Stream Mitigation: Science, Policy, and Practice

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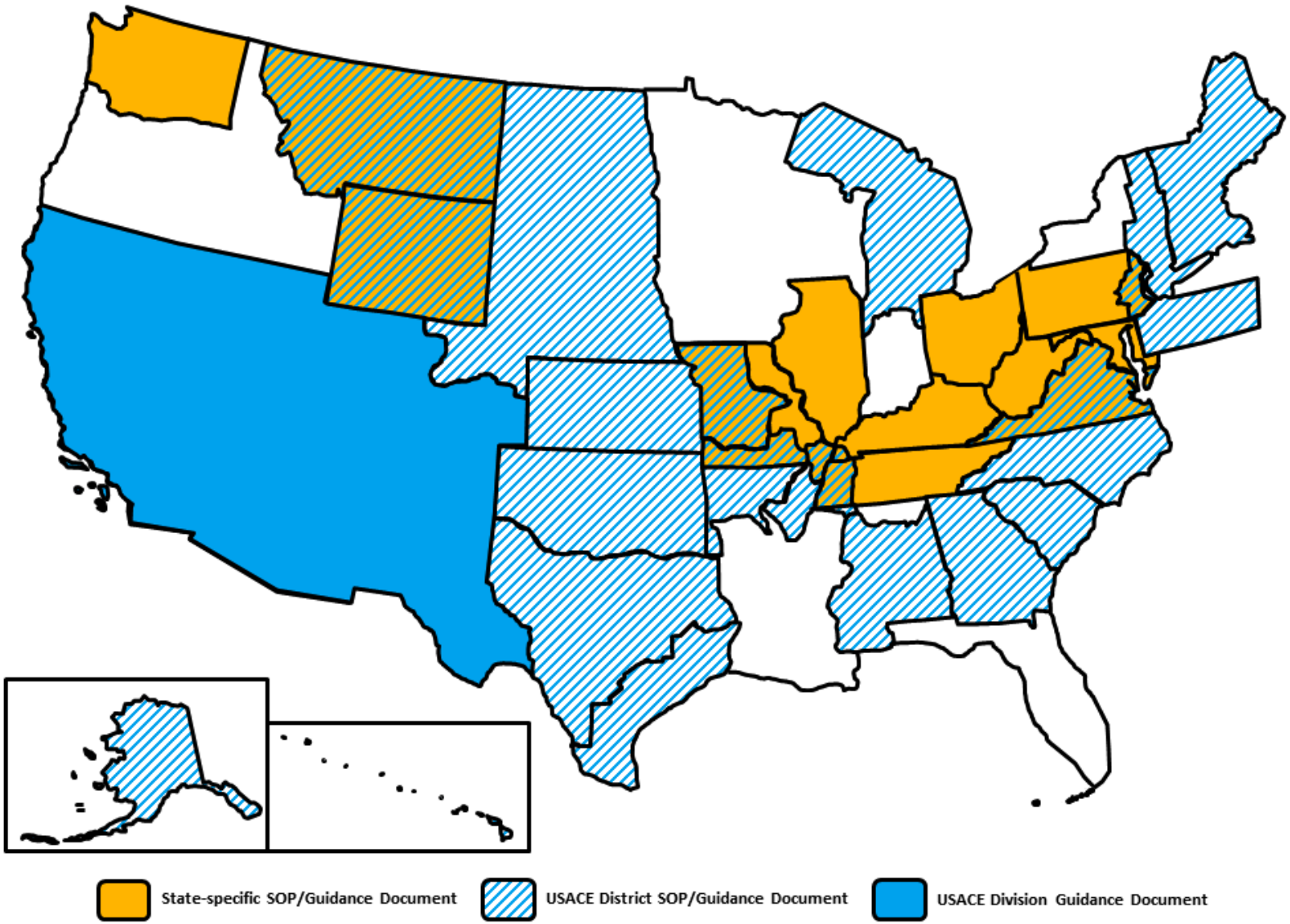
Goals

1. Undertake an in-depth inventory of current stream mitigation guidance and procedures at the Corps district and state levels.

2. Characterize the current state of stream compensatory mitigation practice across the country

Methodology: Document Review

- Document review
  - 32 documents
  - Most written/revised after the rule


State-specific SOP/Guidance Document
USACE District SOP/Guidance Document
USACE Division Guidance Document

Methodology: Interviews

- Corps Districts Interviewed
  - Fort Worth; Galveston; Little Rock; Los Angeles; Mobile; New England; Norfolk; Omaha; Portland; Seattle; St. Louis; Wilmington
- Other State and Federal Agencies
  - Missouri Department of Conservation (MDC); New Hampshire Department of Environmental Services (NHDES); North Carolina Ecosystem Enhancement Program (NCEEP), now DMS; Virginia Department of Environmental Quality (VDEQ); Washington Department of Fish and Wildlife (WDFW); National Oceanic and Atmospheric Administration (NOAA Marine Fisheries, Northwest Fisheries Science Center); U.S. Fish and Wildlife Service (FWS, Field Office); U.S. Environmental Protection Agency (EPA) Region 4

Results

- Site Selection and Service Areas
- Watershed Approach
- Debit Determination Methods
- Determination of Credits
- Buffers
- Credit Release Schedules
- Performance Standards
- Monitoring
- Land Protection
- Long-Term Management
- Adaptive Management

Site Selection

- Most compensation takes place in the same watershed as impacts
- Site selection boundaries defined by HUCs and sometimes ecoregions
  - Evaluation criteria include: site gradient, site viability, distance from impact site, preservation of unusual flora and fauna
  - But, site selection is still often opportunistic
- Little guidance on service areas; but most use 8-digit HUCs

Watershed Approach

- Few details on the watershed approach
- Some SOPs list general criteria (e.g., New England, Ohio, Charleston, Omaha, Mobile, Tulsa, Detroit, Wilmington)
- Some with more specific guidance – e.g., Maryland, South Pacific Division
- Some offer additional credit for compensation in priority watersheds (e.g., Kansas, Kentucky, Virginia USM) or using watershed approach (e.g., Wyoming)
- Lack of watershed plans is significant impediment

Debits

- Several Approaches:
  - Debit Tables – usually include stream type (e.g., ephemeral, intermittent, or perennial), priority area/category (e.g., primary, secondary, or tertiary), existing condition, duration of impact, dominant impact, and cumulative impacts; each assigned a range of multipliers

Debit Determination Example

Example of a Debit Determination Table from the Missouri SOP

ADVERSE IMPACT FACTORS WORKSHEET									
Stream Type Impacted	Ephemeral 0.3		Intermittent 0.4		Perennial 0.8				
Priority Area	Tertiary 0.1		Secondary 0.4		Primary 0.8				
Existing Condition	Functionally Impaired 0.1		Moderately Functional 0.8		Fully Functional 1.6				
Impact Duration	Temporary 0.05				Permanent 0.3				
Impact Activity	Clearing 0.05	Utility Crossing/ Bridge Footing 0.15	Below Grade Culvert 0.3	Armor 0.5	Detention 0.75	Morphologic Change 1.5	Impoundment (dam) 2.0	Pipe 2.2	Fill 2.5
Linear Impact Calculation	0.0002 multiplied by linear feet of stream impact recorded in each column [in subsequent table]								

Source: Missouri, p. 23.

Debits

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  - Ratios
  - Some incorporate assessment methodologies (e.g., Nebraska, South Pacific Division, Pennsylvania, Norfolk, West Virginia)
- Cumulative Impacts

Credits

- Tables – stream type (ephemeral, intermittent, perennial), priority area/category, existing condition, net benefit, monitoring/contingency, site protection, construction timing/timing of mitigation, location of mitigation, temporal lag or loss; each with multiplier
- Some link functional lift to credit generation (e.g., Missouri, Kansas, Illinois, Little Rock) or incorporate assessment methodologies (e.g., Wyoming, Fort Worth, Tulsa, Charleston, Tennessee, Pennsylvania)

Buffers

			Buffer Credit (Credits/Ft)		
SOP	**Minimum Width (Ft)**	**Maximum Width (Ft)**	**Restoration**	**Enhancement**	**Preservation**
Georgia	50	200	0.1 to 2.0	0 to 0.4	0 to 0.3
Illinois	25	300	0 to 2.4	0 to 0.95	0 to 0.65
Kansas	50	300	0.16 to 0.56	0.08 to 0.28	0.04 to 0.14
Missouri	50	300	0.5 to 1.1	0.25 to 0.55	0.13 to 0.27
Ohio	50	150	Up to 0.25 (reestablishment)	Up to 0.125 (rehabilitation)	Up to 0.0625
Virginia*	100 (per bank)	200 (work beyond 100 credited less)	0.2 to 0.4 (reestablishment)	0.15 to 0.38 (planting)	0.07 to 0.14 per percent area
Charleston**	50	300		0.2 to 0.39	0.075 to 0.2
Galveston	100/side, or 200 total with both >25	200 (work between 100-200 credited less)	0.5	0.25 to 0.5 (planting)	0.05 to 0.1
Fort Worth	25 (ephemeral); 50 (intermittent); 100 (perennial)				
Little Rock	25	100	0.4 to 1.6	0.2 to 0.8	0.1 to 0.4
Los Angeles		300			
Mobile***	50	200	0.4 to 1.6	0.2 to 1.2	0.1 to 0.4
New England	100				

Credit Release Schedule

	Virginia	Georgia	Fort Worth*	Mobile	South Pacific	Wilmington
Initial Release	15	10	30	20	15 (bank establishment)	15 (bank establishment)
Construction					25	
As-Built	10	10 beg., 10 end	10	10		15 (bank), 30 (ILF)
Bankfull event 1				20		
BFE 2				30		
2 BFEs			10			
Year 1	10, 25 if BFE	10				10 (bank), 10 (ILF)
Year 2	10, 25 if BFE	10	10		15	10 (bank), 10 (ILF)
Year 3	10, 25 if BFE	10	10		15	15 (bank), 15 (ILF)
Year 4	10, 25 if BFE	10			15	5 (bank), 5 (ILF)
Year 5		5	10	10	15	15 (bank), 15 (ILF)
Year 6		5				5 (bank), 5 (ILF)
Year 7						10 (bank), 10 (ILF)
Final	25 for each BFE	20	20	10		

Performance Standards

- Some SOPs do not mention performance standards, some include general language, a few have performance standards for streams
  - Physical criteria (pattern, profile, dimension, pebble counts, erosion)
  - Riparian buffers
  - Chemical and biological criteria are much less common but there are some examples
- In practice, performance standards are often based on channel dimension, pattern, profile, and bed material.

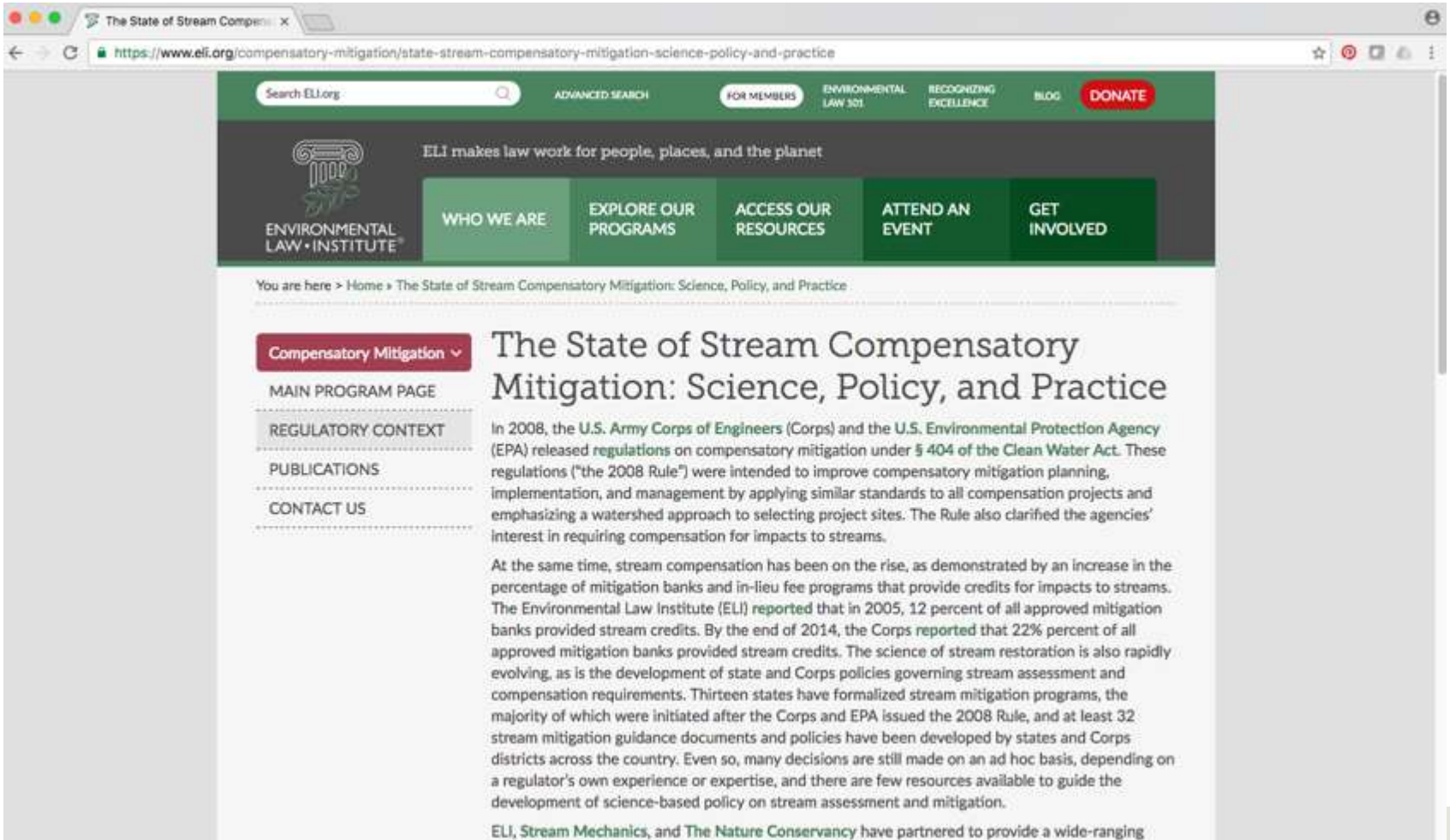
Monitoring

	Years	What Must be Monitored
Georgia	"Monitoring efforts should usually include periodic reviews in the first year and annually thereafter"	Soils, hydrology, vegetation, and wildlife
Kansas	Annually; no less than 5 years, longer depending on resource type and adaptive management measures occurring after initial site work	Physical and biological
Kentucky	Annual physical monitoring for 3-8 years	As-built survey, permanent picture stations, riffle and channel pebble counts, bar samples, vegetative monitoring, habitat assessment of stream projects
Maryland	5 years	Description of how the mitigation project meets the mitigation requirements, performance standards; photographs, description of any modification which have been made or need to be made to satisfy mitigation requirements.
New York District	5-10 years	Restatement of goals, objectives, and performance standards; identification of any structural failures; description of management activities and corrective actions; summary and full presentation of data collected; site map showing locations of data collection; assessment of the presence and level of occurrence of invasive species; vegetation cover map; photographs; assessment of degree to which performance standards are being met; proposed corrective actions; narrative summary of monitoring results
Ohio	Project-specific	Monitoring requirements are based on project activities. Examples include substrate sampling, stream stability rating, water chemistry, hydrology monitoring, vegetation monitoring, qualitative habitat evaluation index, qualitative macroinvertebrate sampling, invertebrate community index, index of biotic integrity, amphibian/salamander sampling.
Tennessee	Five annual monitoring reports; if longer than 5 years then "monitoring may be conducted on a less than annual timeframe"	Photos, riparian vegetation survey, aquatic species survey, channel morphology survey
Virginia	10 years	Aerial photograph; narrative summarizing condition of the site; results of vegetation survey; comparison of as-built, current, and previous years monitoring data; discussion of any deviation from as-built or previous year's data, corrective action plan; report including detailed resource documentation, tables summarizing attainment of success criteria, revised summary table of action credits based on field measurements
Washington	At least 3 years	Bank protection, upstream and downstream geomorphic impacts, high-flow hydraulics, fish habitat, vegetation establishment

Long-Term

- Land Protection
  - Easements are often preferred mechanism
- Long-term Management
  - About half of the SOPs had provisions related to long-term management
- Adaptive Management
  - Most SOPs recognize importance of adaptive management. Either require minimum adaptive management discussion in the mitigation plan or require adaptive management if and when a project encounters difficulty.

For More Information:



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Questions?