RIPARIAN ECOSYSTEM RESTORATION EFFECTIVENESS FRAMEWORK

Tracking the Benefits of Stream and Floodplain Restoration in the Lake Tahoe Basin

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Riparian Ecosystem Restoration Effectiveness **Framework**

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Purpose of research

- Evaluate current effectiveness evaluations
  - Not analyzing the actual effectiveness of existing restoration but rather the effectiveness evaluations themselves
- Develop a tool to improve future effectiveness evaluations

Presentation outline

- Part 1 (Matt):
  - Inventory findings and improvement identification
  - Provide context for tool development
- Part 2 (Nicole):
  - Detailed description of the Framework

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Inventory and Analysis of Existing Effectiveness Evaluations

- Gathered effectiveness reporting for 19 projects in the Tahoe Basin
- Each metric used in an evaluation was assigned a qualitative rating based on:
  - Was it measured both pre-and post-project?
  - Direct applicability to a stated project objective
  - A monitoring duration sufficient to resolve natural variability, or to capture trends

Inventory and Analysis of Existing Effectiveness Evaluations

Findings

1. Documentation poor
2. Incomplete project goals
3. Project objectives could be greatly improved
4. Monitoring rarely achieving evaluation of effectiveness for number of reasons
5. Adaptive management seldom implemented

Documentation

FINDINGS

- Difficult to obtain
- Incomplete or inconsistent
  - Reports implied in earlier documents unavailable
  - Lacking rationale for monitoring approach taken
  - No standardization across projects

IMPROVEMENTS

- A clear, consistent process for developing documentation
- A central repository for effectiveness reporting

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Project Goals

FINDINGS

- Common goal statement: improvement of water quality, fish and wildlife habitat and communities.
- Majority of projects fundamental design approach of restoring natural process and function
- However, goal statements varied widely, from ecosystem process statements to policy statements.

IMPROVEMENTS

- A conceptual model of the role of riparian ecosystem restoration in the Lake Tahoe Basin
- Clear definition a goal and an objective; consistent use in effectiveness evaluations

Objectives

FINDINGS

- 29% contained testable hypothesized outcomes
- Most statements were goals, not objectives
  - Improve fish habitat: goal statement
  - Increase length of undercut stream banks by 25%: objective
- Quantitative statement of existing conditions and the effect of impairment were also rare

IMPROVEMENTS

•A systematic set of procedures to develop testable project objectives during design phase.

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Metric Performance

FINDINGS

- Pre- and post efforts essential, but included in only about 74% of existing evaluations
- Typical duration 2 years post project
- Only 1 evaluation contained sufficient effort to account for sampling and natural environmental variability

IMPROVEMENTS

General monitoring strategy

- BACI designs
- Increased duration
- Focused metric and protocol selection
- Consider environmental noise, sampling error and minimize

Adaptive Management

- Effectiveness evaluation has little value outside of a process for learning from the results and using them to improve project performance
- 0 current evaluation reports contained elements of an adaptive management plan

IMPROVMENTS

- Clear guidelines for the development of adaptive management plans and incorporation into project planning

FRAMEWORK meets improvement needs

GOAL
A process and guidance to improve effectiveness evaluations of riparian restoration projects

OBJECTIVES

- Standardized format for developers; improve communication
- All terms clearly defined
- Consistent format for reviewers; improve understanding
- Focused project goals and objectives
- Link project objectives with monitoring strategy
- Focused, specific adaptive management process

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Framework components

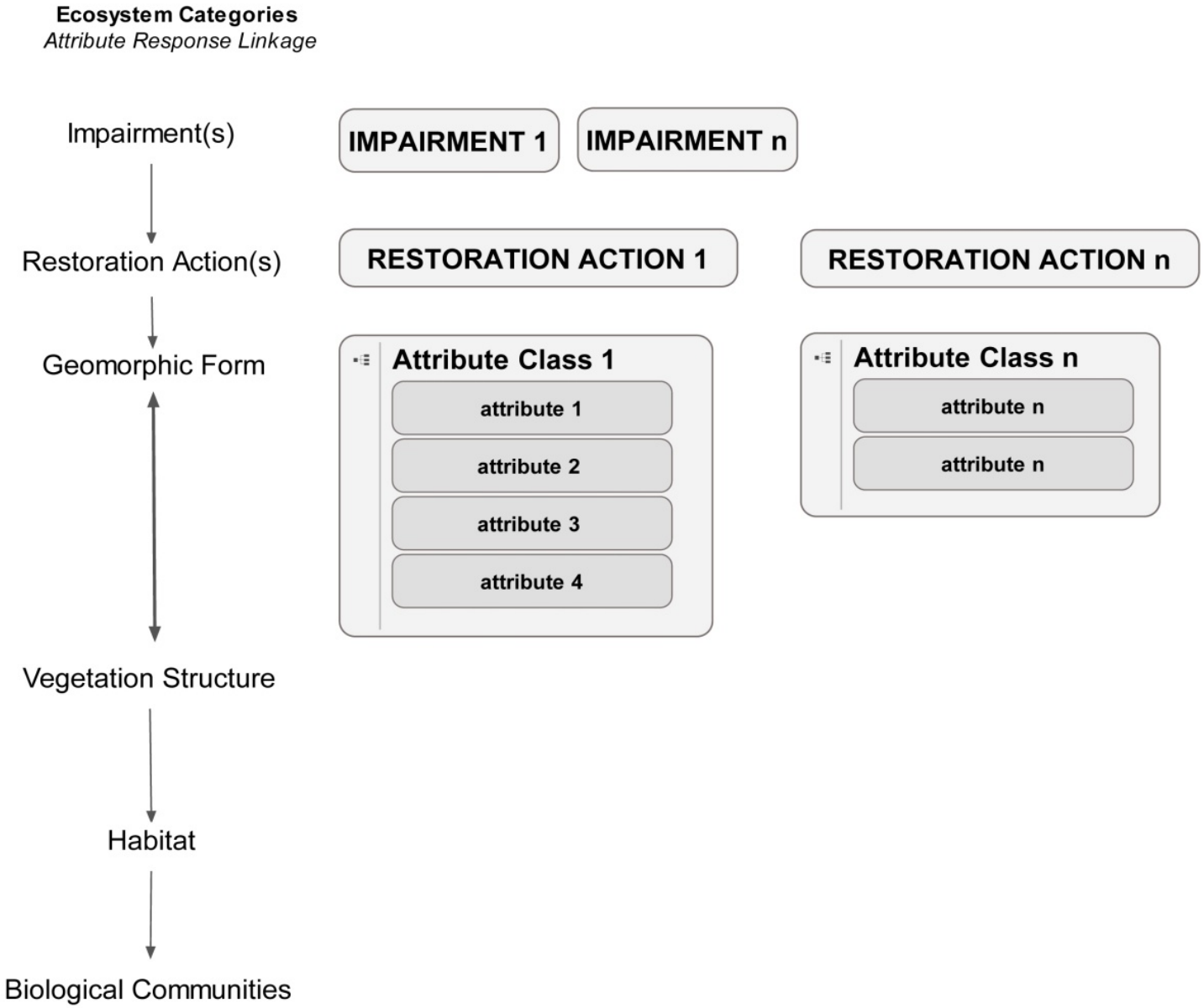
1. **Existing Conditions Summary**
   Documents the primary impairments and effects on ecosystem function.

2. **Project Objectives**
   Hypothesized effects of the primary restoration actions on the identified (impaired) ecosystem attributes.

3. **Monitoring Strategy**
   Select the protocols and metrics that adequately measure progress towards project objectives with the resources available.

4. **Adaptive Management Plan**
   Outlines the milestones post project of when and how effectiveness evaluations are produced and reviewed.

Conceptual Model: Attribute Linkage Diagram



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WHAT IS FRAMEWORK	WHAT IS RAPID ASSESSMENT
A process for implementing Level 2 and 3 assessments	Level 2 assessment
Does not contain protocols	Protocols for data collections as well as analysis
Informs many steps within project development	Can be used to inform design, but mostly used for evaluation
Adaptability to specific site constraints	Does not account for site-specific constraints
Level 3 assessments have far greater analytical power for cause-effect relationship	Limited cause-effect analytical power

Potential Roles of the Framework and Rapid Assessments in Tahoe Restoration

FRAMEWORK	RAPID ASSESSMENT
The basis for standardized project effectiveness evaluation development	Level 2 assessment within individual projects
The basis for implementation of adaptive management	Evaluation of wetland/riparian area health across larger spatial scales, such as the Tahoe basin – Measuring progress toward attaining management objectives – Identification of areas not functioning at potential
The basis for documentation of project effectiveness	

Framework components

1. **Existing Conditions Summary**
2. **Project Objectives**
3. **Monitoring Strategy**
4. **Adaptive Management Plan**

Existing Conditions Summary

Purpose

- Documents the observable degraded attributes of the riparian ecosystem

- Communicates and justifies high priority attributes of subject ecosystem

- Informs restoration action selection

- Focuses project objectives

Products

1. Existing Conditions Diagram
2. Supporting Narrative

Existing Conditions Summary

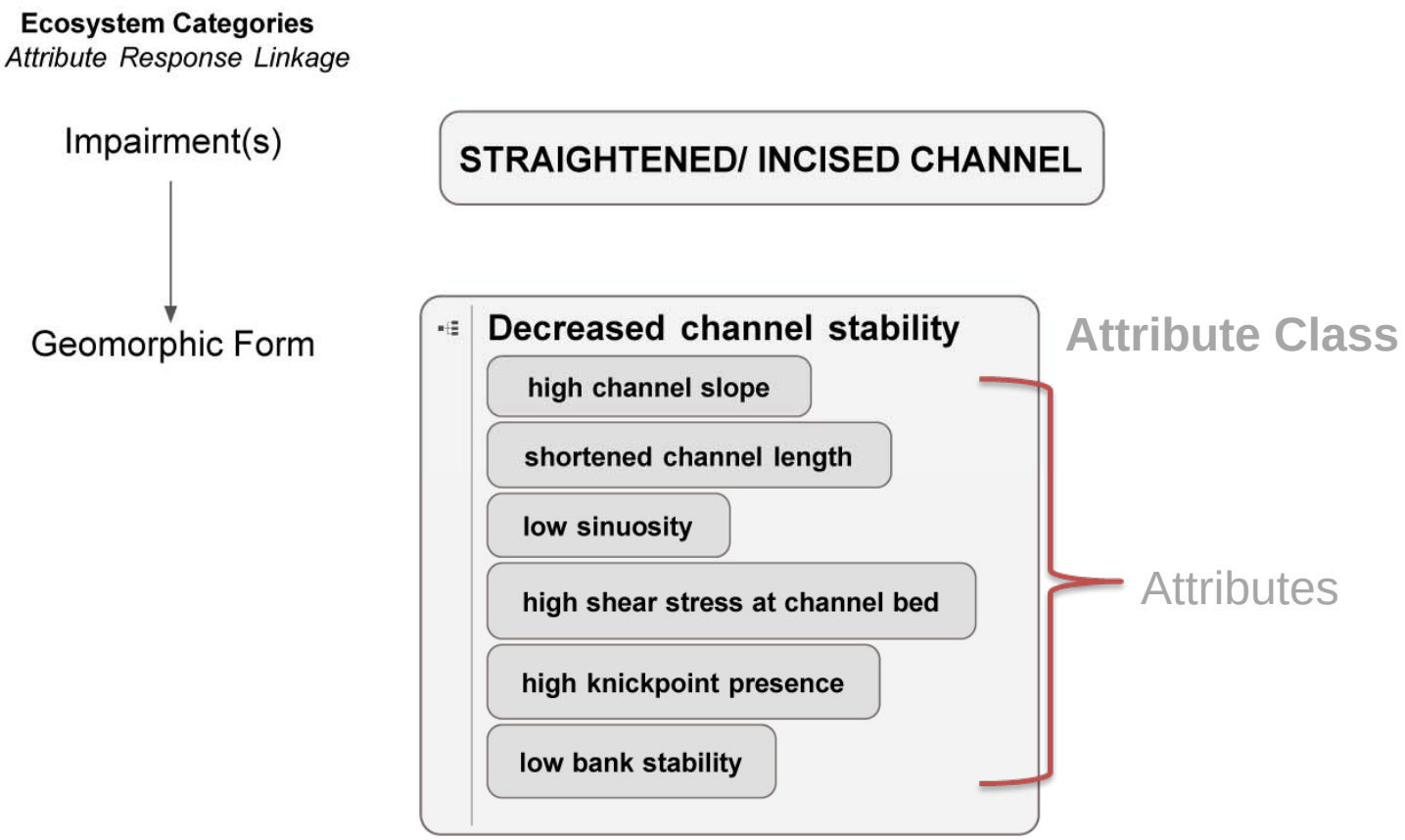
Development Process

- Use top down approach
- Evaluate cause and effect → degraded status
- Can attribute be quantified?
- Question: Will any future restoration to improve attribute condition (other factors?)
- Create Attribute Glossary

REALITY

Highly iterative process

Existing Conditions Diagram
EXAMPLE segment
ANGORA SEWER REACH



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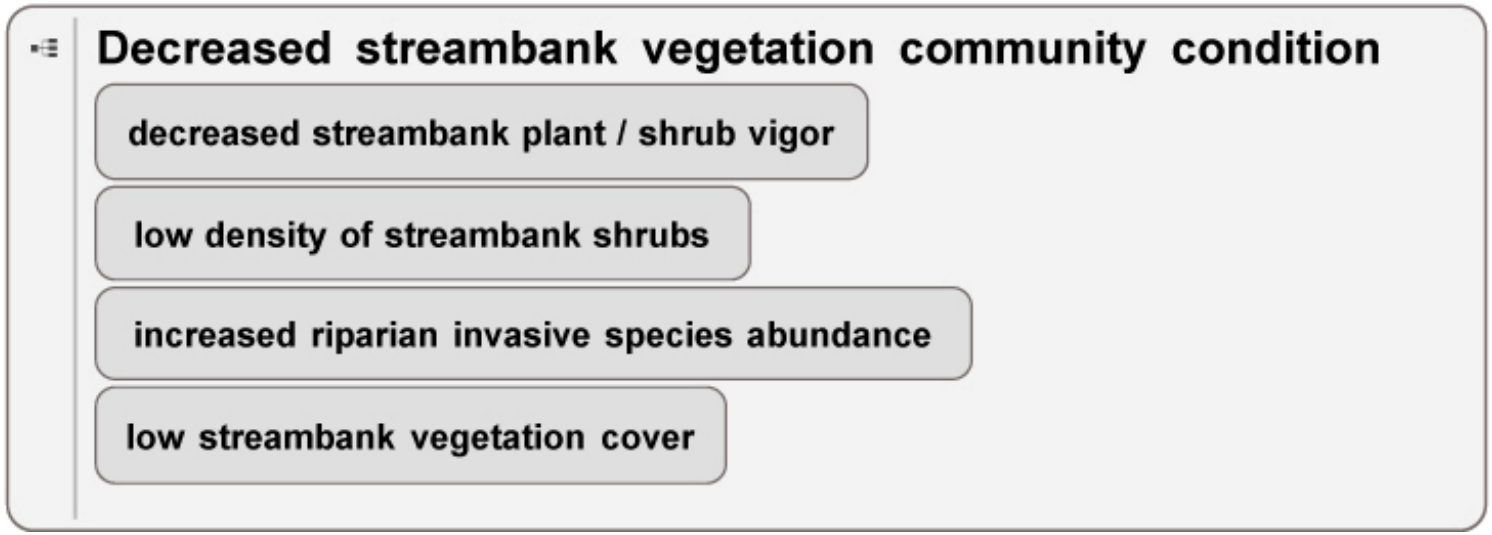
Existing Conditions Diagram
EXAMPLE segment
ANGORA SEWER REACH

Vegetation Structure



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Project Objectives

Purpose

Building directly upon identified impaired attributes

- Documents the hypothesized effects of the restoration to the complete ecosystem

- Develop separate project specific goals (attribute class) and objectives (attributes)

- Focuses monitoring strategy

Products

1. Existing Conditions Diagram
2. Supporting Narrative

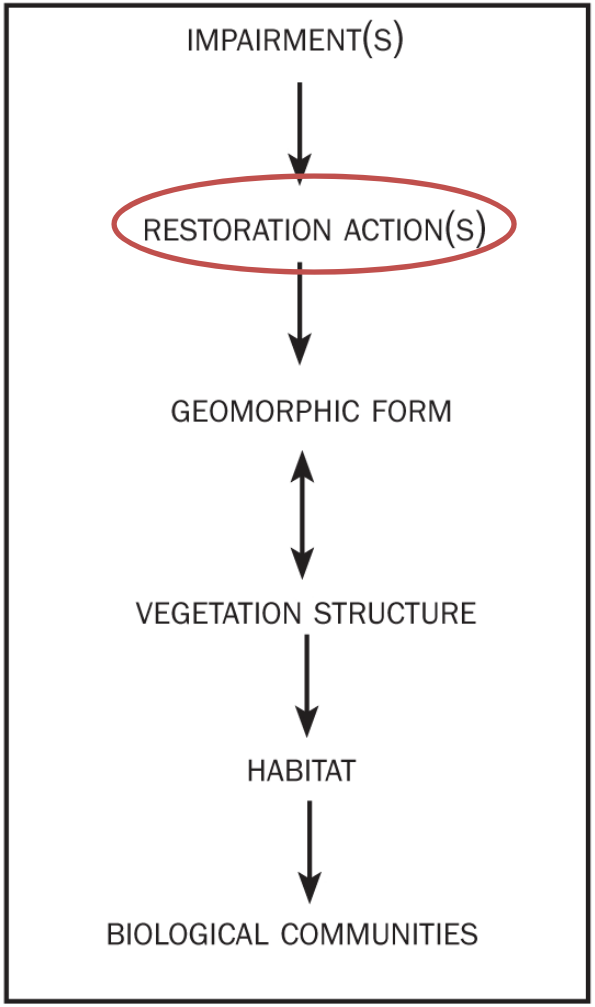
Project Objectives Development

Development Process
Insert Restoration Action(s)

Opposite statements for each impaired attribute

Question: Is attribute hypothesized to respond to restoration action(s)?

REALITY
Quantify expected response(s)
(scary!)



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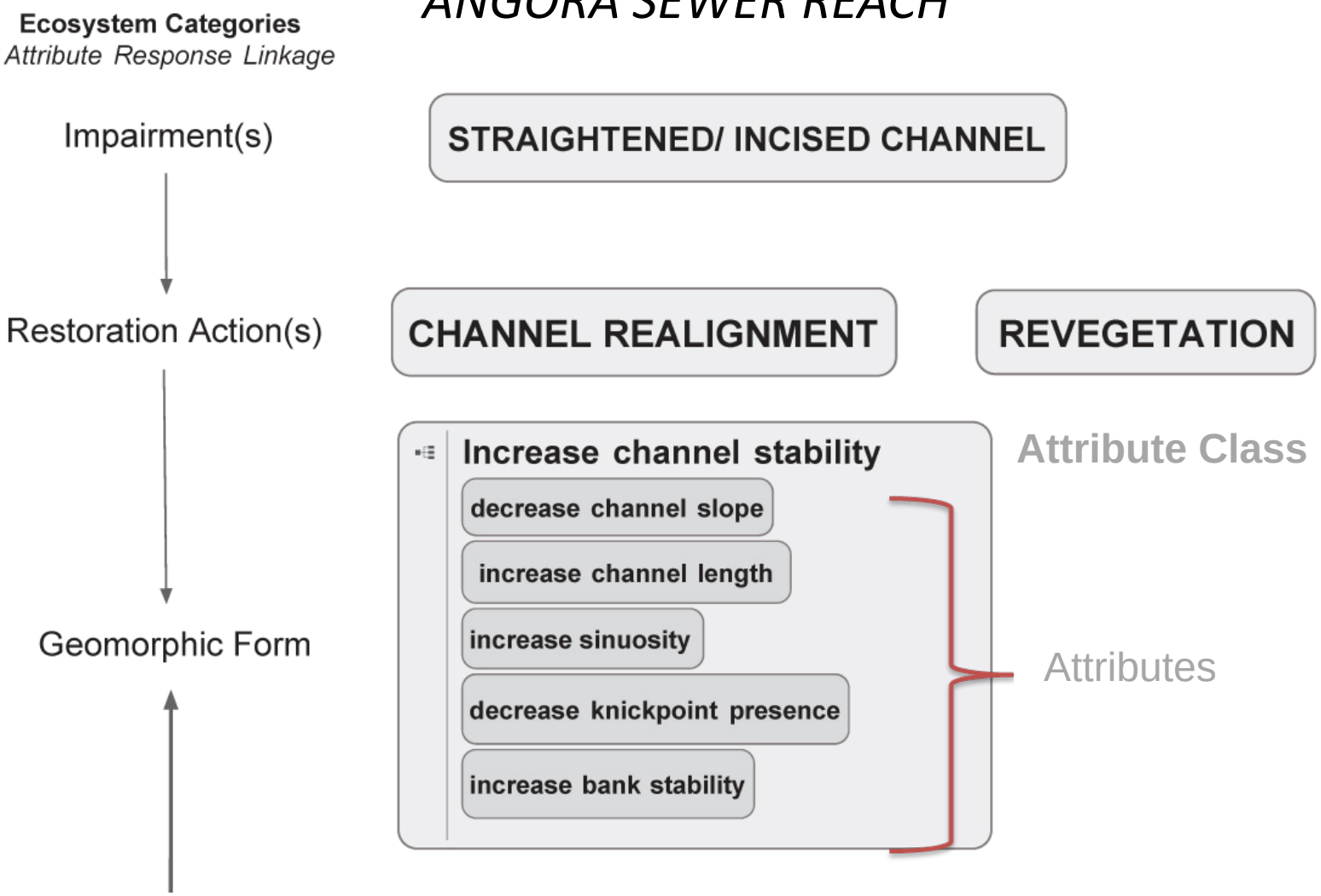
Project Objectives Diagram
EXAMPLE segment
ANGORA SEWER REACH



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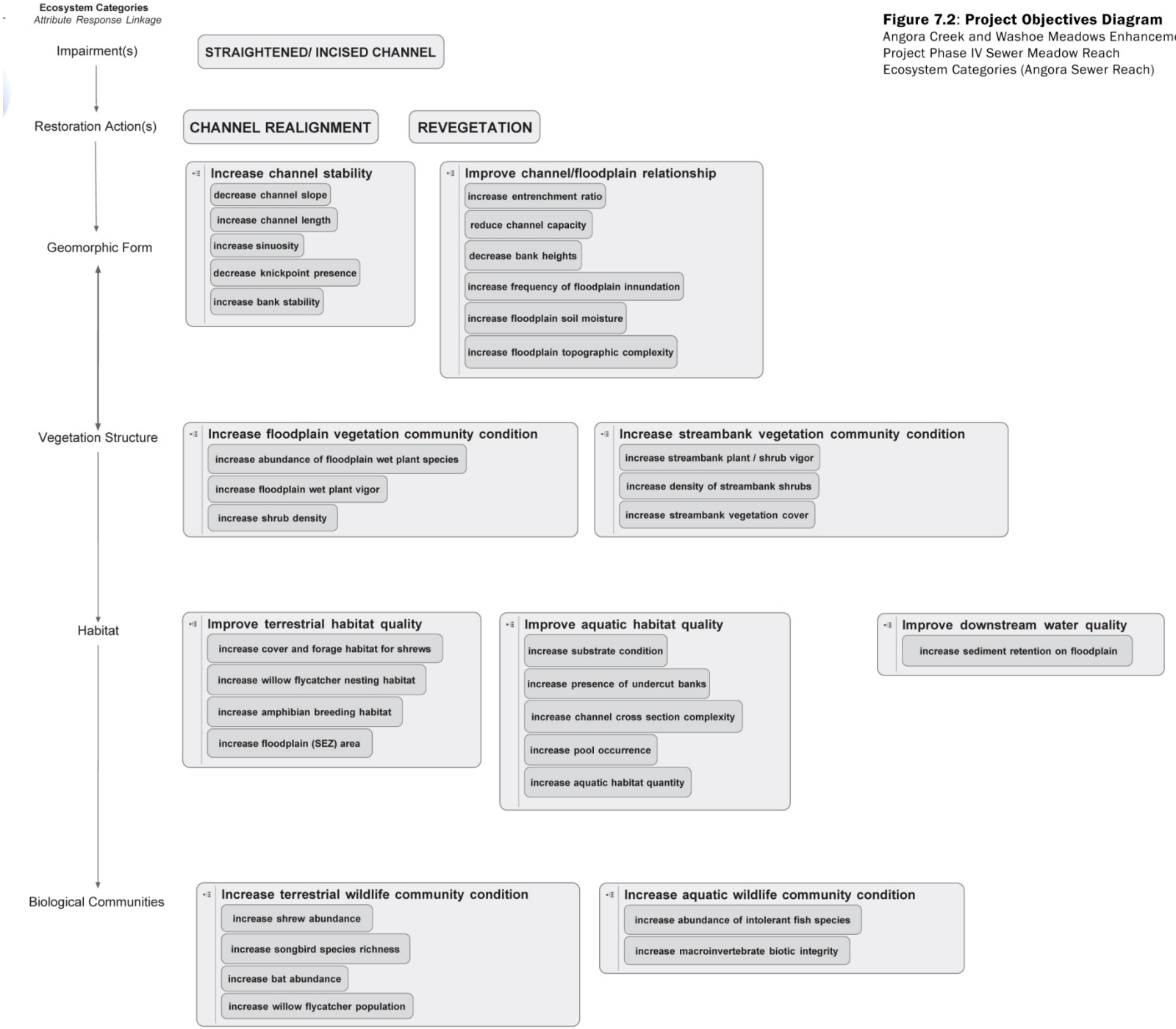

Figure 7.2: **Project Objectives Diagram**
Angora Creek and Washoe Meadows Enhancement
Project Phase IV Sewer Meadow Reach
Ecosystem Categories (Angora Sewer Reach)

Monitoring Strategy

Purpose

Building directly upon project objectives

- Define the approach to evaluate effectiveness of restoration
- Force critical thinking on protocols and metrics selected, systematic
- Communicate and document protocols and metrics
- Prioritize project objectives
- Ensure approach is developed pre implementation

Products

1. Monitoring Strategy Table
2. Supporting Narrative

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Monitoring Strategy Development Process

Development Process

Phased approach to protocol and metric selection

Identify potential protocols for each objective; laundry list

Evaluate and prioritize protocols

Ensure collectively metrics selected will evaluate “effectiveness” across classes.

Details in a Monitoring Plan

REALITY

Not everything can be monitored; cost will rule

Highly iterative process

Monitoring Strategy Development Process

Metric and Protocol Considerations

1. Ability to repeat pre/post project
2. Magnitude of project effects
3. Precision needed
4. Sensitivity to environmental variability
5. Response time of metric
6. Relative cost
7. Cost effectiveness
8. Established protocols?
9. Alignment with broader programmatic objectives

Adaptive Management Plan

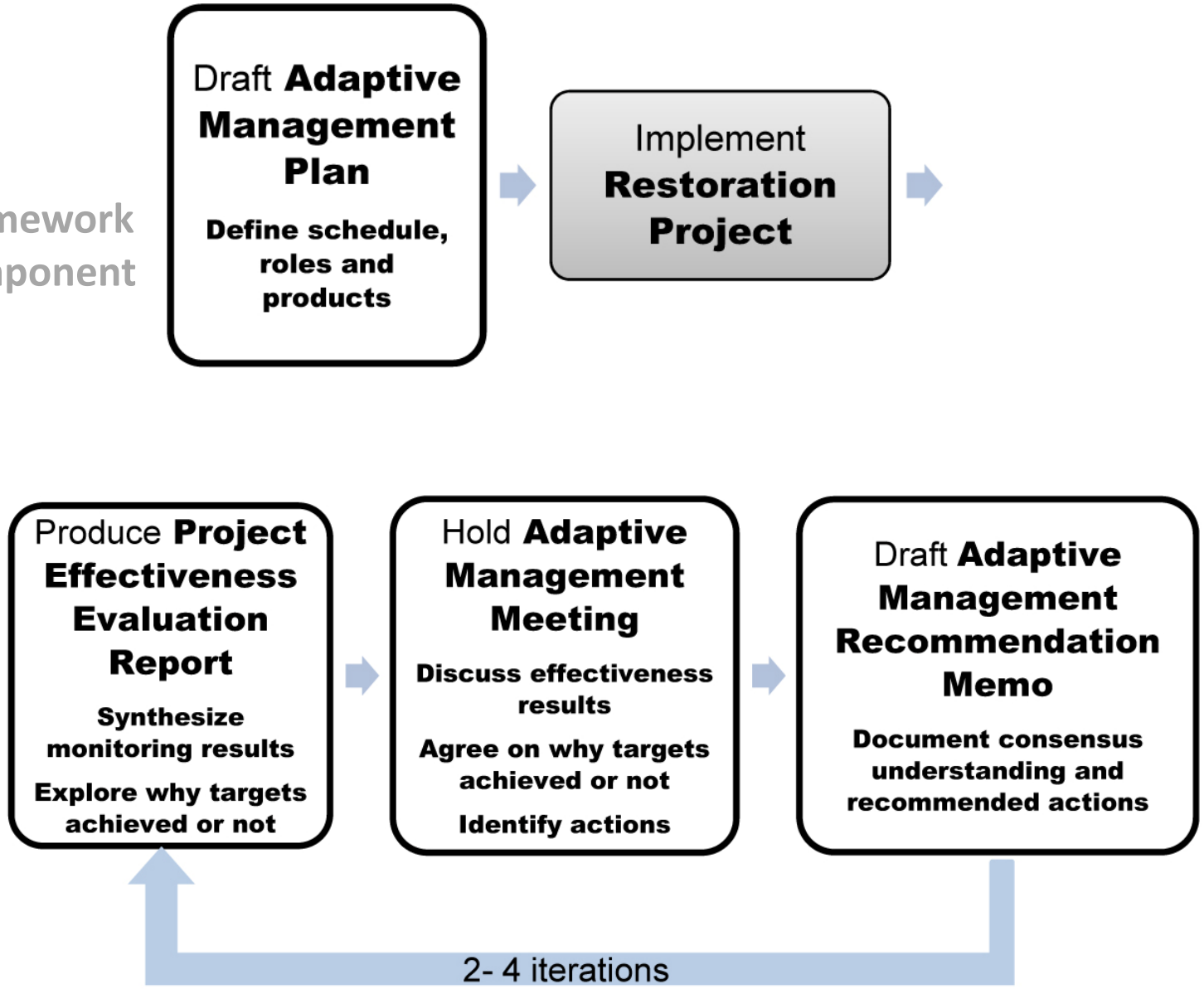
Products

1. Adaptive Management Plan

Purpose

- Motivate and actualize adaptive management
- Set milestones to be completed post project
- Communicate and document lessons learned from specific restoration efforts

Framework component



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TAKE HOME MESSAGES

- Final SNPLMA Rnd 8 Technical Report provides guidance, structure, process and considerations
- Development of Framework is a learning and communication process (highly iterative)
- Each step logically builds upon previous products
- Extensive communication tool
- Products finalized pre-restoration implementation
- Implement process to **learn** from our past mistakes.
- Perhaps the FRAMEWORK documents will be a future permitting requirement?

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