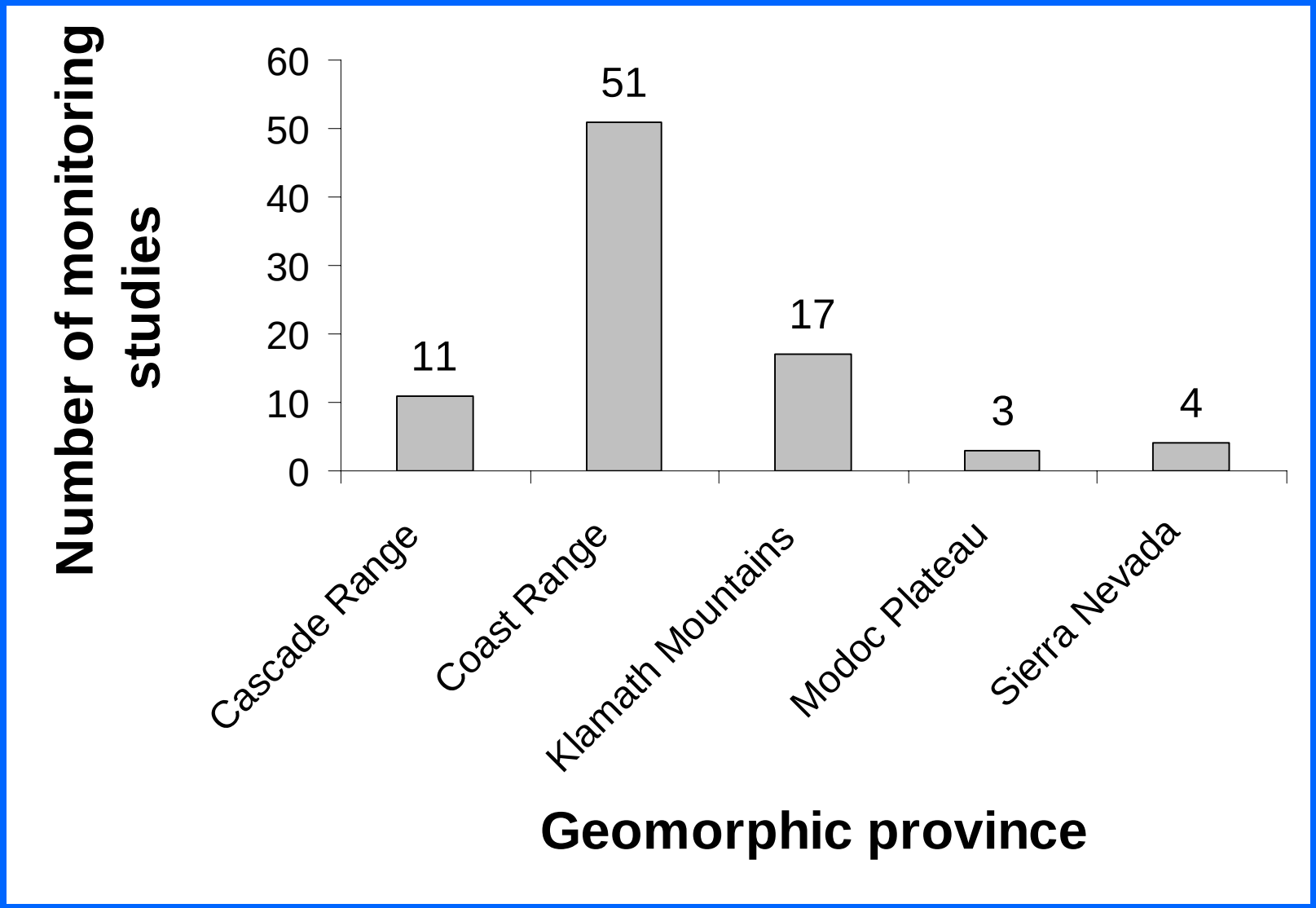
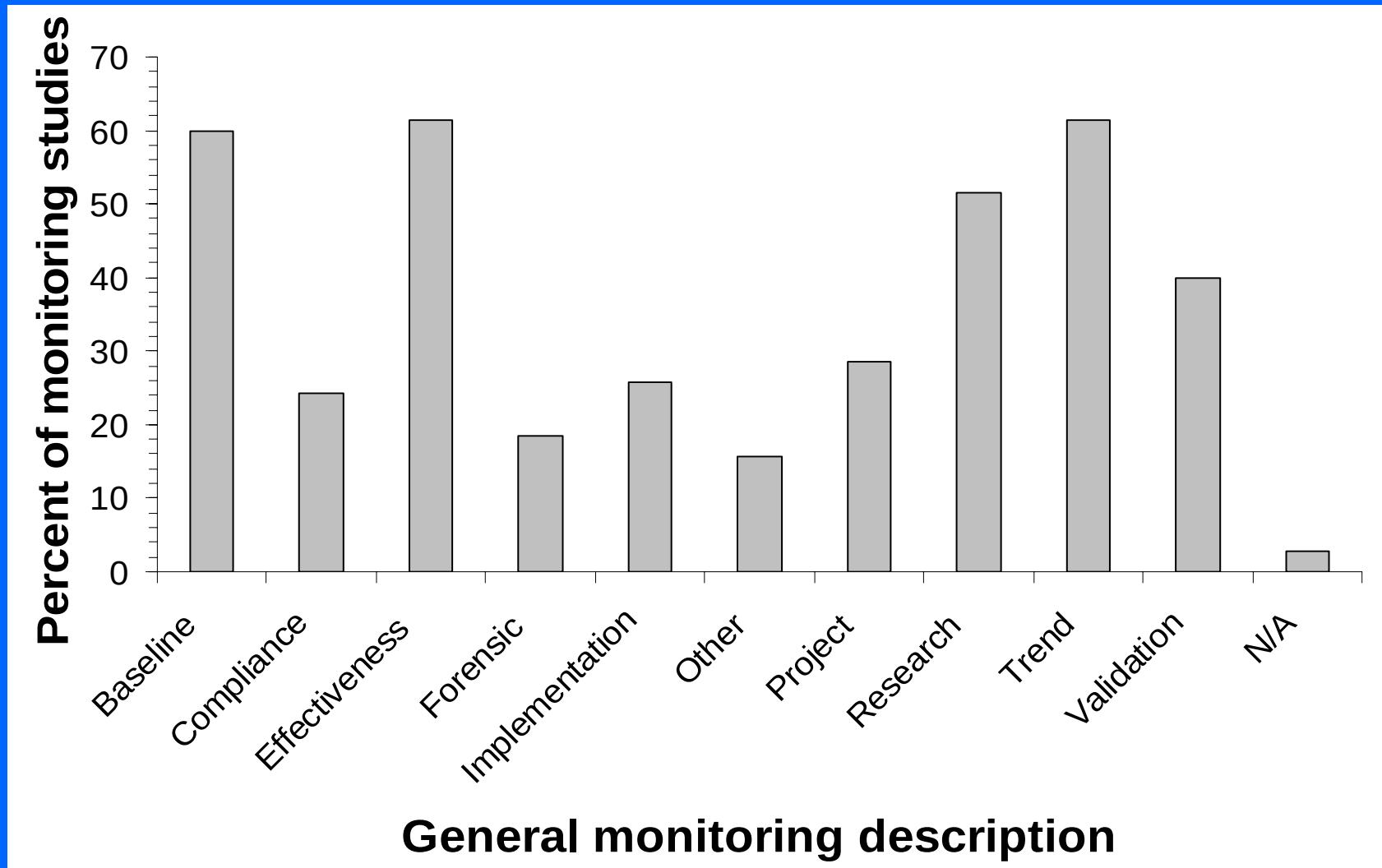
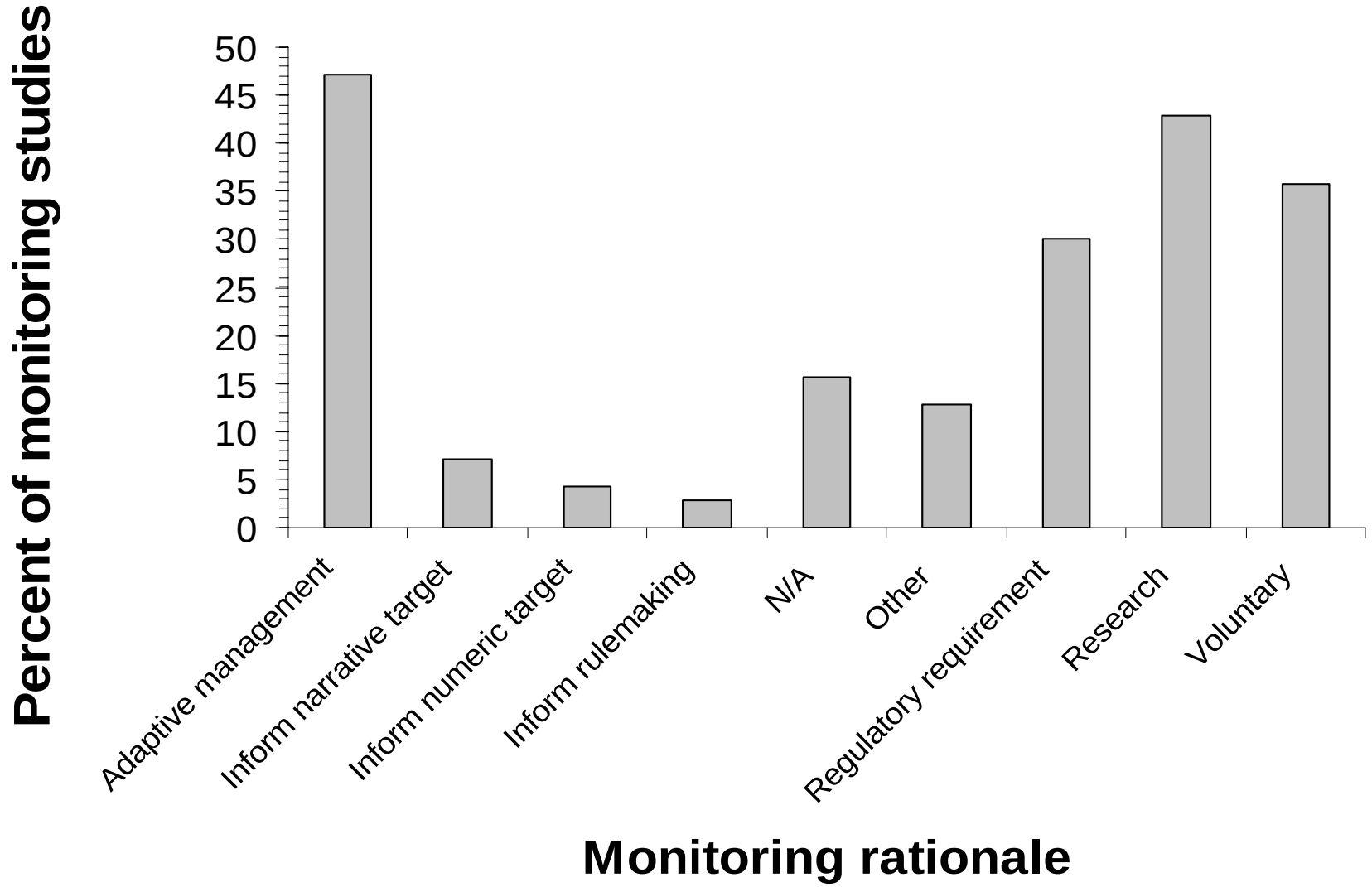


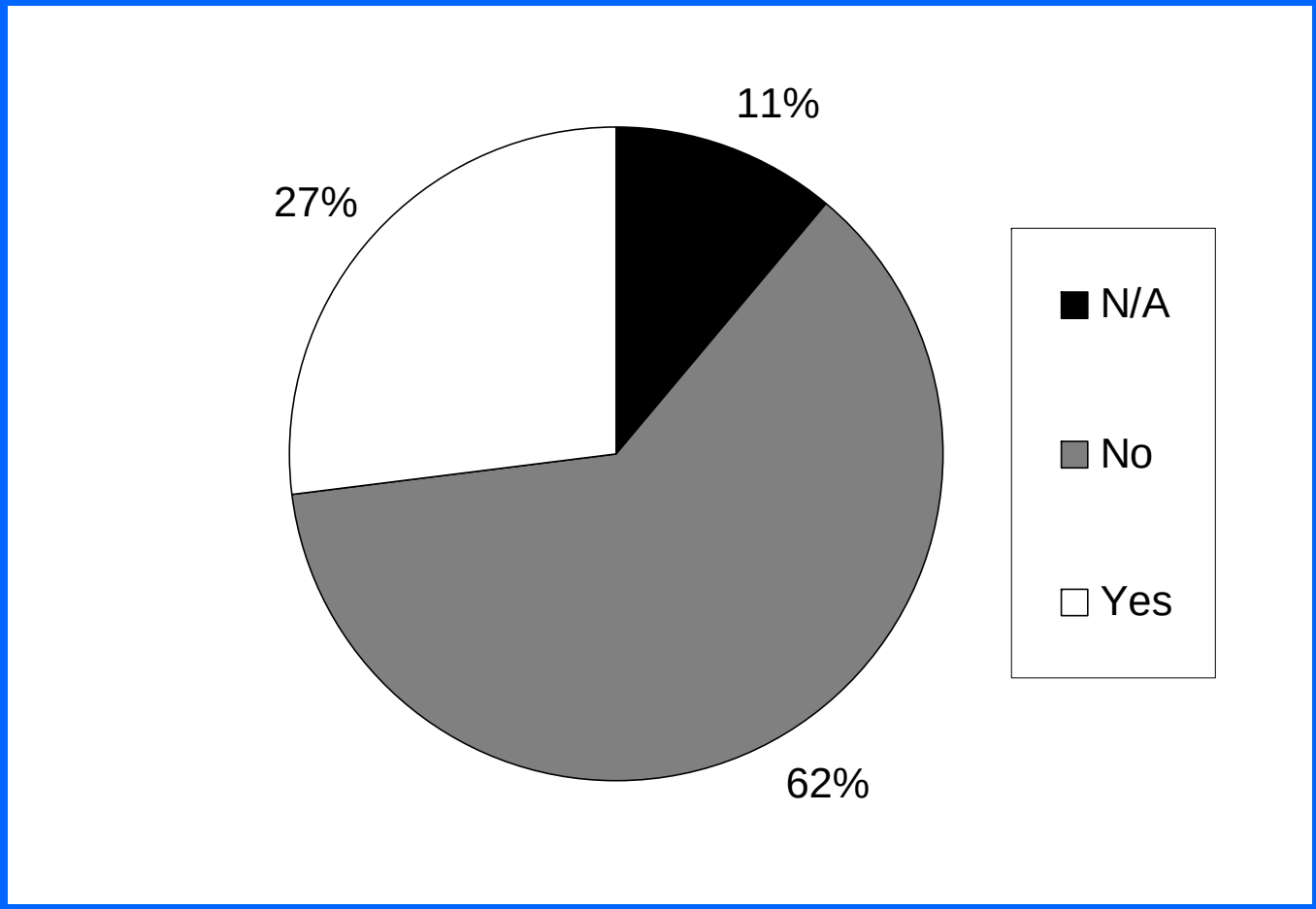
TYPES OF MONITORING



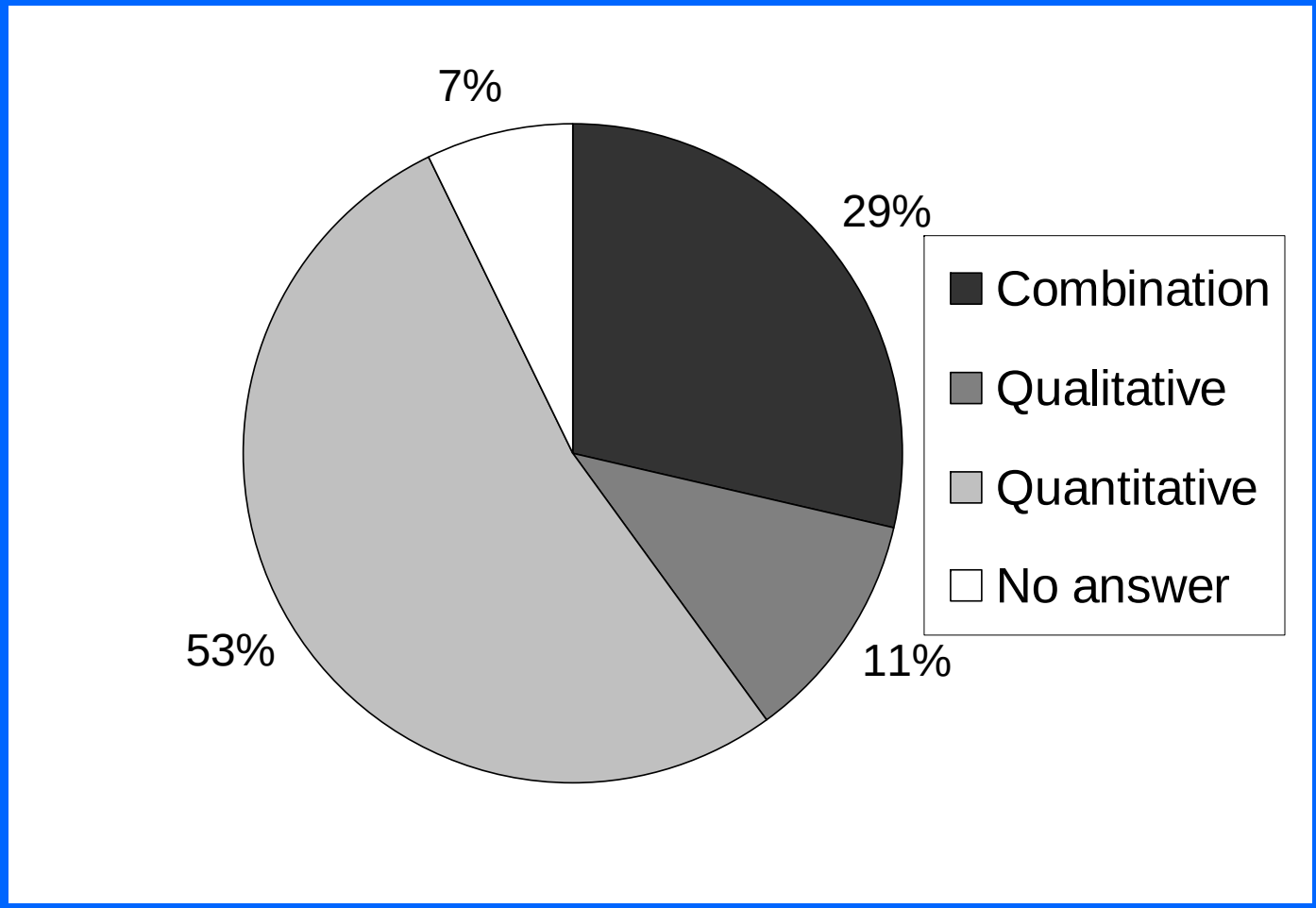
MONITORING RATIONALE

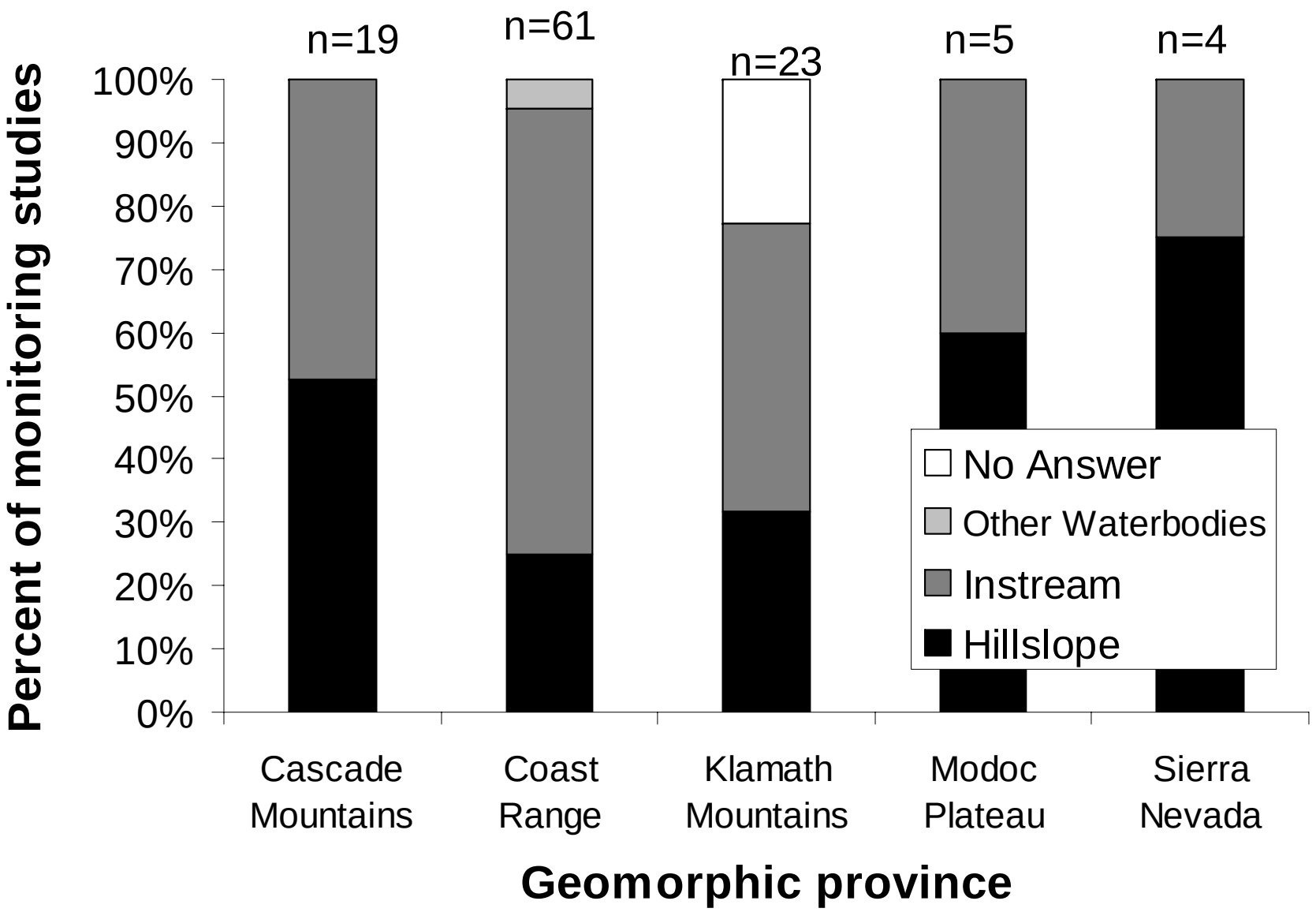


ARE OBJECTIVES FRAMED AS TESTABLE HYPOTHESES?

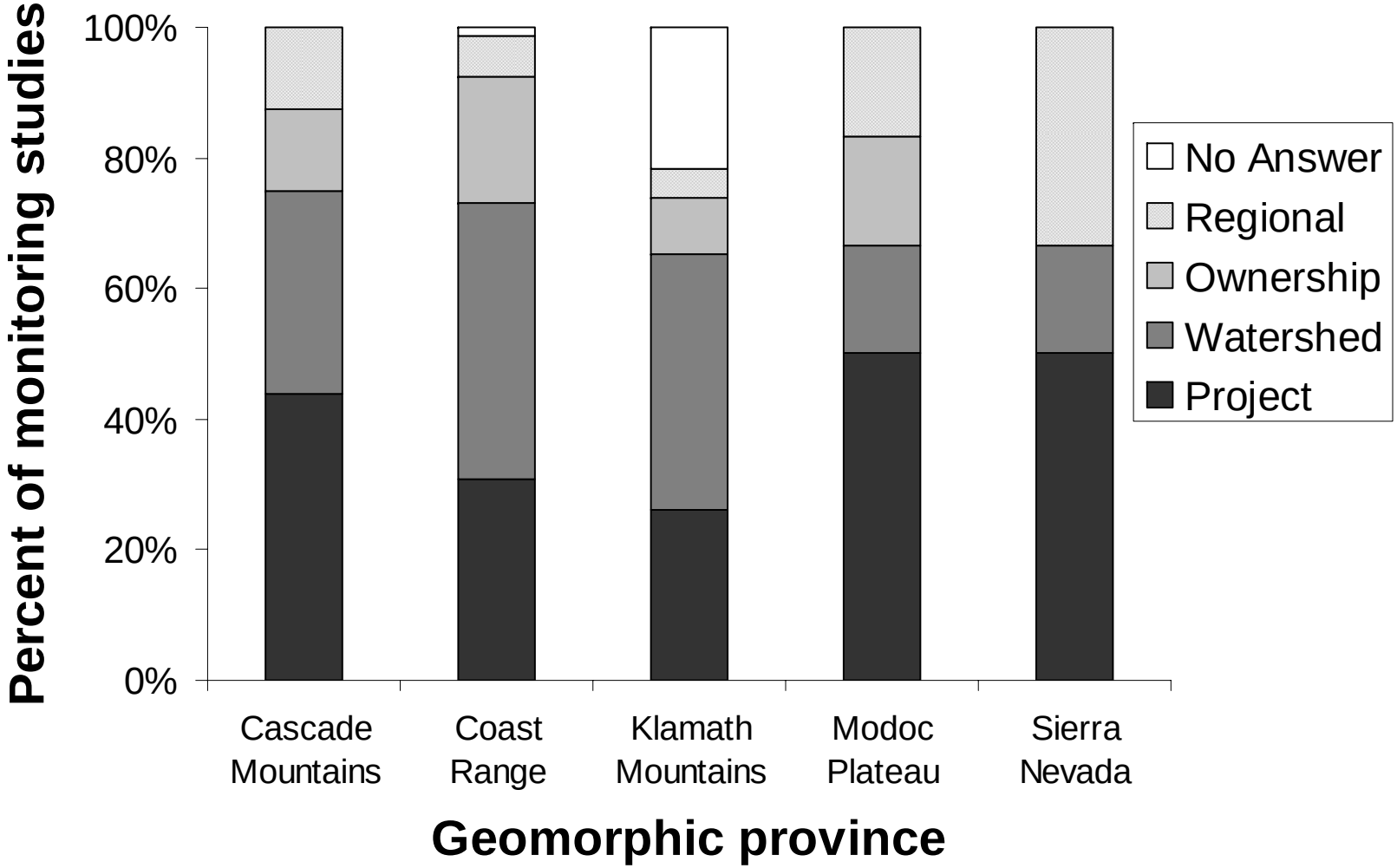


MONITORING METHODS ARE PRIMARILY

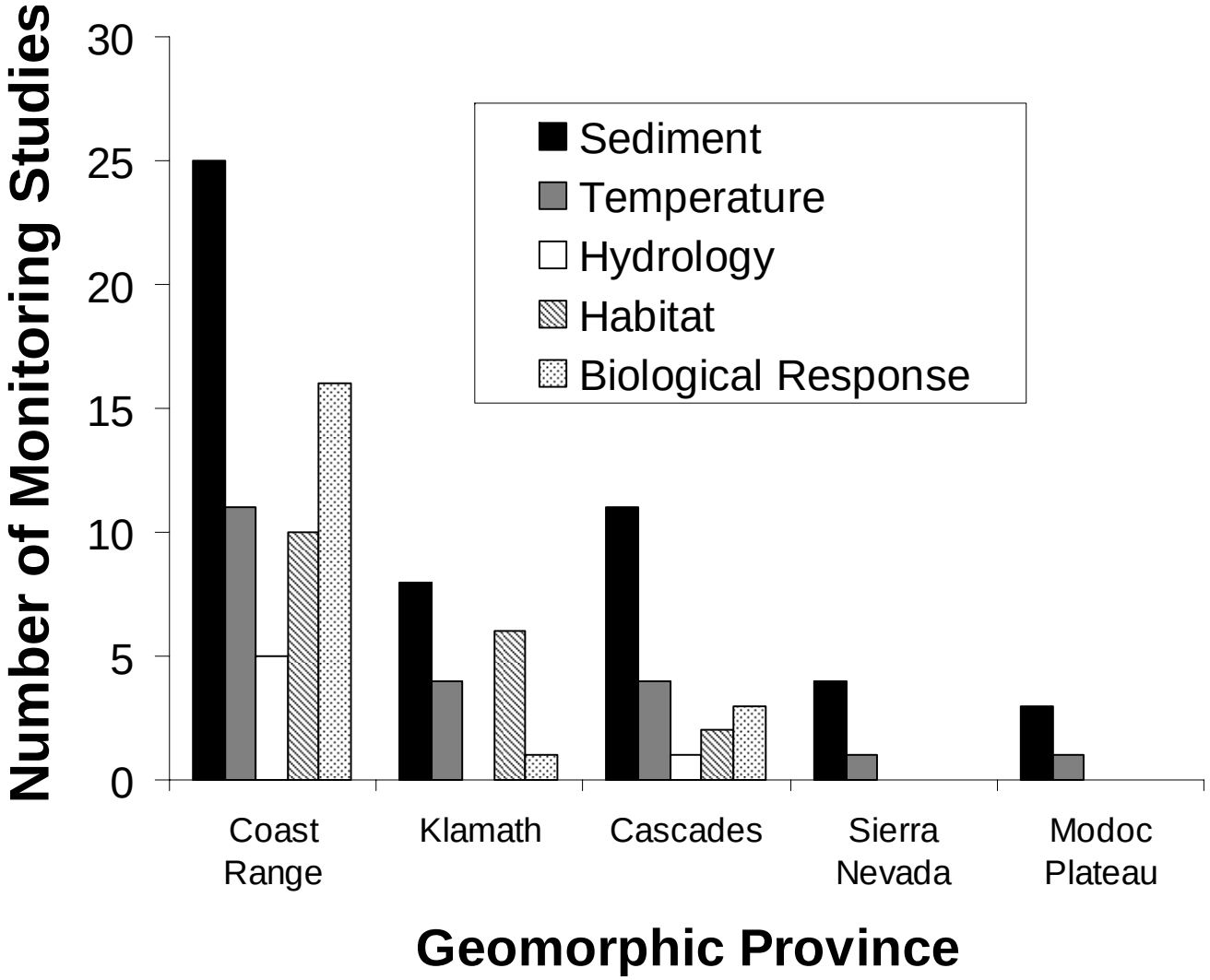



n=19
n=61
n=23
n=5
n=4
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percent of monitoring studies
No Answer
Other Waterbodies
Instream
Hillslope
Cascade Mountains
Coast Range
Klamath Mountains
Modoc Plateau
Sierra Nevada
Geomorphic province

AT WHAT SCALE IS THE MONITORING BEING DONE?



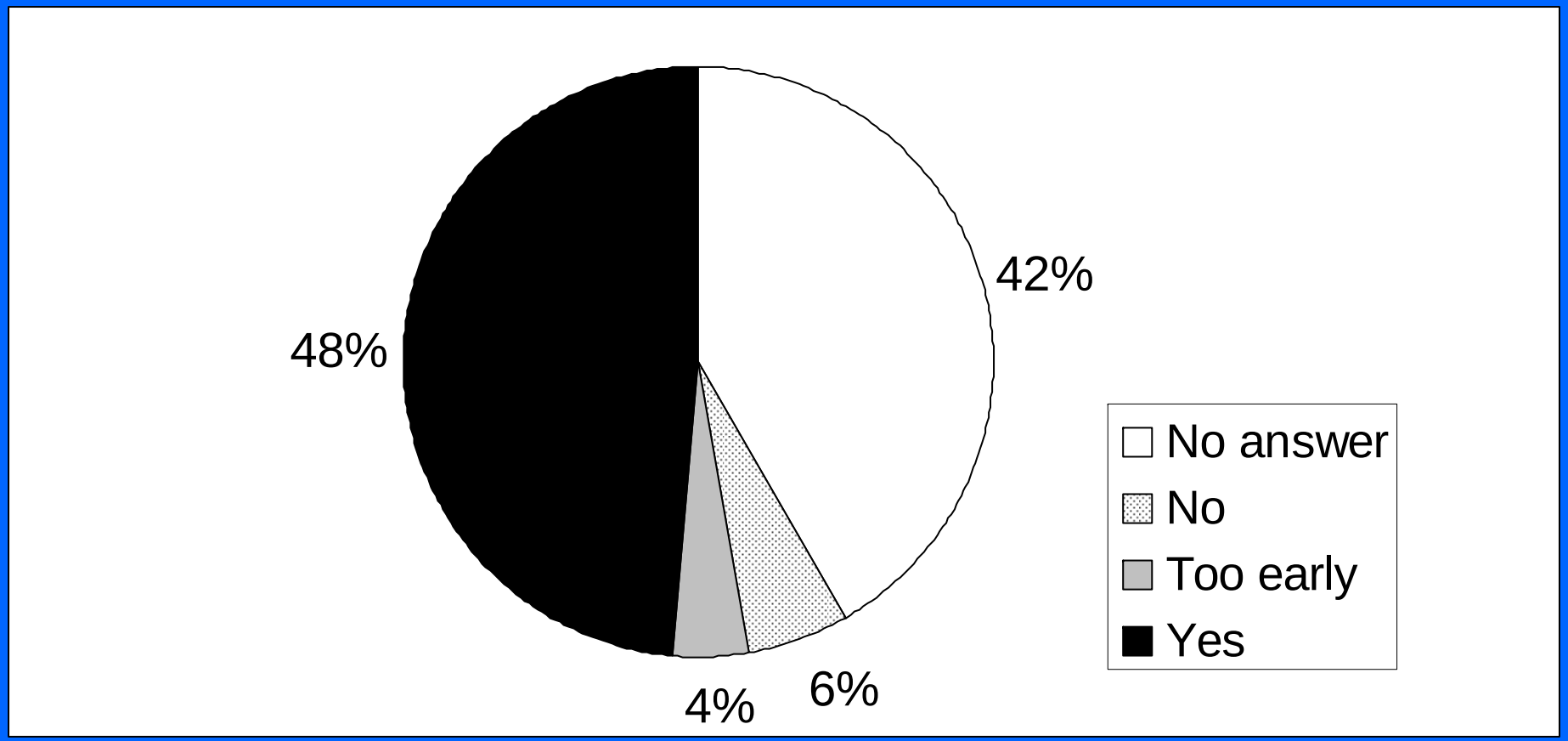
MONITORING PARAMETERS



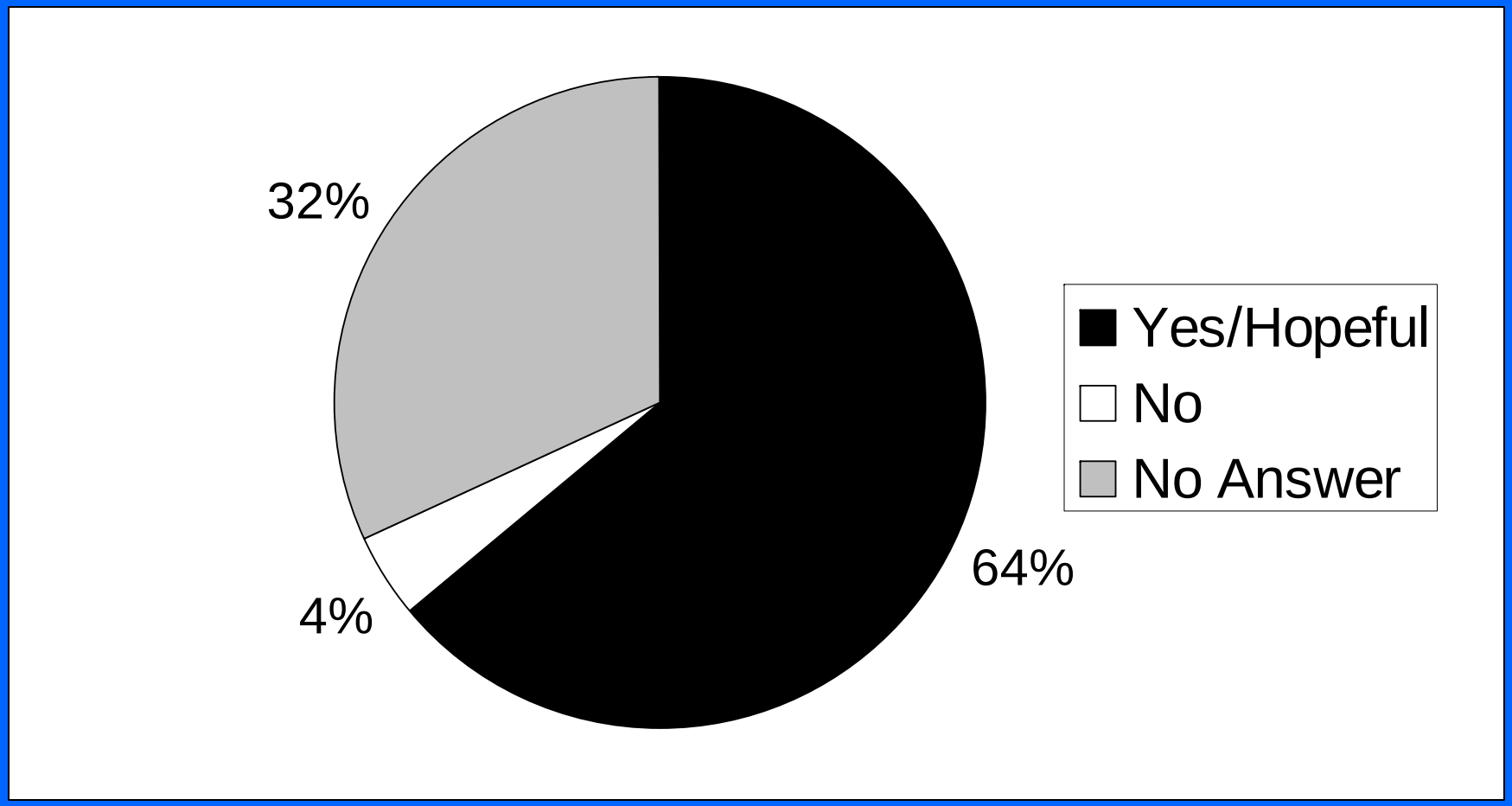
MONITORING RESULTS AND DATA AVAILABILITY

- Monitoring results for 46% of respondents
- Just over 10% offered conclusions from monitoring studies
- Approximately 50% have monitoring reports available

ARE MONITORING OBJECTIVES BEING MET?



ARE MONITORING DATA BEING UTILIZED?



Is Monitoring Cost Effective?

- Costs for individual studies ranged from $2500 yr to $200,000
- 67% of respondents did not answer
- Difficult to answer given incomplete response

CASE STUDIES– GREEN DIAMOND RESOURCE CO.

- Aquatic HCP
- Monitoring studies address suite of controlling processes
- Address scale linkages (Class I and III)
- Summer salmonid population estimates
- Outmigrant trapping

Case Study – Campbell Timberland Management

- Voluntary
- Monitor populations of adult and juvenile coho and steelhead
- Intensive watershed monitoring (SF Wages & SF Ten Mile)

Case Study – Mendocino Redwood Company

- Monitoring of Coastal tailed frog, Red-legged frog, Southern torrent salamander
- Outmigrant smolt abundance and salmon distribution monitoring
- Channel, sediment, and temperature monitoring

CASE STUDY - IMMP

- Collaborative interagency monitoring program
- Qualitative understanding of high risk watercourse crossings
- Promotes social learning and consensus building

MONITORING STATUS: CONCLUSIONS (1)

- 72 monitoring studies submitted
- 68 percent submitted by industrial landowners
- 70 percent from the Coast Range geomorphic province
- Monitoring most commonly classified as EFFECTIVENESS, BASELINE, TREND, and RESEARCH.

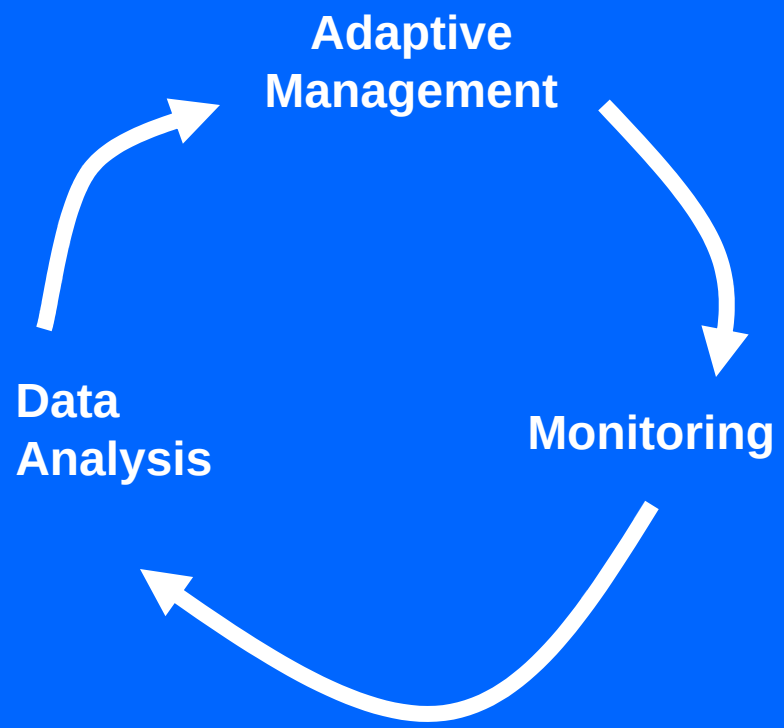
MONITORING STATUS: CONCLUSIONS (2)

- Most common rationale for monitoring is ADAPTIVE MANAGEMENT, VOLUNTARY, and REGULATORY REQUIREMENT
- Monitoring primarily done at the project or watershed scale
- Sediment the dominant parameter measured
- Generally a lack of results or conclusions from monitoring studies

MONITORING STATUS: CONCLUSIONS (3)

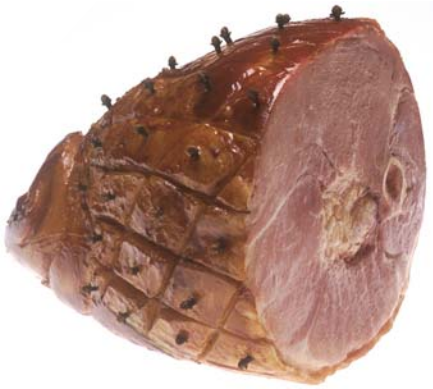
- Half of studies are summarized in reports available to public
- Relatively little cost information submitted
- Difficult to assess cost effectiveness of monitoring activities

FUTURE DIRECTIONS: INCENTIVIZE MONITORING



- Allow for monitoring data to inform management and regulation (i.e., adaptive management)
- Allow for adaptive management to be a two way street

Holling's Adaptive Management (HAM)



Socio-Political Adaptive Management (SPAM)

•Management activities conducted as experimental manipulations implemented within the context of well-designed monitoring experiment

•Rooted in scientific culture

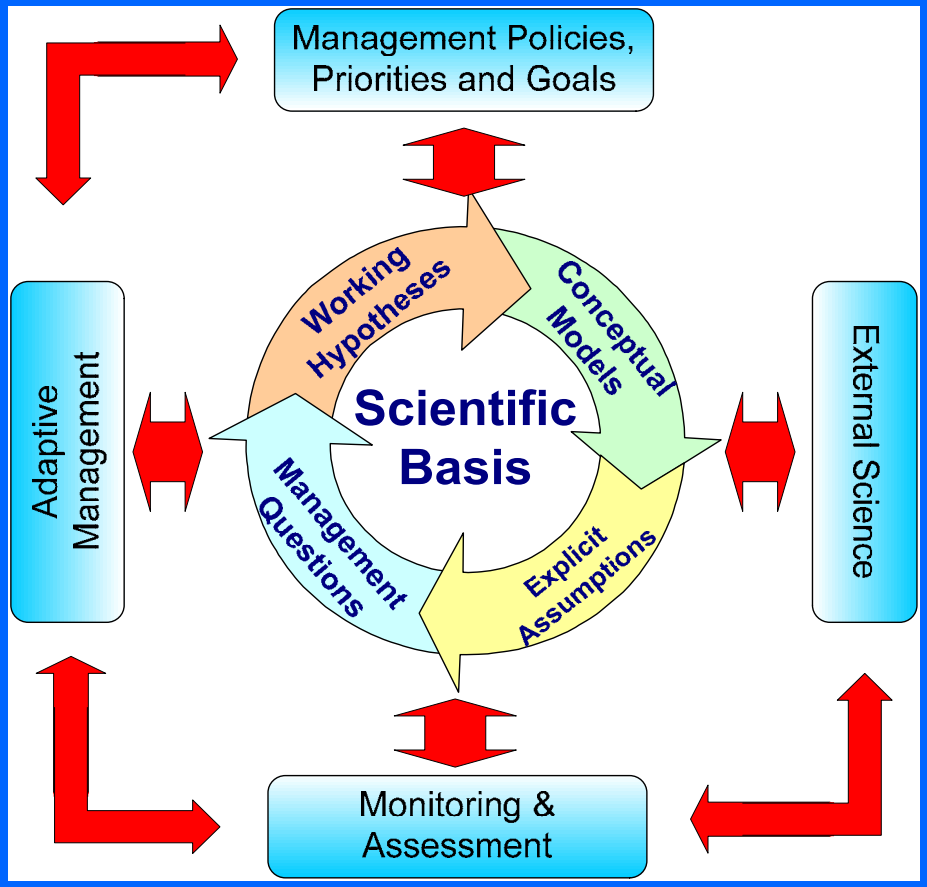
•Iterative process resulting in a feedback loop between monitoring and management.

•Assumes independent monitoring will document negative impacts from management activities

•Rooted in policy culture

•Typically a linear process that rarely results in a feedback loop between monitoring and management.

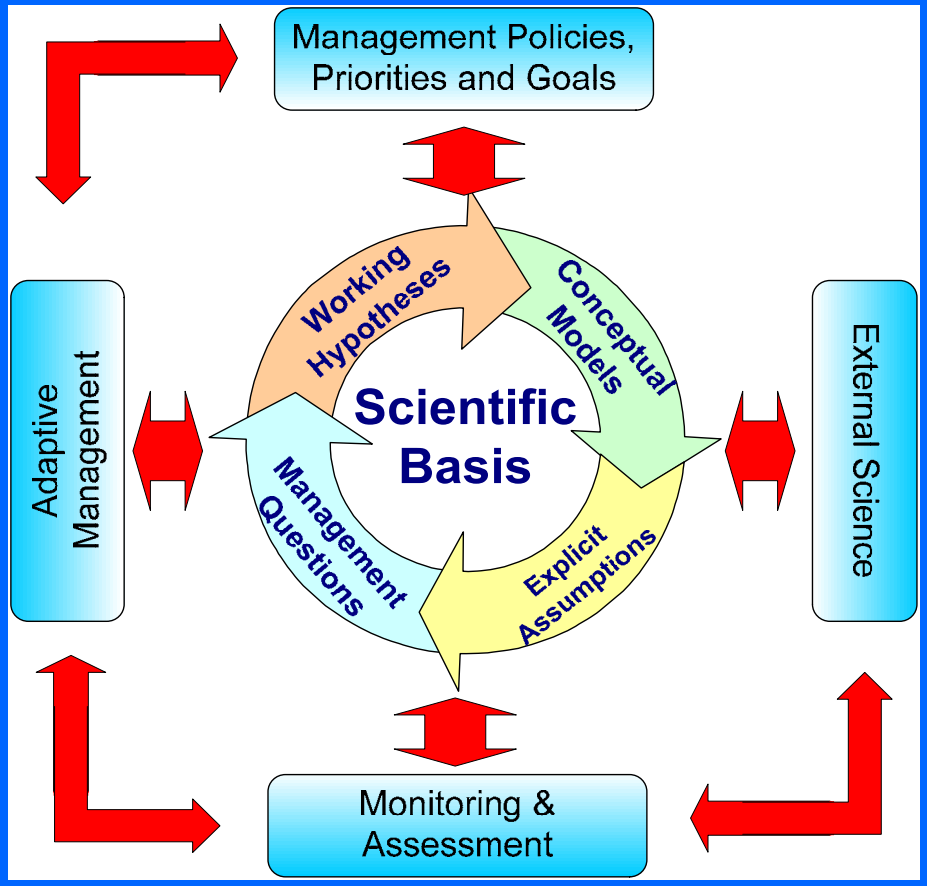
FUTURE DIRECTIONS – POLICY FRAMEWORK



(SWC, 2008)

- Identify clear functional goals and performance measures that define the decision space for science-based management (SWC, 2008)
- A priori agreement on type and magnitude of change to trigger adaptive management
- Common vision (e.g., clean water; healthy fish; viable industry)

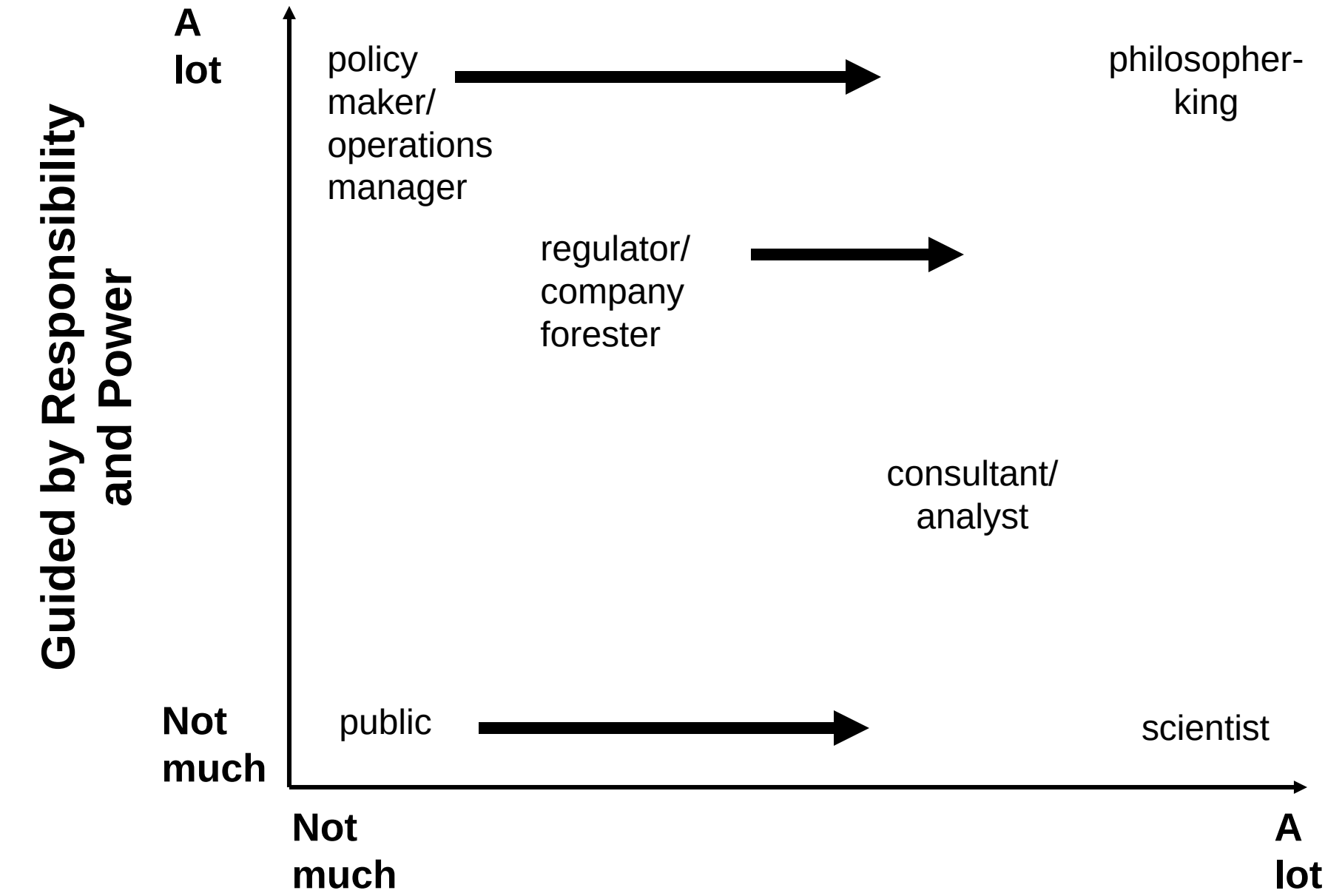
FUTURE DIRECTIONS – SCIENCE FRAMEWORK



(SWC, 2008)

- Collaborative for greater cost efficiency
- Hypothesis testing
- Formalize qualitative understanding
- Hierarchical to address critical issues of scale and scale linkages

QUESTIONS??


A lot
Guided by Responsibility and Power
policy maker/ operations manager
philosopher-king
regulator/ company forester
consultant/ analyst
Not much
public
scientist
Not much
A lot
Guided by Science/Truth

(Lee, 1999)

METHODS - QUESTIONAIRRE

1. Landowner information and locations
2. General description of monitoring
3. Monitoring objectives
4. Monitoring methods
5. Data utilization
6. Data availability
7. Monitoring costs