WISSAHICKON CREEK
Feasibility Study

U.S. Army Corps of Engineers,
Philadelphia District

January 14, 2010

Co-sponsor:

Philadelphia Water Department

with

Biohabitats, Inc.

Friends of the Wissahickon

US Army Corps of Engineers
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Purpose of public meeting

- Describe USACE feasibility process & the Wissahickon Creek Feasibility Study
- Introduce proposed restoration sites & possible alternatives
- Share information & get feedback from you!

Agenda/Overview

- Project background
- Introduction to NEPA
- Overview of Feasibility Process
  - ID Problems and Opportunities
  - Inventory and Forecast Conditions
  - Formulate Alternative Plans
  - Evaluate and Compare Alternatives
- Breakout groups based on project sites

Project Sponsors & Partners

- Army Corps of Engineers, Philadelphia District

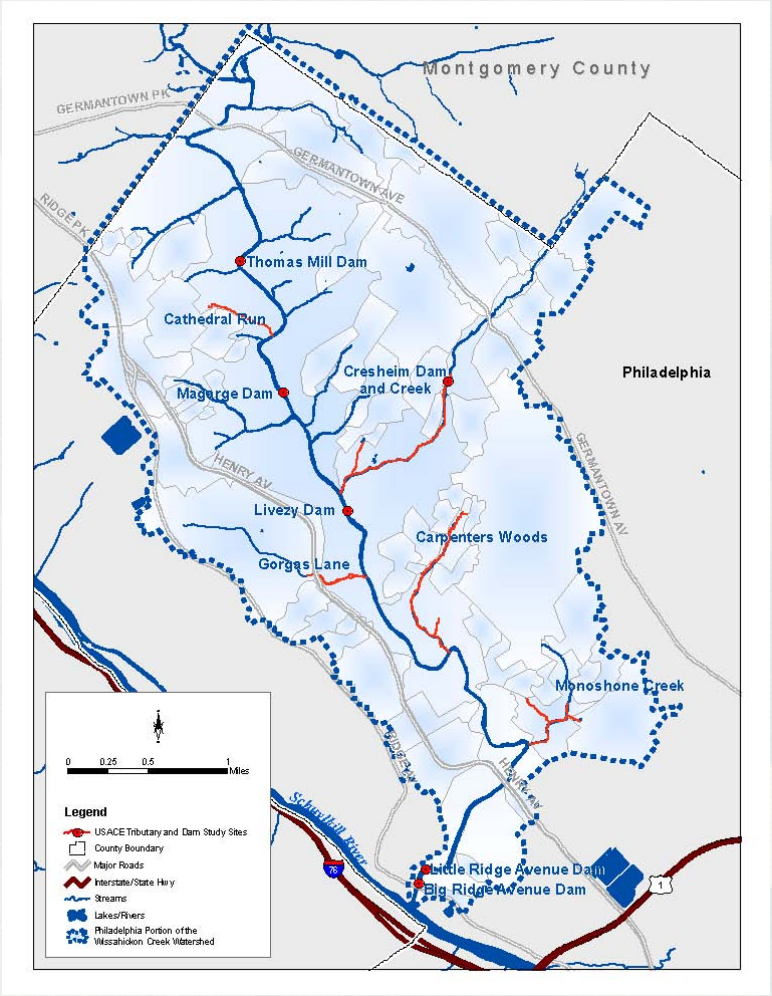
  Consultants: Biohabitats, Inc. & Versar
- Agency Partner: Philadelphia Water Department

  (non-federal sponsor)
- Additional Stakeholders
  - Friends of the Wissahickon
  - City of Philadelphia Department of Recreation (formerly FPC)
  - Neighborhood/community groups
  - Watershed organizations

Project Description & History

- USACE received authority to conduct a **Schuylkill River Basin Reconnaissance Study** in 1988 (completed in 2002)
- Focused on flood control, water supply, recreation, water quality, and other water and land related resource problems
- Identified primary problems in the Wissahickon: streamflow variability, poor quality aquatic habitat and impaired biological communities, flooding and overall ecosystem imbalance
- PWD initiated the **Wissahickon Creek Feasibility Study** in 2004

Project Setting & Location



- 64 square mile watershed
- Philadelphia portion of watershed is 10.6 sq. mi.
- Study includes river corridor and selected tributaries between the Schuylkill River and Montgomery Co. / City line
- ~ 8 miles of mainstem and selected tributaries
- Heavily impacted by urban development
- Long-term history of human disturbance

Project Purpose

- ID Problems and Opportunities within the study area
- Investigate and evaluate ecological restoration solutions toward improving impairments in the ecosystem
- Focus toward improvement in aquatic and riparian habitat

Introduction to NEPA

- National Environmental Policy Act of 1969
- National charter on protection of the environment
- Process applies to Federal agencies and the programs they fund

NEPA: Human Environment

- Preserve and protect the human environment
  - Ecology
  - Water and air quality
  - Endangered species
  - Socioeconomic
  - Archeology
  - Culture
  - Aesthetics
  - Recreation

NEPA: Interagency Coordination

- Coordination with agencies that have legal jurisdiction or expertise in the project area

NEPA: Public Involvement

- Public notices
- Public meetings
- Comments on documents
- Surveys

USACE Feasibility Process

- Six Planning Steps
  - Step 1: Identify Problems & Opportunities
  - Step 2: Inventory & Forecast Conditions
  - Step 3: Formulate Alternative Plans
  - Step 4: Evaluate Alternative Plans
  - Step 5: Compare Alternative Plans
  - Step 6: Select a Recommended Plan

Step 1: Identify Problems & Opportunities

- Water Quality and Habitat Impairments

  State 303(d) listings:

  - Elevated Nutrients
  - Siltation
  - Low Dissolved Oxygen
  - Oil & Grease
  - Pathogens
  - Water/flow Variability
  - Habitat Alteration

- Non-Native and Invasive Riparian Species
- Impediments to Resident Fish Passage

Step 1: Identify Problems & Opportunities

- ❑ Promote fish passage
- ❑ Reduce sedimentation
- ❑ Improve aquatic habitat
- ❑ Restore natural stream channel characteristics
- ❑ Create or enhance riparian wetlands

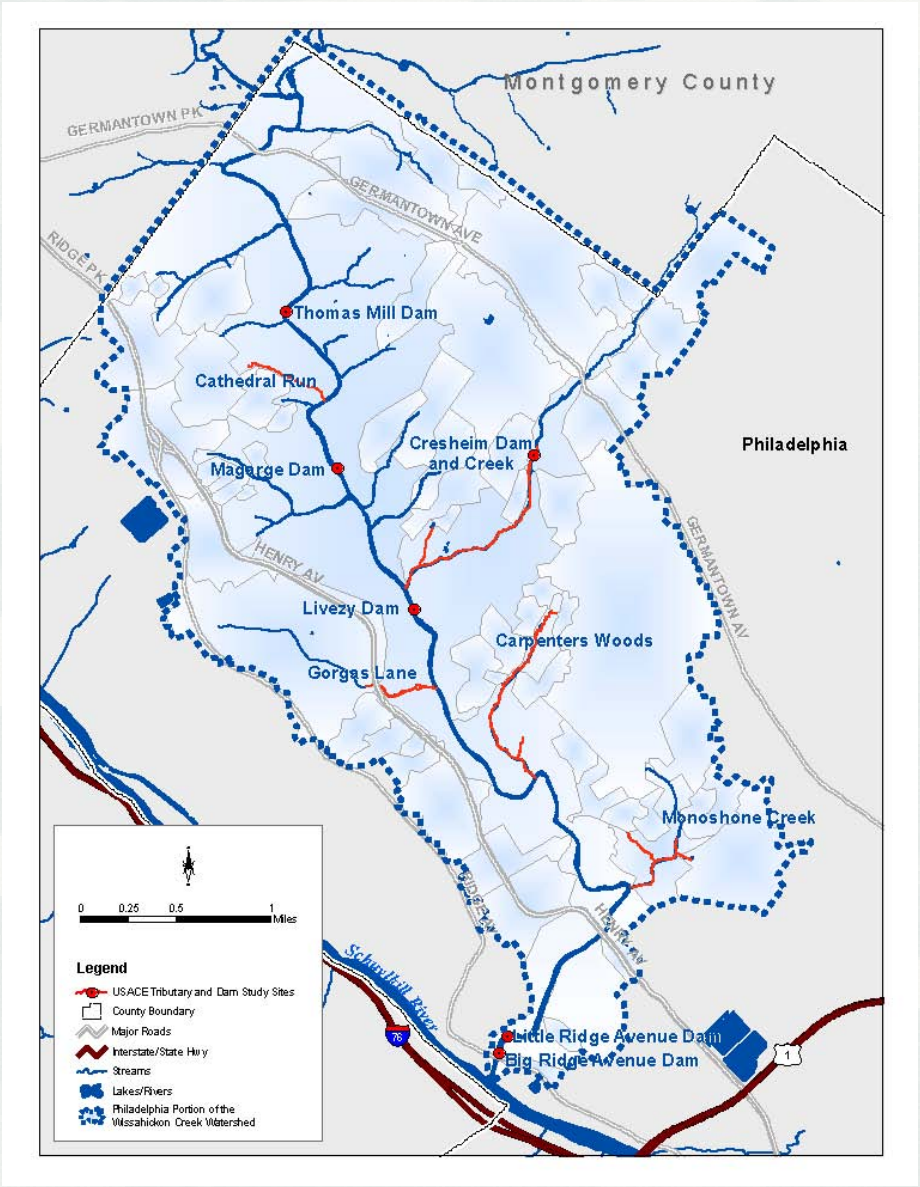
Step 2: Inventory & Forecast Conditions

- Site Description
- Site Conditions:

  aquatic resources and wetlands, vegetation, wildlife resources, finfish and invertebrates, and cultural resources
- How can changes in the environment over time impact the current problems and opportunities?
- Forecasted without any “project action” over 50 years

Step 3: Formulate Alternative Plan

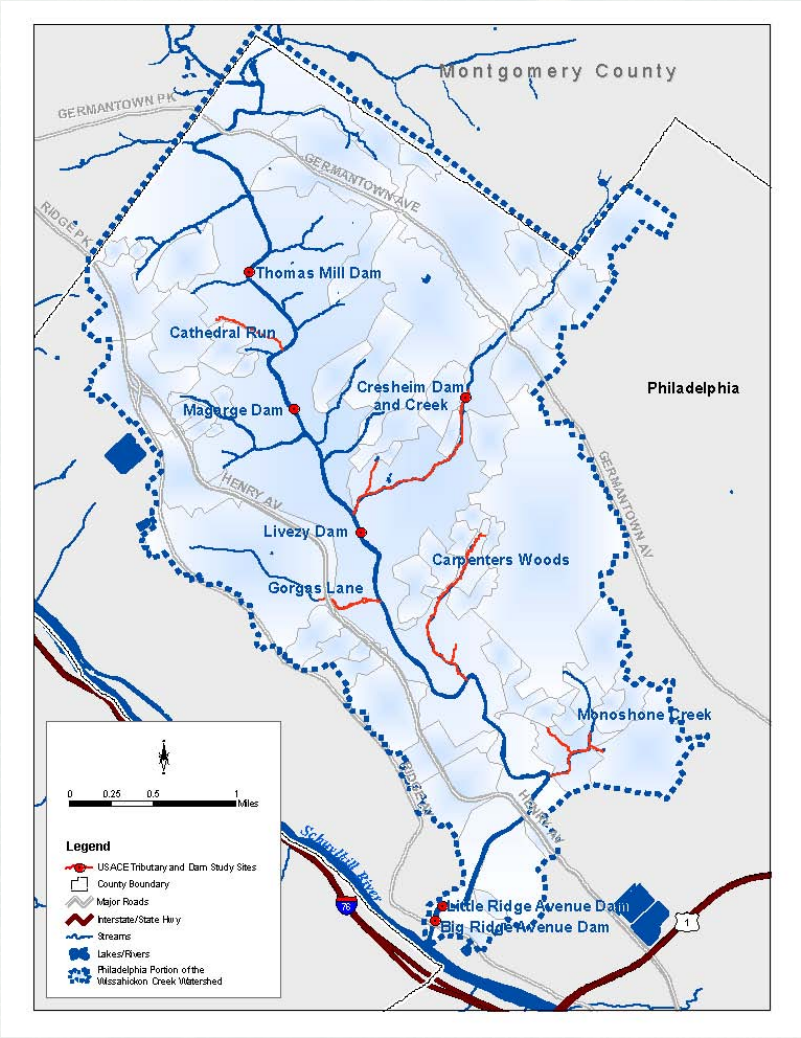
- ❑ Project Site Selection
- ❑ Restoration Approaches
- ❑ Alternative Development



Project Site Selection

- Selected based on prior studies by USACE and PWD
- 10 sites selected
  - 5 dams along mainstem
  - 5 tributaries

10 Identified Restoration Sites



- Big Ridge Ave. Dam
- Little Ridge Ave. Dam
- Monoshone Creek
- Carpenters Woods
- Gorgas Run
- Livezey Dam
- Cresheim Creek Dam
- Magarge Dam
- Cathedral Run
- Thomas Mill Dam

Restoration Approaches

- No action alternative
- Action alternatives
  - Tributaries
    - Bank and bed stabilization
    - Floodplain reconnection
    - Wetland enhancement/creation
  - Dams
    - Full or partial removal
    - Addition of fish ladder or rock ramp

Big Ridge Avenue Dam

- Downstream-most site
- 20-ft high Wissahickon dam
- Piers upstream support SEPTA rail line
- Encased sewer line

Big Ridge Avenue Dam (WSBR) Restoration Alternatives

- Alternative 1: No action
- Alternative 2: Dam removal
- Alternative 3: Partial dam removal & addition of rock ramp
- Alternative 4: Partial dam removal & addition of fish ladder

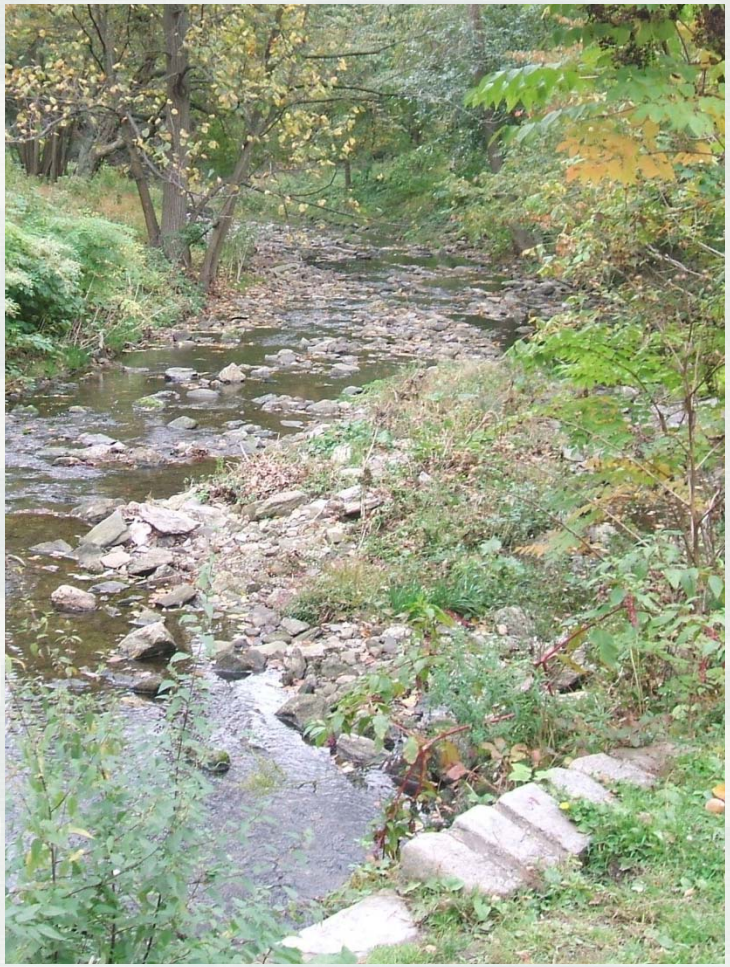
Little Ridge Avenue Dam

- 8-ft high Wissahickon dam
- Piers downstream support SEPTA rail line
- Encased sewer line

Little Ridge Avenue Dam (WSLR) Restoration Alternatives

- Alternative 1: No action
- Alternative 2: Dam removal
- Alternative 3: Partial dam removal & addition of rock ramp
- Alternative 4: Bypass channel construction

Monoshone Creek



- Tributary to Wissahickon
- Flows along Historic RittenhouseTown
- Extensive rock walls and weirs

Monoshone Creek (WSMC) Restoration Alternatives

- Alternative 1: No action
- Alternative 2: Channel naturalization & wetland construction
- Alternative 3: Stream restoration at higher invert & wetland construction
- Alternative 4: Preserve existing structures & wetland construction

Carpenters Woods

- Tributary to Wissahickon
- Wooded corridor
- Past repairs at upstream end

Carpenters Woods (WSCW) Restoration Alternatives

- Alternative 1: No action
- Alternative 2: Stream restoration at higher invert & wetland construction
- Alternative 3: Stabilization of eroding banks & wetland construction
- Alternative 4: Stream restoration at higher invert, wetland construction & riparian enhancement

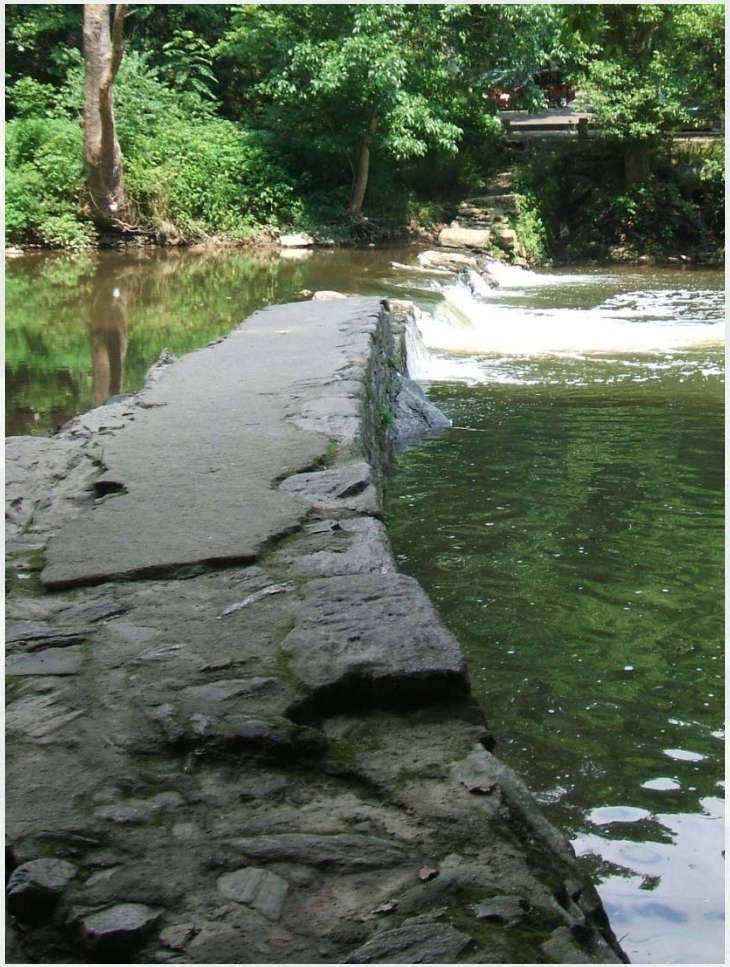
Gorgas Run

- Begins at stormwater outfall
- Steep, coarse tributary
- Existing boulders along bank to protect water main

Gorgas Run (WSGR) Restoration Alternatives

- Alternative 1: No action
- Alternative 2: Full stream restoration with additional treatments
- Alternative 3: Local stream restoration & bank stabilization with additional treatments
- Alternative 4: Wetland creation

Livezey Dam

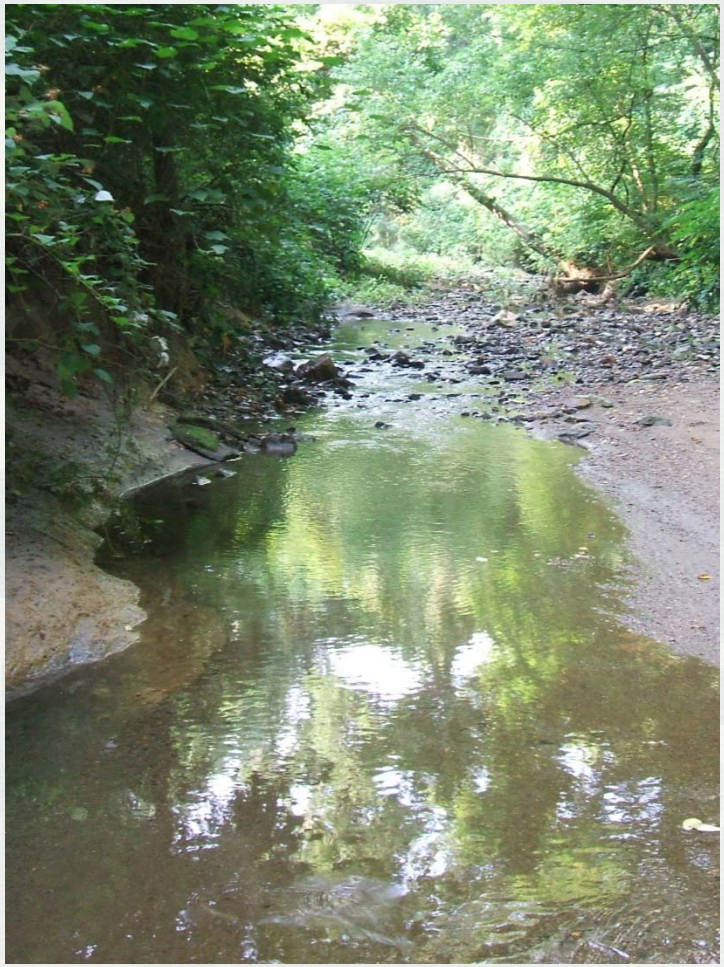


- Rock dam on Wissahickon
- Partially breached

Livezey Dam (WSLD) Restoration Alternatives

- Alternative 1: No action
- Alternative 2: Dam removal
- Alternative 3: Partial dam removal at breach
- Alternative 4: Installation of rock ramp over existing dam breach

Cresheim Dam & Creek



- Tributary to Wissahickon
- Rock dam
- Channel erosion downstream of dam

Cresheim Dam & Creek (WSCD) Restoration Alternatives

- Alternative 1: No action
- Alternative 2: Dam removal and channel stabilization
- Alternative 3: Dam retrofit and channel stabilization
- Alternative 4: Stream restoration at higher invert

Magarge Dam

- Rock dam on Wissahickon
- Partially breached

Magarge Dam (WSMD) Restoration Alternatives

- Alternative 1: No action
- Alternative 2: Dam removal
- Alternative 3: Partial dam removal & addition of rock ramp
- Alternative 4: Addition of naturalized passageway

Cathedral Run

- Steepest tributary
- Coarse bed material
- Most severe bank erosion
- Bedrock outcrops
- PWD wetland/drainage basin creation in the headwaters

Cathedral Run (WSCR) Restoration Alternatives

- Alternative 1: No action
- Alternative 2: Full stream restoration using step-pools
- Alternative 3: Bank stabilization & grade control
- Alternative 4: Stream restoration at higher invert

Thomas Mill Dam

- ❑ Rock dam on Wissahickon
- ❑ Historic covered bridge
- ❑ Adjacent mill race
- ❑ Partially breached

Thomas Mill Dam (WSTM) Restoration Alternatives

- Alternative 1: No action
- Alternative 2: Dam removal
- Alternative 3: Naturalized passageway along existing breach
- Alternative 4: Bypass channel through mill race

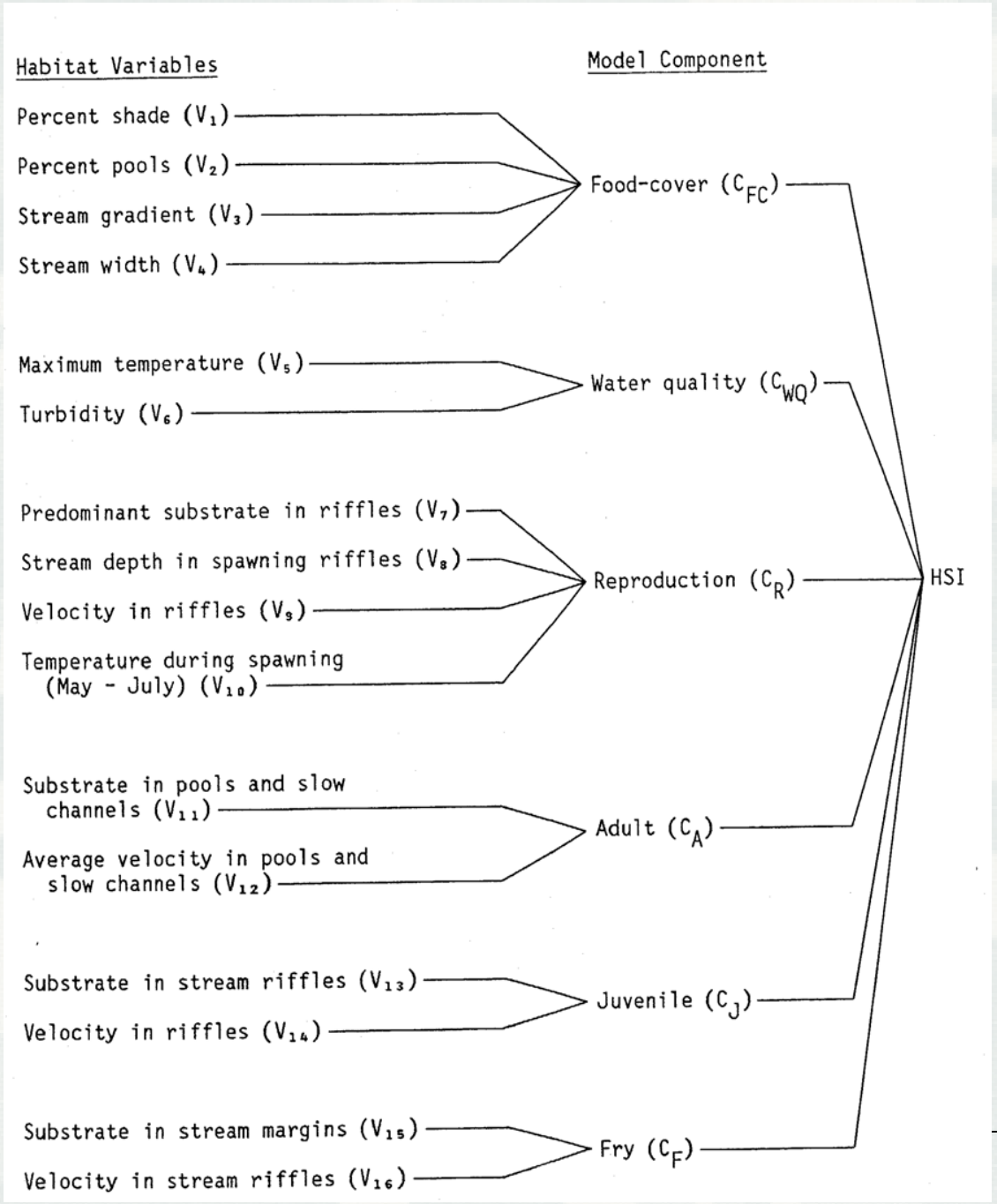
Steps 4 and 5: Overview of the Alternative Evaluation and Comparison Process

- Two Inputs:
  - Costs—construction cost estimates
  - Benefits—FWS Habitat Evaluation Procedure (HEP)

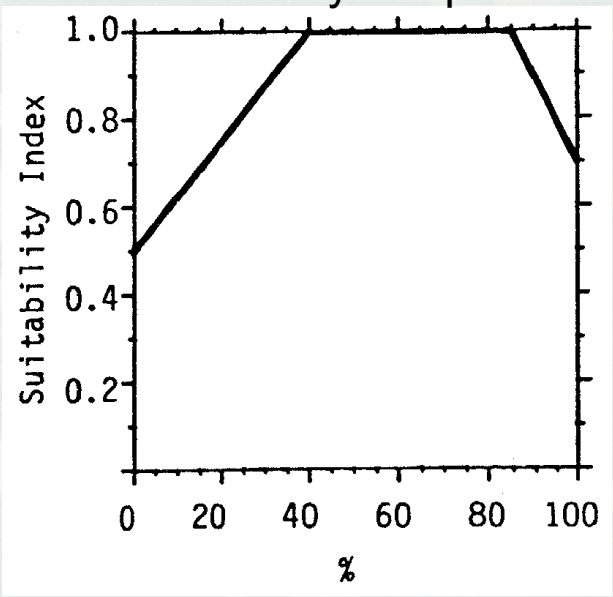
- Corps Cost-Effectiveness/Incremental Cost Analysis **(CE/ICA):** the foundation for project and alternative selection

Environmental Benefit

- USFWS's Habitat Evaluation Procedure (HEP)
  - Species-specific approach, based on habitat improvements relating to food, cover, reproduction, and basic needs for survival
  - Models exist for a number of mammals, birds, reptiles, amphibians, fish, and invertebrates
  - We used Brown Trout, Common Shiner, and Blacknosed Dace



Suitability Graph



Percent pools (V_2)

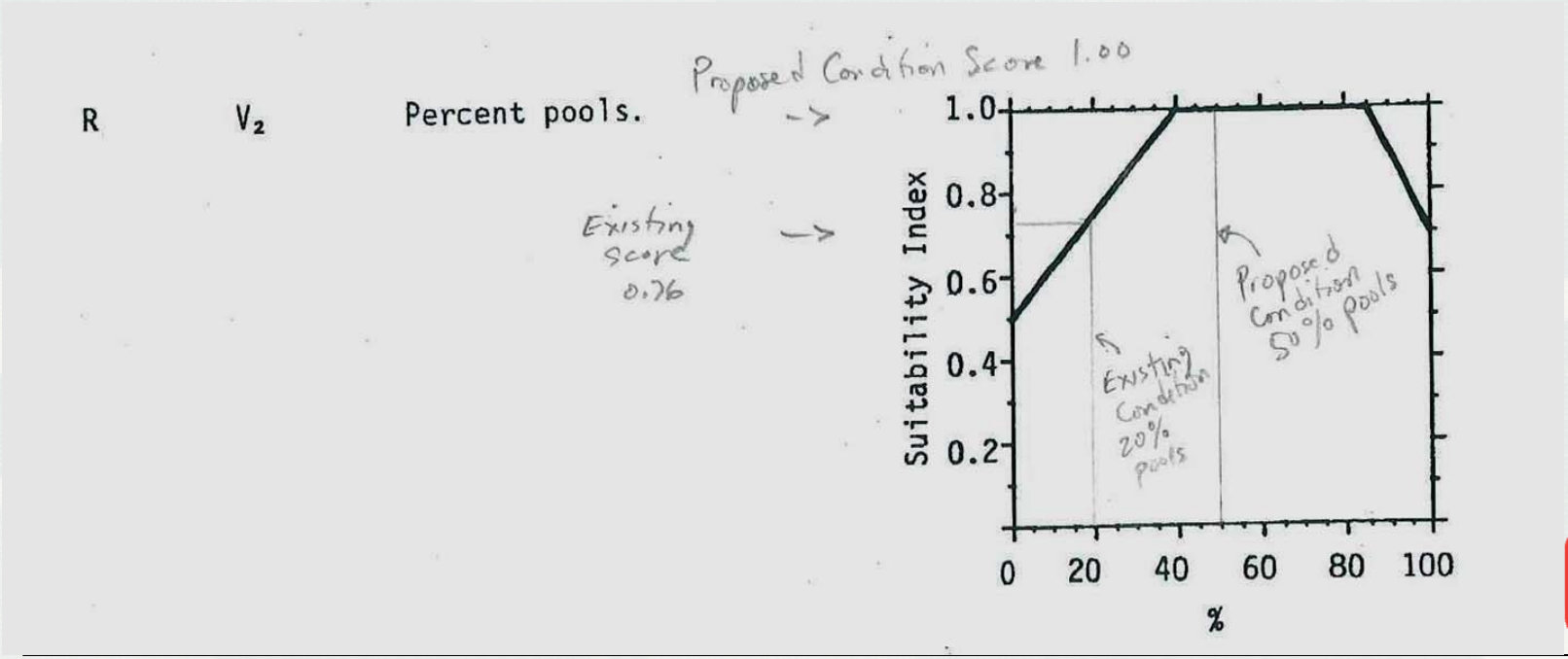
Food-Cover ($C_{f\text{-}c}$)

$C_{f\text{-}c} = (V_1+V_2+V_3+V_4)/4$

Or, if any value ≤ 0.4,
$C_{f\text{-}c} = V_1$, V_2, V_3, or V_4,
whichever is lowest.

Approach to Using HEP to Estimate Environmental Benefits of Restoration

- Modify the individual suitability index scores based on projected results of each alternative on each habitat variable



Approach to Using HEP to Estimate Environmental Benefits of Restoration

- Repeat for all variables (Blacknosed Dace has 15 variables, Common Shiner has 9 variables, and the Brown Trout has 14 variables)
- Conduct this for all 10 project sites and for each of four alternatives

Approach to Using HEP to Estimate Environmental Benefits of Restoration

- Run the revised scores through the model to generate the post-restoration and forecasted no-action habitat score

Model Element	**Habitat Variable**		**Tributary Reference WSPC017**		**Alternative 1** (Project Area: 10000ft long by 15ft wide, 150000ft^2, 3.44 ac)			**Alternative 2** (Project Area: 150000ft^2, 3.44 ac)		
Food Cover	v2	Percent pools	21.0	0.76	16.0	0.65	Assume site will have a 5% reduction in pools from channel erosion and deposition and homogenization of channel form	50.0	1.00	Estimated based on step-pool restoration, ½ pool, ¼ riffle, ¼ runs or glides

Step 6: Select a Recommended Plan

- Preferred alternatives will be based on an incremental analysis
- Cost versus the ecological benefits
- Analysis looks for best benefit within proposed alternatives

Time for Break-out Sessions!