

NORTH CAROLINA'S STREAM MITIGATION PROGRAM



**US Army Corps
of Engineers®**
Wilmington District



A BRIEF HISTORY

- 1996: 401 Rules Adopted (no mention of stream mitigation)
- 1997: Wetlands Restoration Program established
- 1997: GCs and NWP's Reissued. Stream Impacts (LF) recognized
- 1999: NCDOT begins using WRP for some mitigation needs
- 1999: First stream mitigation projects (NCDOT and WRP).
- 2001: Internal Technical Guide for Stream Work (DWQ)
- 2003: Interagency Stream Mitigation Guidelines (USACE et al)
- 2003: WRP reorganized as Ecosystem Enhancement Prgm (NCEEP)
- 2008: Federal Mitigation Rule passed
- 2008 - 2011: Various legislation regarding mitigation passed

DEFINITIONS

- Ephemeral Stream
- Intermittent Stream
- Perennial Stream
- Modified Natural Stream
- Ditch

**North Carolina
Division of Water Quality**

**Methodology for Identification of
Intermittent and Perennial Streams and
Their Origins**

Version 4.11
Effective Date: September 1, 2010



NC DWQ Stream Identification Form Version 4.11

Date:	Project/Site:	Latitude:
Evaluator:	County:	Longitude:
Total Points: <i>Stream is at least intermittent if ≥ 10 or perennial if ≥ 30*</i>	Stream Determination (circle one) Ephemeral Intermittent Perennial	Other e.g. Quad Name:

A. Geomorphology (Subtotal = _____)	Absent	Weak	Moderate	Strong
1* Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

*artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = _____)	Absent	Weak	Moderate	Strong
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = _____)	Absent	Weak	Moderate	Strong
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macroinvertebrates (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

USACE AID# _____ DWQ # _____ Site # _____ (indicate on attached map)



STREAM QUALITY ASSESSMENT WORKSHEET



Provide the following information for the stream reach under assessment:

1. Applicant's name: _____ 2. Evaluator's name: _____
 3. Date of evaluation: _____ 4. Time of evaluation: _____
 5. Name of stream: _____ 6. River basin: _____
 7. Approximate drainage area: _____ 8. Stream order: _____
 9. Length of reach evaluated: _____ 10. County: _____
 11. Site coordinates (if known): prefer in decimal degrees. 12. Subdivision name (if any): _____

Latitude (ex. 34.872312): _____ Longitude (ex. -77.556611): _____

Method location determined (circle): GPS Topo Sheet Ortho (Aerial) Photo/GIS Other GIS Other _____

13. Location of reach under evaluation (note nearby roads and landmarks and attach map identifying stream(s) location): _____

14. Proposed channel work (if any): _____

15. Recent weather conditions: _____

16. Site conditions at time of visit: _____

17. Identify any special waterway classifications known: Section 10 Tidal Waters Essential Fisheries Habitat
 Trout Waters Outstanding Resource Waters Nutrient Sensitive Waters Water Supply Watershed (I-IV)

18. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area: _____

19. Does channel appear on USGS quad map? YES NO 20. Does channel appear on USDA Soil Survey? YES NO

21. Estimated watershed land use: _____ % Residential _____ % Commercial _____ % Industrial _____ % Agricultural
 _____ % Forested _____ % Cleared / Logged _____ % Other (_____)

22. Bankfull width: _____ 23. Bank height (from bed to top of bank): _____

24. Channel slope down center of stream: _____ Flat (0 to 2%) _____ Gentle (2 to 4%) _____ Moderate (4 to 10%) _____ Steep (>10%)

25. Channel sinuosity: _____ Straight _____ Occasional bends _____ Frequent meander _____ Very sinuous _____ Braided channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): _____ Comments: _____

Evaluator's Signature _____ Date _____

This channel evaluation form is intended to be used only as a guide to assist landowners and environmental professionals in gathering the data required by the United States Army Corps of Engineers to make a preliminary assessment of stream quality. The total score resulting from the completion of this form is subject to USACE approval and does not imply a particular mitigation ratio or requirement. Form subject to change - version 06/03. To Comment, please call 919-876-8441 x 26.

STREAM QUALITY ASSESSMENT WORKSHEET

#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
		Coastal	Piedmont	Mountain	
PHYSICAL	1	Presence of flow / persistent pools in stream (no flow or saturation = 0; strong flow = max points)	0 - 5	0 - 4	0 - 5
	2	Evidence of past human alteration (extensive alteration = 0; no alteration = max points)	0 - 6	0 - 5	0 - 5
	3	Riparian zone (no buffer = 0; contiguous, wide buffer = max points)	0 - 6	0 - 4	0 - 5
	4	Evidence of nutrient or chemical discharges (extensive discharges = 0; no discharges = max points)	0 - 5	0 - 4	0 - 4
	5	Groundwater discharge (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 - 3	0 - 4	0 - 4
	6	Presence of adjacent floodplain (no floodplain = 0; extensive floodplain = max points)	0 - 4	0 - 4	0 - 2
	7	Entrenchment / floodplain access (deeply entrenched = 0; frequent flooding = max points)	0 - 5	0 - 4	0 - 2
	8	Presence of adjacent wetlands (no wetlands = 0; large adjacent wetlands = max points)	0 - 6	0 - 4	0 - 2
	9	Channel sinuosity (extensive channelization = 0; natural meander = max points)	0 - 5	0 - 4	0 - 3
	10	Sediment input (extensive deposition = 0; little or no sediment = max points)	0 - 5	0 - 4	0 - 4
STABILITY	11	Size & diversity of channel bed substrate (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 - 4	0 - 5
	12	Evidence of channel incision or widening (deeply incised = 0; stable bed & banks = max points)	0 - 5	0 - 4	0 - 5
	13	Presence of major bank failures (severe erosion = 0; no erosion, stable banks = max points)	0 - 5	0 - 5	0 - 5
	14	Root depth and density on banks (no visible roots = 0; dense roots throughout = max points)	0 - 3	0 - 4	0 - 5
	15	Impact by agriculture, livestock, or timber production (substantial impact = 0; no evidence = max points)	0 - 5	0 - 4	0 - 5
	16	Presence of riffle-pool/ripple-pool complexes (no riffles/ripples or pools = 0; well-developed = max points)	0 - 3	0 - 5	0 - 6
	17	Habitat complexity (little or no habitat = 0; frequent, varied habitats = max points)	0 - 6	0 - 6	0 - 6
	18	Canopy coverage over streambed (no shading vegetation = 0; continuous canopy = max points)	0 - 5	0 - 5	0 - 5
	19	Substrate embeddedness (deeply embedded = 0; loose structure = max)	NA*	0 - 4	0 - 4
	20	Presence of stream invertebrates (see page 4) (no evidence = 0; common, numerous types = max points)	0 - 4	0 - 5	0 - 5
BIOLOGY	21	Presence of amphibians (no evidence = 0; common, numerous types = max points)	0 - 4	0 - 4	0 - 4
	22	Presence of fish (no evidence = 0; common, numerous types = max points)	0 - 4	0 - 4	0 - 4
	23	Evidence of wildlife use (no evidence = 0; abundant evidence = max points)	0 - 6	0 - 5	0 - 5
Total Points Possible		100	100	100	
TOTAL SCORE (also enter on first page)					

* These characteristics are not assessed in coastal streams.

PERMITTING AND MITIGATION

- DWQ has General Certifications which correspond with NW Permits
- Individual WQ Certifications written for DA Individual Permits
- USACE determines mitigation requirements on a case-by-case basis
- DWQ mitigation threshold is 150 LF of stream

MITIGATION REQUIREMENTS SUMMARY

	USACE	NCDWQ
Ephemeral Stream	No	No
Intermittent Stream	Case-by-Case	Yes
Perennial Stream	Yes	Yes
Modified Natural Stream	Case-by-Case	Yes
Ditch	Case-by-Case	No*
Mitigation Threshold	Case-by-Case (gen 150 LF)	150 LF
Mitigation Ratios	Case-by-Case (typically 2:1)	1:1

*Unless determined to be jurisdictional by the USACE

STREAM MITIGATION OPTIONS

- Applicant can provide their own mitigation.
- Applicant can purchase mitigation credit from an approved mitigation bank.
- Applicant can purchase mitigation credit from In-Lieu Fee Program (NC Ecosystem Enhancement Program).

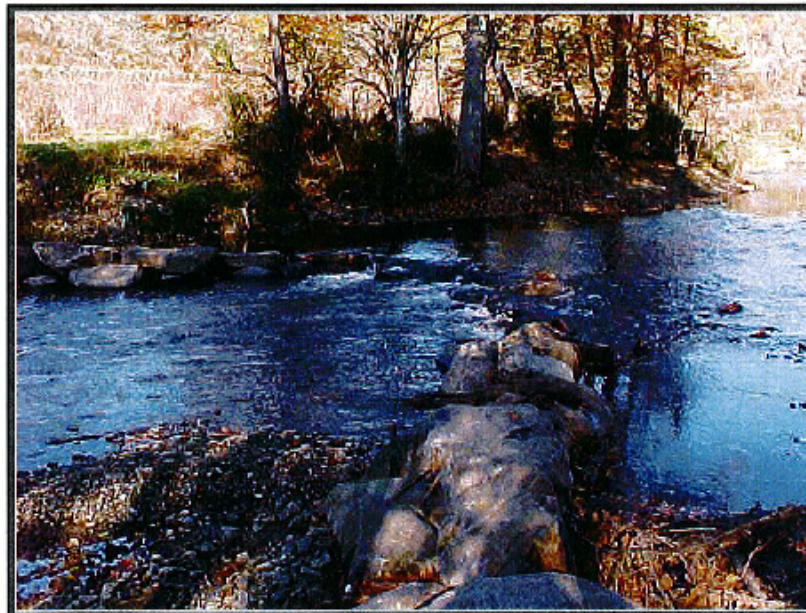


**US Army Corps
of Engineers,**
Wilmington District



STREAM MITIGATION **GUIDELINES**

April 2003



NRCS Project, North Toe River, Avery County, NC
5 May 2002

STREAM MITIGATION METHODS

- Restoration: Construction of new channel. Restore PDP.
- Enhancement 1: Work on existing channel. Examples include adding structures, floodplain benches (in-channel work).
- Enhancement 2: In channel work limited. Bank stabilization, vegetation planting, cattle exclusion.
- Preservation.

STREAM MITIGATION RATIOS

- Restoration 1:1
- Enhancement 1 1:1 to 1.5:1
- Enhancement 2 1.5:1 to 2.5:1
- Preservation 5:1

APPLICATION OF MITIGATION RATIOS

- Applicant-Provided Mitigation: Ratios applied to Applicant. Example: Mit requirement* is 300 LF, applicant proposes E1 (1.5:1) for mitigation, must complete 450 LF of E1.
- Mitigation Bank or ILF: Ratios applied to mitigation site. Example: Mit Banker completes 1,000 LF of E1 (1.5:1), site generates 667 LF of stream credit.

* Mitigation requirement is initially based on the impacts. DWQ requires mitigation at a 1:1 ratio, and the USACE will determine the ratio based on the assessed functions of the stream to be impacted

Compensatory Mitigation Rule Timeline for Bank or ILF Instrument Approval*

	Event	# of Days**	
Phase I	Optional Preliminary Review of Draft Prospectus	30	DE provides copies of draft prospectus to IRT and will provide comments back to the sponsor within 30 days.
Sponsor Prepares and Submits Prospectus ~DE must notify sponsor of completeness w/in 30 days of submission~			
Day 1**	Complete Prospectus Received by DE		
Phase II	Public notice must be provided within 30 days of receipt of a complete prospectus	30	
Day 30			
Phase II	30-Day Public Comment Period	30	
Day 60			
Phase II	DE must provide the sponsor with an initial evaluation letter within 30 days of the end of the public comment period.	30	15
Day 90	DE distributes comments to IRT members and sponsor within 15 days of the close of the public comment period.		
Sponsor Considers Comments, Prepares and Submits Draft Instrument ~DE must notify sponsor of completeness w/in 30 days of submission~			
Day 1	Complete Draft Instrument Received by IRT Members		
Phase III	30-day IRT comment period begins 5 days after DE distributes draft instrument to IRT members	30	
Phase III	DE discusses comments with IRT and seeks to resolve issues ~ # of days variable~	60	90
Day 90	Within 90 days of the receipt of a complete draft instrument by IRT members, the DE must notify the sponsor of the status of the IRT review.		
Sponsor Prepares Final Instrument ~Sponsor provides copies to DE and all IRT members~			
Day 1	Final Instrument Received by DE & IRT		
Phase IV	DE must notify IRT members of intent to approve/not approve instrument within 30 days of receipt.	30	45
Day 30	IRT members have 45 days from submission of final instrument to object to approval of the instrument and initiate the dispute resolution process.		
Phase IV	Remainder of time for initiation of dispute resolution process by IRT members	15	
Day 45	INSTRUMENT APPROVED/NOT APPROVED, or DISPUTE RESOLUTION PROCESS INITIATED		

EPA/Corps draft 4/02/08

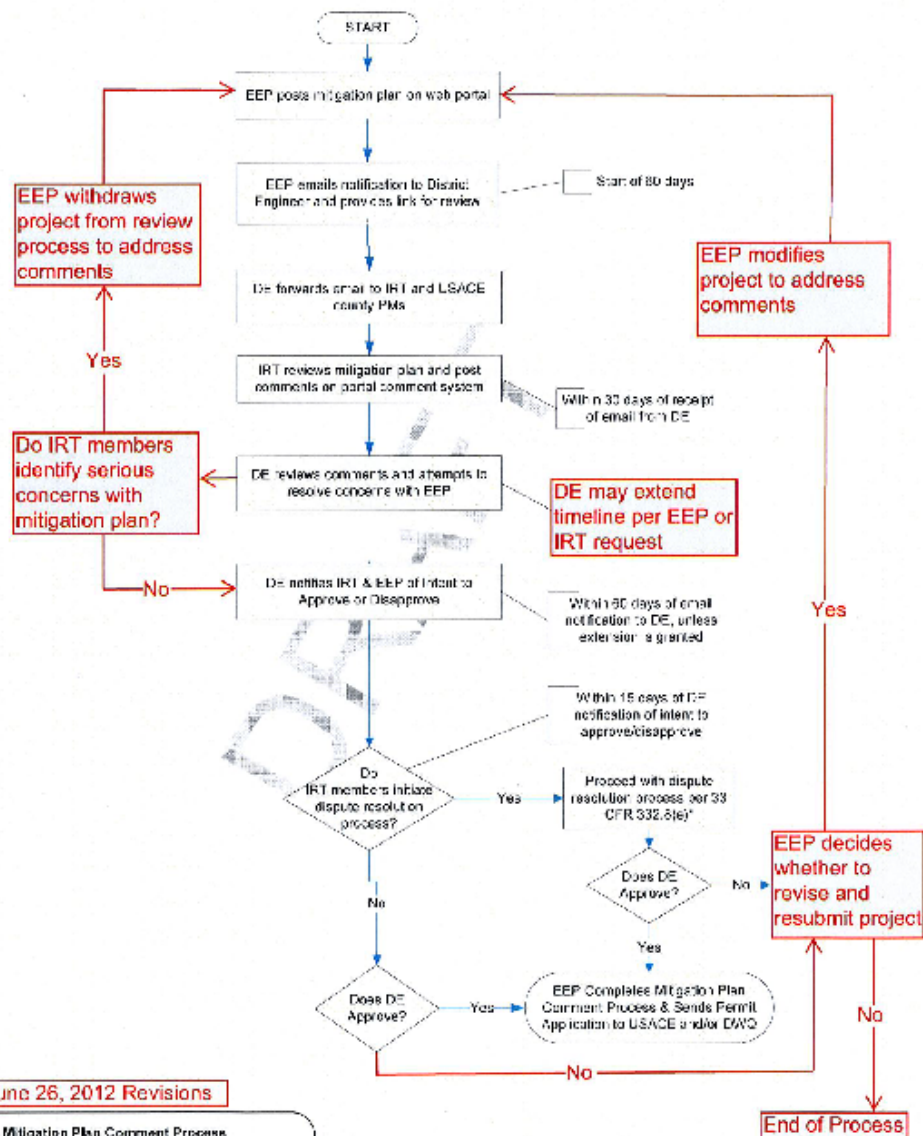
Total Required Federal Review (Phases II-IV): <225 Days

*Timeline also applies to amendments

**The timeline in this column uses the maximum number of days allowed for each phase.

Mitigation Comment & Approval Process

Streamlined Review Process, 33 CFR 332.8(g)(2)



June 26, 2012 Revisions

Mitigation Plan Comment Process	
C.No. I&P.PRO.01.01.0*	
Owner:	03/26/2011
Jurek, JCF	Rev. 0

* DE must be notified by letter from a senior official of the agency represented on the IRT within 15 days of receipt of DE's notification of intent to approve the modification per 33 CFR 332.8(e)

STREAM MITIGATION MONITORING

- Five years of monitoring required for all Restoration, E1 and E2 projects to include
 - Stream Channel Stability: Cross sections and long. profiles as-built and annually (Restoration and E1).
 - Bankfull Events: Document bankfull events (Restoration and E1).
 - Vegetation: Document survival of planted stems annually. Also note volunteer species and numbers.
 - Photographs: Establish photo points along stream channel and in representative veg plots.
 - Protection: Monitoring easement and fencing (if present) to ensure easement is not violated

STREAM MITIGATION PERFORMANCE STANDARDS

- Stream Channel Stability: Changes in channel should be minimal. Changes should not represent a movement toward instability.
- Bankfull Events: At least two bankfull events during the five-year monitoring period.
- Vegetation: Survival of planted stems at a density of 260 stems per acre. Volunteers can be considered on a case-by-case basis.

CREDIT RELEASE - BANKS

Credit Release Milestone	Description	Interim Release	Total Release
1	Bank Establishment (Execution of MBI, approval of final Mit. Plan, financial assurance, Recordation of protective mechanism)	15%	15%
2	Completion of construction and establishment of monitoring plots	15%	30%
3	1 st Yr monitoring successfully completed	10%	40%
4	2 nd Yr monitoring successfully completed	10%	50% (65%*)
5	3 rd Yr monitoring successfully completed	10%	60% (75%*)
6	4 th Yr monitoring successfully completed	10%	70% (85%*)
7	5 th Yr monitoring successfully completed	15%	85% (100%*)

*A reserve of 15% of a site's stream credits shall be released after two bankfull events have occurred, in separate years, provided the channel is stable and all other performance stds are met. In the event that less than two bankfull events occur during the monitoring period, release of these reserve credits shall be at the discretion of the IRT.

CREDIT RELEASE - ILF (NCEEP)

Credit Release Milestone	Description	Interim Release	Total Release
1	Approval of final Mit. Plan, Issuance of permits.	0%	0*%
2	Completion of construction and establishment of monitoring plots	30%	30%
3	1 st Yr monitoring successfully completed	10%	40%
4	2 nd Yr monitoring successfully completed	10%	50% (65%**)
5	3 rd Yr monitoring successfully completed	10%	60% (75%**)
6	4 th Yr monitoring successfully completed	10%	70% (85%**)
7	5 th Yr monitoring successfully completed	15%	85% (100%**)

*The initial release of credits is not provided because NCEEP is a In-Lieu Fee Program with advance credits available to use per the NCEEP ILF Instrument.

**A reserve of 15% of a site's stream credits shall be released after two bankfull events have occurred, in separate years, provided the channel is stable and all other performance stds are met. In the event that less than two bankfull events occur during the monitoring period, release of these reserve credits shall be at the discretion of the IRT.

STREAM PRESERVATION

- Preservation reach should be in as near reference condition as possible.
- The reach provides important physical, chemical and biological functions for the watershed.
- The reach is under threat of destruction or adverse modification.
- The reach provides connectivity to other important resources.
- The reach captures the top of a watershed

STREAM PRESERVATION OTHER CONSIDERATIONS

➤ Streams in a watershed that:

- are adjacent to, or within a unique wetland (15A NCAC 2B .0100).
- contains Critical Habitat Areas identified DMF
- contains a significant Natural Heritage Area
- provide habitat for state or federally listed T&E species.
- contains fishery nursery areas, High Quality Waters, Outstanding Resource Waters, Trout Waters, or Water Supply Watersheds.
- contains unique and/or high quality habitat (stream and/or wetland) that is adjacent or within an area experiencing a rapid increase in population or development trend.
- contain stream reaches designated as critical habitat by the US F&WS.

Headwater Stream Restoration in the Coastal Plain

PLEASE NOTE: The following document is in draft and subject to change. While the information contained herein may be used for planning purposes, final plans should be coordinated with the Corps of Engineers, the NC Division of Water Quality and/or the Ecosystem Enhancement Program as appropriate.

INFORMATION REGARDING STREAM RESTORATION With Emphasis on the Coastal Plain

Prepared By:

US Army Corps of Engineers,
Wilmington District, Regulatory Division
And
North Carolina Department of Environment and Natural Resources,
Division of Water Quality

Version 2
April 4, 2007

This document is intended to provide general information to compensatory mitigation providers for use when planning or evaluating potential stream mitigation projects; particularly in the coastal plain (defined as the Middle Atlantic Coastal Plain Ecoregion as shown on Griffith, et. al. 2002) of North Carolina. The term “stream” as used in this document, means that the flow of water is contained in a natural channel or bed with identifiable banks and, in its unaltered state on the coastal plain, usually has adjacent wetlands. This document is meant to complement the April 2003, Stream Mitigation Guidelines, prepared by the Corps of Engineers Wilmington District, Environmental Protection Agency, the North Carolina Division of Water Quality and the North Carolina Wildlife Resources Commission (US Army Corps of Engineers, 2003).

INTRODUCTION

The decision whether to pursue any potential mitigation site should hinge on what can reasonably be accomplished considering current site conditions, and site constraints. Mechanically returning a site to a historic condition may not be possible or in some cases even preferable. The primary consideration must be what functions need to be returned or improved upon. Designers must then examine to what degree they can control those factors contributing to the loss or degradation of those identified functions. Together, these considerations should indicate whether a project is viable and ultimately determine the goals of the project.

COASTAL PLAIN HEADWATER STREAM RESTORATION









COASTAL PLAIN HEADWATER STREAM RESTORATION

- Fill existing ditches.
- Remove field crowns and/or bedding.
- Sculpt broad (100 ft) swale or valley.
- Plant appropriate vegetation.
- Monitoring a hybrid between stream and WL monitoring.
- Performance standards include demonstration of downvalley flow.
- Credit determined by valley length.
- No wetland credit within 100 ft valley

DAM REMOVAL

- Two projects completed to date for stream mitigation
- Stream credit awarded based on:
 - Restoration of flowing river within footprint of impoundment.
 - Restoration of appropriate aquatic community.
 - Presence of listed T&E species.
 - Use by anadromous fish.
 - Scientific value (research).
 - Public use/value.
- Guidance rescinded by USACE for revision.

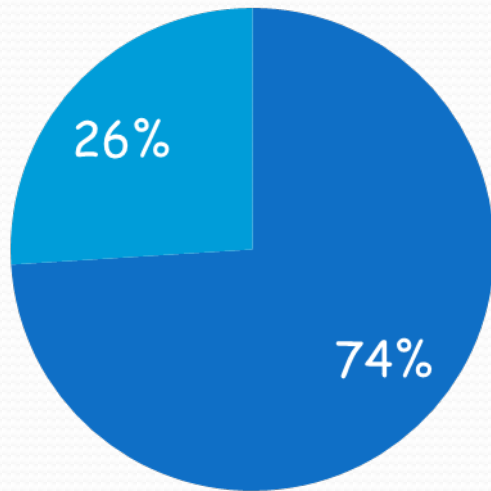
HOW ARE WE DOING?

2007-2009 Study of Mitigation Compliance

Number of mit. components excluding
Preservation

Performance Stds Met?

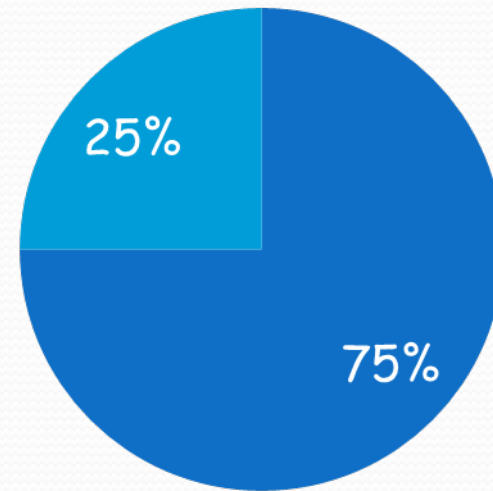
■ Yes ■ No



Total length of mit. streams excluding
Preservation

Performance Stds Met?

■ Yes ■ No



HOW ARE WE DOING?

- Are performance standards accurate surrogates for stream function?
- Are there other readily available or collectible data that would better assess/measure improvements to stream functions resulting from mitigation activities?
- Is five years an adequate amount of time to assess a project's trajectory toward meeting project goals (e.g. improving water quality, restoring aquatic ecosystem, etc.)?
- Does our system of generating credit from the different mitigation activities reflect the actual uplift provided by those activities (e.g. does full-blown channel restoration provide significantly more uplift than simply excluding cattle and planting buffers)?

WHERE ARE WE GOING?

- Focus on amount of functional uplift, not type of mitigation activity, to determine credit yield.
- Look more closely at less intensive mitigation strategies than construction of a completely new channel, floodplain, and riparian zone.
- Develop monitoring methods that may give better insight into whether the mitigation activities conducted have actually improved stream function.
- Explore alternative mitigation strategies beyond stream channel and riparian manipulation alone, such as incorporation of urban or agricultural Best Management Practices (BMPs) to improve water quality before entering the stream

REVISED/UPDATED MONITORING PROTOCOLS (DRAFT)

- Increase stream monitoring period from five years to seven years.
- Visual monitoring at least annually.
- Stream Stability Monitoring:
 - Longitudinal Profile - At as-built and as necessary if visual monitoring indicates signs of bed or bank instability.
 - Cross Sections - As built and years 1, 2, 3, 5 and 7.
- Bankfull Event Documentation.
- Water Quality Sampling: Temperature, conductivity, DO, and pH pre-construction and at least annually. Sampling from location upstream from project, within the project reach, and downstream from the project.
- Vegetation Monitoring: Monitoring of vegetation plots (totalling at least 2% of the site) for vegetation survival and vigor (height) in years 1, 2, 3, 5 and 7. Invasive exotic or native species should be monitored, especially if they are affecting growth or survival of planted species.

BIOLOGICAL (MACROBENTHOS) MONITORING COMPONENT

- DWQ has established protocols for collection of macrobenthos samples from small streams.
- DWQ has developed small stream biocriteria for small streams; need to determine the minimum watershed size in which the biocriteria can be determined (EPA WPD Grant).
- Evaluate older stream projects - some data available for 20 streams projects that are 8 to >10 years old, last sampled in 2007-2008. Resample these projects and compare with pre-construction data.

A scenic view of a waterfall cascading over mossy rocks in a lush forest. The text "QUESTIONS??" is overlaid in the center.

QUESTIONS??