Incorporating decision analysis and predictive design into stream restoration:

The Stream Project

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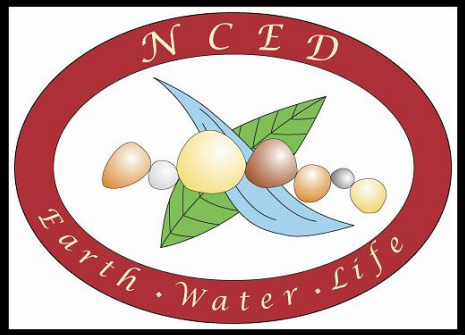
Overview



<u>Project Goal</u>:

- Link stream restoration preferences, objectives, and actions in transparent and predictive decision-analysis framework
  - Uncertainty and risk evaluation
  - Tools for assessment and design
  - Incorporate stakeholder preferences and social benefits

Goals of Talk

- Share motivation for the Stream Project
- Describe vital elements and project structure
- Discuss the distribution plans

Why?

- Stream restoration is widely practiced
- Many different objectives – need to evaluate tradeoffs
- Link between objective and action is weak
- Uncertainty is neglected

Consider Typical Project Objectives

- Project will reduce sediment and nutrient loadings
  - By how much? At what cost?
  - Is there a cheaper alternative?
- Project will provide instream habitat
  - Is habitat limiting?
  - What are the odds of population recovery?
  - What is it worth?
- Project will provide a stable, natural channel
  - What is that?
  - Is it consistent with other objectives?

We can do better

- Understanding of streams and their ecosystems is improving
- New tools are available
- Science and engineering skills of practitioners continue to improve
- Stream Project will assemble the tools and provide a decision framework

There is plenty to build on …

Group	Year	Title
Federal Interagency Stream Restoration Working Group	1998	Stream Corridor Restoration, Principals, Processes, and Practices
US Army Corps of Engineers	2001	Hydraulic Design of Stream Restoration Projects
US Army Corps of Engineers	2001	Channel Restoration Design for Meandering Rivers
National Resource Conservation Service	2007	Part 654 National Engineering Handbook: Stream Restoration Design

Key elements of the Stream Project:

#1 Interdisciplinary Interaction

#2 Objectives Linked to Actions

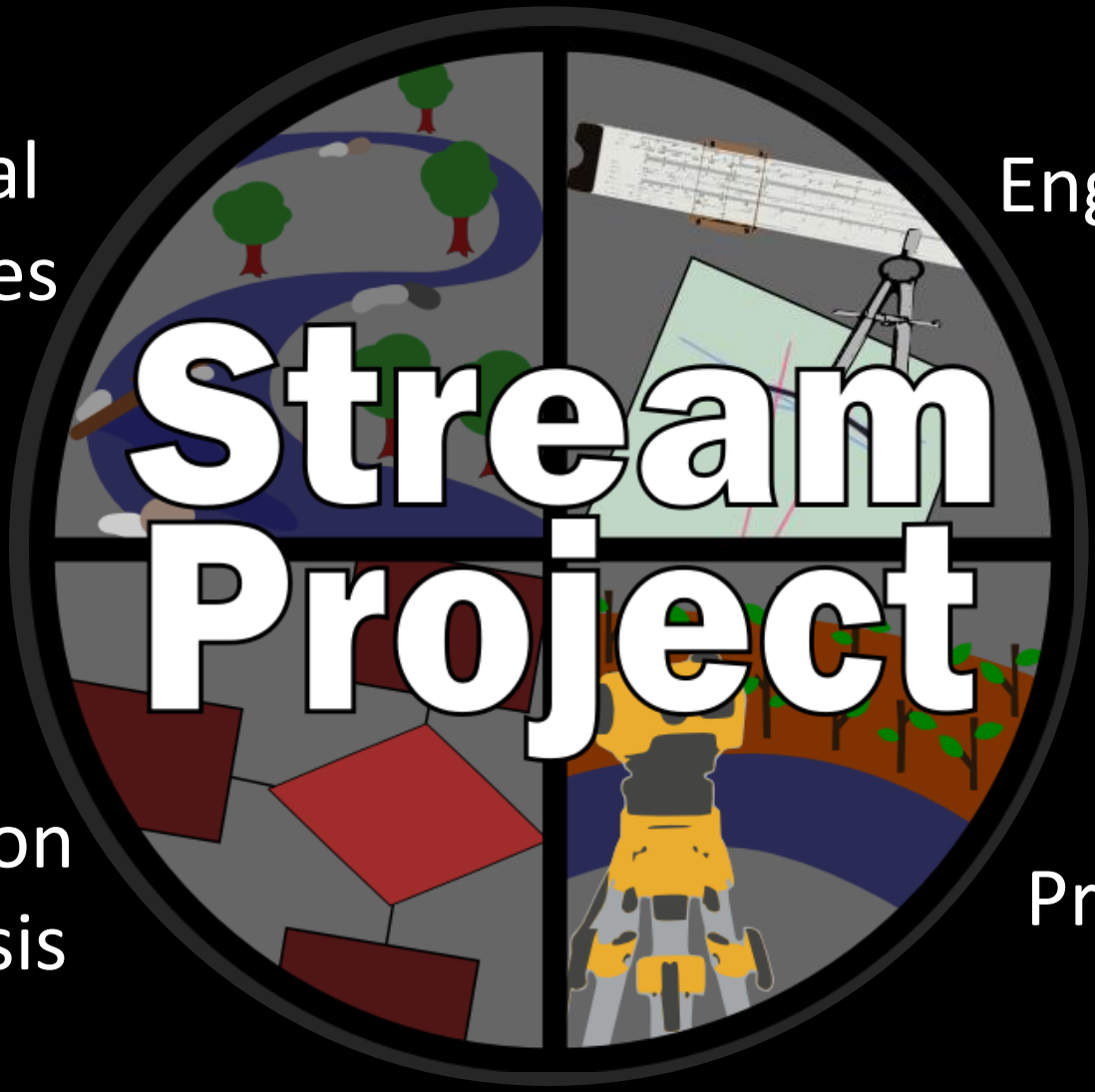
#3 Integrated Toolbox

#4 Unifying Case Studies

#1: Interdisciplinary Interaction

Natural Sciences

Engineering



Decision Analysis

Practice

#2 Objectives Linked to Actions

- Specific, quantifiable objectives explicitly linked to design choices
  - support tradeoff analysis
  - adaptive management
  - effective learning by doing
- Range of Objectives
  - Infrastructure protection
  - Decrease transport of nutrients/sediment
  - Recover endangered aquatic population
  - Improve aesthetics or recreational opportunities

#3 Integrated Toolbox

- Assessment of watershed and reach scale controls
- Quantify sediment and hydrologic drivers
- Predict physical, biological, and geochemical response to design manipulations
- Decision analysis for evaluating design alternatives

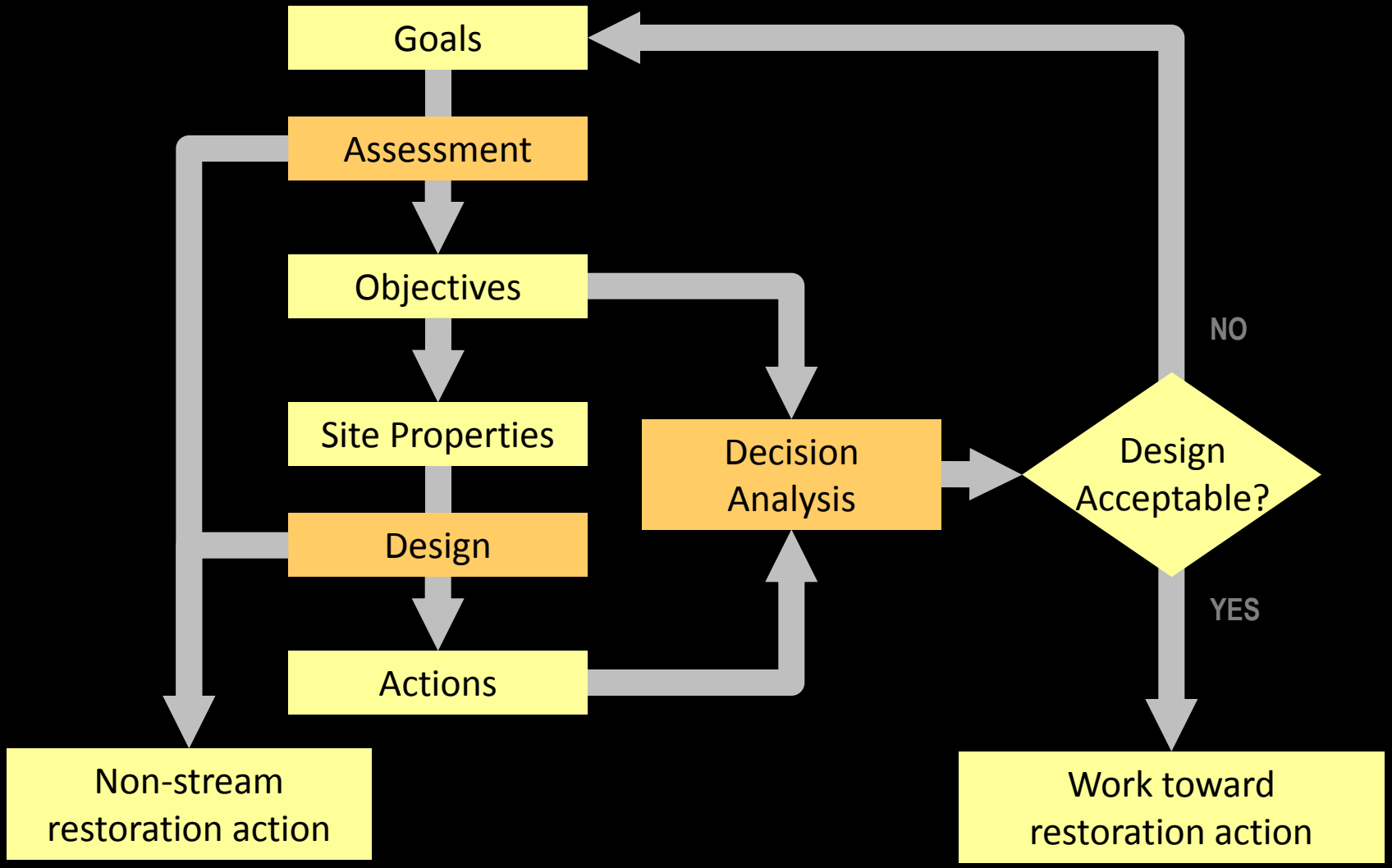
#4 Unifying Case Studies

- Apply framework and tools to diverse restoration projects

- Demonstrate the importance of the watershed context

Minebank Run, Baltimore County, MD

Stream Project Framework



Stream Project: Chapters

- 1) Introduction
- 2) Objectives driven framework
- 3) Principles and strategies for ecosystem lift
- 4) Hydrology
- 5) Sediment
- 6) Fluvial geomorphology
- 7) Hydraulics
- 8) Sediment transport
- 9) Channel dynamics
- 10) Water quality
- 11) Energy and productivity
- 12) Physical habitat
- 13) Social value
- 14) Vegetation design
- 15) Decision analysis methods
- 16) Monitoring and adaptive management

Watershed Context

Site Dynamics: Assessment and Design

Making Decisions and Learning

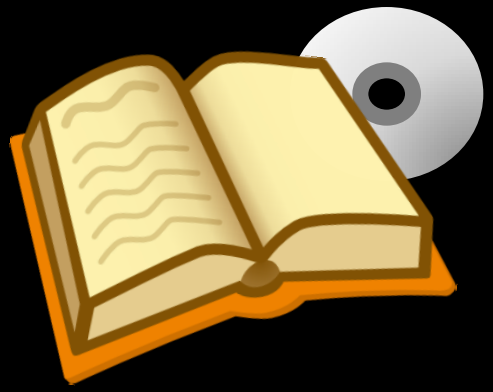
Scalable Toolsets

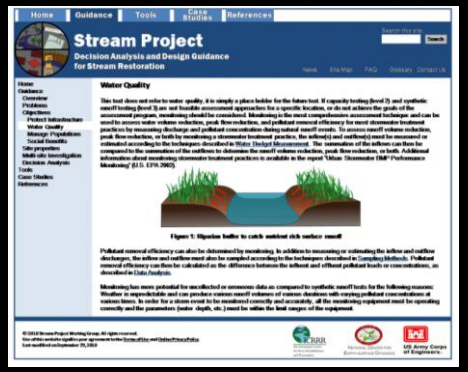
Required Information	Chair	Bike	Scooter	SUV

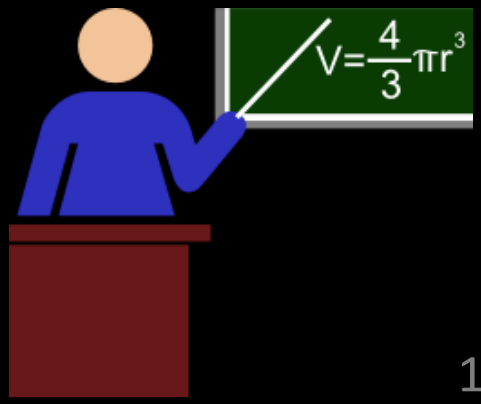
- Do you have predictive tools you would like to share with us? Send us your tools and suggestions to info@streamproject.org

Distribution

- Printed manual with digital toolset
  - Draft underway
  - Final by July 2012
- Website: StreamProject.org
  - Coming in 2012!
- Training Workshops
  - Short courses at regional stream restoration conferences 2011-2012







What the Stream Project will NOT do for you

- Provide a ‘cookbook’ approach to stream restoration
- Circumvent engineering analysis and judgment
- Provide all the background you need
- Recommend reach scale restoration if the problem is at the watershed scale
- Eliminate stream restoration failures

What the Stream Project can do for you

- Help set the appropriate objectives given the site / watershed attributes and constraints
- Predicatively and transparently link objectives → site attributes → restoration actions
- Provide a range of scalable tools that quantify uncertainty
- Provide a bases for tradeoffs among objectives and between costs and benefits

The Stream Project Team

Name	Affiliation(s)	Specialties
Peter Wilcock - Director	JHU, NCED, ICRRR	*sediment transport, channel dynamics*
Daniel Baker - Manager	JHU, NCED, ICRRR	*channel design, water quality*
Patrick Belmont	USU, NCED, ICRRR	*watershed analysis, water quality*
Phaedra Budy	USU, ICRRR	*fish biology, ecosystem restoration*
Jock Conyngham	USACE ERDC Env. Lab	*aquatic habitat, fishery restoration*
Martin Doyle	U. North Carolina	*channel design, restoration strategies*
Craig Fischenich	USACE ERDC Env. Lab	*environmental assessment, riparian ecology*
Richard Fischer	USACE ERDC Env. Lab	*riparian ecology*
Ben Hobbs	JHU, NCED	*environmental economics, decision analysis*
Meg Jonas	USACE ERDC Env. Lab	*hydraulics and channel design*
Gary Parker	UIUC, NCED	*sediment transport, channel dynamics*
Jack Schmidt	USU, ICRRR	*fluvial geomorphology, hydrology*
Dave Shepp	USACE Headquarters	*water quality, environmental restoration*
Barb Utley	USU, NCED, ICRRR	*fluvial processes, water quality monitoring*
Joe Wheaton	USU, ICRRR	*multi-dimensional modeling, instream habitat*

Questions?

Email us: info@streamproject.org

Timeline

2010

Project initiated: Team assembled

Objectives-driven framework defined

Meeting: Common vision established

Scope of tools defined

2011

Meeting: Chapters outlined and case studies

Draft chapters written & assembled

Meeting: Evaluate draft manual and toolset

Application of Stream Project to case studies

Short courses regional meetings

2012

Meeting: Assemble final manual and software

Final editing and software testing