



Restoring America's Greatest River

Presented at the water quality technical section of the annual meeting of the LMRCC, 9/16/06 at Vicksburg, MS

Overview of Existing EMAP-GRE Field Operations



United States Environmental Protection Agency Office of Research and Development Washington, DC 20460 EPA/620/R-06/002

February 2006

Great River Ecosystems Field Operations Manual





Environmental Monitoring and Assessment program

http://www.epa.gov/emap/greatriver/fom.html

Extent of EMAP-GRE Phase I



Field Operations

- Current EMAP-GRE methods are the default for LMR unless unsafe, unfeasible, or clearly suboptimal with regard to program objectives
- LMR methods will be a compromise between program continuity and optimization for LMR
- Basic program framework and functions the same for LMR
- Changes based on consensus of EPA and LMR collaborators

EPA provides:

- Probability sample design
- Site dossiers/GIS data
- Field operations manual
- Initial and annual training
- QA field audits
- Preprinted field forms and sample labels
- Specialized supplies (certain filters and vials)
- Sample tracking and IM functions
- Laboratory analyses
- Data entry
- Validated data
- Hosting technical meetings and workshops
- Final assessment report

Cooperator responsibilities:

- Crews
- Gear
- Most supplies
- Data collection
- Shipping/sample transport
- Data Verification
- Workshop attendance; collaboration on report preparation

Section I - Basics

- Survey design
 - Sites randomly located based on probability sample
 - Goals of the design are to insure representativeness and prevent bias
- Index period
 - July 1 through September 30

Basics, cont.

- Habitats sampled
 - Main channel
 - Main-channel littoral zone to 6 m depth
 - Main-channel terrestrial riparian

 Integrative assumption: Presence and quality of off-channel habitats influences ecological integrity of main-channel at some spatial scale

EMAP features multiple indicators:

- Biotic assemblages (fish)
- Chemical indicators ([nutrients])
- Exposure indicators (fish tissue contaminants)
- Function indicators (sediment metabolism)
- Physical habitat indicators (riparian vegetation structure)

Biotic assemblage indicators:

- Littoral
 - Fish
 - Benthos
 - Periphyton
 - Aquatic vegetation
- Channel
 - Snag surface Invertebrates
 - Zooplankton
 - Phytoplankton

Water chemistry

On boat: DO, conductivity, pH, temperature, Secchi depth In field: Turbidity In lab: cations, anions, nutrients, metals, DIC, DOC, TSS, seston geomarkers, chl *a*

Exposure indicators

Fish tissue contaminants

Pesticides, PCBs, PBDEs, Hg

Sediment toxicity and chemistry

Physical Habitat Indicators

- Riparian vegetation
- Riparian land use
- Human disturbance
- Fish cover
- Channel and bank morphology

QA is a priority

Table 1-1. Generic QA activities for EMAP-GRE field operations.

Category	Considerations
Training	All crews will be thoroughly and consistently trained for assigned field tasks, safety, and project QA procedures. Initial training is supplemented by annual "booster" training.
Standardization	Crews will receive standardized training based on this manual. Standardized field forms and labels will be used by all crews. Field instruments, sampling equipment, and supplies will be specified or supplied.
Calibration	Calibration of field instruments will be integrated with field operations.
Objectivity	Field operations are designed to minimize unnecessary subjectivity in measurements. To the extent possible, rules will be provided for site verification and other field decisions.
Communication Biggest challenge	Regular communication between field crews and coordinating EPA personnel forestalls problems, misinterpretations, and supply shortages and promotes inter-river and among-crew uniformity. Field-season QA audits and post-field-season debriefings improve QA.
Documentation	Non-standard or unusual situations or conditions are documented with data quality flags and notes on the field forms and by communication with EPA scientists and IM personnel.
Information management	Web-based sample tracking and 100% data proofing are fully integrated into the program

Training is a priority



Training flotilla on Upper Miss near Alton, IL

Duluth EMAP-GRE core team

- David Bolgrien: Sample design, program administration, GIS
- Ted Angradi: Ops manual, benthos, reference
- Mark Pearson: fish, training
- Terri Jicha: IM, water chemistry
- Debra Taylor: Physical habitat and vegetation
- Brian Hill: Branch chief and algae
- Allan Batterman: QA officer

EPA ORD Duluth 218-529-5000

Section 2 Field Operations

- Crew configuration and responsibilities
- Flow of daily operations
- Guidelines for recording field data

Crew Responsibilities

able 2-1. Outline of the responsibilities of each field crew.									
Crew	Habitats	Sampling responsibilities	Section of manual						
Fish sampling	Near-shore littoral	Fish assemblages	8						
		Substratum	8						
		Fish cover	8						
		Fish tissue for contaminants	9						
		Fish tissue for DNA	8						
River sampling	Main channel	Water chemistry	5						
		Phytoplankton	5						
		Macrozooplankton	5						
		Microzooplankton	5						
		LWD	10						
	Near-shore littoral	LWD	10						
		Benthic macroinvertebrates	10						
		Snag macroinvertebrates	10						
		Sediment	11						
		Periphyton	11						
		Aquatic vegetation	6						
	Riparian zone	Bank characteristics	7						
		Riparian vegetation structure	7						
		Human disturbance	7						
		Invasive plants	7						

Crew Configuration

- Two 3 person crews suggested
- Other configurations are acceptable
- Crew division of labor is flexible
- Safety first
- Need sufficient crew to complete a site in a day
- Everybody goes through training









08.18.2004

No The

MDC

Sampling platforms vary



EMAP-GRE WATER CHEMISTRY AND PLANKTON FORM (front)

	•	DATE			,			ANNU		Revie	wed	
SITE ID: GRW0444					/ <u> </u>] _	2,0,0	_ I				
Water Chemistry												
Water Sample				FLAG			DO/PH Ca	alibration		FLAG		
Sample ID 2 L composite	Sample ID 2 L composite					Altitude at Calibration (m)						
Sample	Collecte	ed?	Composit Station	te of 3 IS?	FLAG	FLAG Was DO meter calibrated on day of sampling? Yes N					No	
2 L composite 1	🗌 Ye	es	🗌 Yes	🗌 No								
500 mL grab	🗆 Ye	es	🗌 Yes	🗌 No		Was	Was pH meter calibrated on day of sampling? Yes N					
2 L Composite Field Duplicate Sample IE			1 1 1			Alka	Alkalinity Sample ID			1 1	_	
DI Blank Sample ID						Alka Dupi	linity S icate S	ample ID				
				Wate	r Quality M	leasur	ements					
* See below for rules			River Left				Thalweg			River Right		
on which depths to take readings; flag depths not used	0.5 m f surfa	rom ce	Mid depth	0.5 m from bottom	n 0.5 m surfa	from ace	Mid depth	0.5 m fror bottom	m 0.5 m from surface	Mid depth	0.5 m from bottom	
deptila not used.	Total de	epth	Sample depth	Sample dep	th Total c	lepth	Sample depth	Sample dep	oth Total depth	Sample depth	Sample depth	
Depth xx.x m												
DO (mg/L)												
Conductivity (uS/cm)												
Temperature (C)												
рН												
Flag												
Phytoplankton Composite Desired Sample (1935-ml composite excluding preservative)												
Sample ID Composite vol. (mL)									FLAG			
					N	umber	of Locations §	Sampled (0-	-3):			
		L	62 um M		nkten Cen		Comple (190	l composit	a filtration desire	الم		
Sample ID			Volumo filtor	acrozoopia	nkton Con	nposite	Sample (180-	L composit	e intration desire	a)	FLAC	
Sample ID			volume miler	eu (L)					0.		FLAG	
					N	umber	or Locations a	sampied (0-	-3):			
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Sample ID			Volume filtere	d (L)		posite	Sample (10-L	composite	initiation desired	/	FLAG	
oumpione				a (L)	-							
					N	umber	of Locations S	Sampled (0-	-3):			
* If donth at the station of		tmotor		o cubcome	0.05 m ch	ovo the	bottom mid de	opth and 0	5m from the surfe	co: cubcomple	volumos:	
445mLfor water; 215mL 1	for phytopl	ankton	, 20L for mach	ozooplankto	e 0.5 m ab n, 2L for m	icrozoc	plankton.	epun, and 0.	om nom the sulfa	ce, subsample	volumes.	
* If depth at the station ≤2m and ≥1m, collect meter readings and a subsample 0.5 m above the bottom, mid-depth, and 0.5m from the surface; subsample volumes: 665mLfor water; 325mL for phytoplankton, 30L for macrozooplankton, 3L for microzooplankton.								bsample				
The depth at the station ≤1m, collect meter readings and a sample at mid-depth 1.3L for water, subsample volumes: 650mL for phytoplankton, 60L for macrozooplankton, 6L for microzooplankton.							_ for					
Flag codes: K=r Explain in comr	no measu nents.	rement	t made, U=sus	spect meas	urement; I	=1, F2,	etc=misc flags	s assigned	by field crew.		16	
											10.	

EPA provides specialized field forms

Section 3 Pre- and post-visit base location activities

Pre-visit base location activities

- Confirm site/ramp status and location
- Preload waypoints into GPS units
- WQ meter calibrations
- Ship previous samples
- Compile forms, load supplies
- Prepare preservatives

Post-visit base location activities

- Filter water, make turbidity readings
- Review data forms
- Download camera files
- Preserve/store samples
- Fill out sample tracking forms
- Fax tracking and field verification forms to Corvallis data center
- Arrange FedEx pickup for next day

Sample not preserved in formalin

- Water: shipped fresh next day
- Chlorophyll filters: frozen, shipped weekly
- DIC, DOC, Other filters: dried, shipped weekly
- Sediment: refrigerated, shipped fresh next day
- Fish tissue: frozen, shipped weekly

Samples preserved in formalin

- Benthos (10%): carried to MED at EOS
- Fish vouchers (10%): carried to MED at EOS Periphyton (4%): carried or shipped at EOS to MED
- Phytoplankton (4%): carried or shipped at EOS to MED
- Zooplankton (4%): carried or shipped to lab in batches



/ / 200

Comp/filtered vol.

Site visit number 1 2 3 4

Sample ID_____

EPA provides

EPA provides specialized labels

Sample preservative recipes

3-1. Stock preservative solutions and instructions for their preparation. All stock solutions should be stored in clearly-labeled non-breakable containers. Labels should include container contents, date of preparation, and the initials of the preparer.									
	Use	Recipe							
red Pre phy peri solu	servative for toplankton and iphyton; stock ution for fish	Add 20 g borax (hydrated sodium borate: Na ₂ B ₄ O ₇ -10H ₂ O) detergent (20 Mule Team [®]) per L 100% formalin (37% formaldehyde). Test pH with paper.							
fered Sto b main pres	ck solution for croinvertebrate servative	Add 35 g Na ₂ CO ₃ (also called "washing soda") per L 100% formalin (37% formaldehyde). Test pH with paper.							
alin- Pre zoo	servative for plankton	Add 600 mL 100% formalin, 5 tablespoons borax and 400 g table sugar (sucrose) to 4.4 L tap water (makes 5 L). Test pH with paper.							
ed Pre	servative for fish ^d	Add 1 part 100% borax-buffered formalin to 9 parts tap water.							
e Sto pre DN	ck solution for fish servation (2005 A sites) ^e	Full strength agriculture-derived.							
e Fiel fish	d preservation of (2005 DNA sites)	Add 9 parts 95% ethanol to 1 part tap water.							
e Lab fish	preservation of (2005 DNA sites)	Add 8 parts 95% ethanol to 2 parts tap water.							
10% carbonate-buffered Pre- formalin (pH10) made		Add 1 part 100% carbonate buffered formalin to 9 parts tap water. Test pH with paper.							
e Sta ma san	in added to croinvertebrate nples	Add 1 teaspoon rose bengal powder to 1 L of 10% carbonate-buffered formalin stock solution.							
	k preserva solutions s ls should in reparer. red Pre phy peri solutions fered Sto b ed Pre alin- Pre zoo ed Pre be Sto pre DN. ree Fiel fish fered fish fered Pre	k preservative solutions and solutions should be stored in ls should include container content Use Use red Preservative for phytoplankton and periphyton; stock solution for fish fered Stock solution for macroinvertebrate preservative alin- Preservative for zooplankton ed Preservative for zooplankton ed Preservative for zooplankton ed Preservative for fish preservation (2005 DNA sites) ^e ree Stock solution for fish preservation (2005 DNA sites) ^e ree Lab preservation of fish (2005 DNA sites) ree Lab preservative for macroinvertebrates ree Stain added to macroinvertebrate samples							

Sample tracking

- Critical for for good QA!
- We use a Web-based system called SWIM
- There are multiple sample types going to multiple labs
- Relatively bombproof after 3 years



Chapter 4: Site Verification Process

The sample design puts sites on the river. Site verification puts actual sample locations at each site.



Chapter 4 Site Verification

Site verification asks:

- 1. Should the site be sampled?
- 2. If it should be sampled, can it be sampled?
- 3. If it can sampled, how should it be laid out?

Site verification is an agreement on how crews will "lay out" the site for sampling.

Laying out the site without bias enhances data integrity.

Site verification

- Determine if site is in the population and can be safely sampled.
 - Not in a tributary or reservoir
 - Not above or below the reach
- All decisions verified with EPA
- Sample locations can be moved around to a limited (and proscribed) degree to avoid problems (safety, islands, tributary mouths)

The Site Dossier

The dossier is a document that guides the crew to the site and provides approximate nominal station locations

EMAP-GRE Site Dossier GRW04449-300

River Thalweg Shoreline Transect Points Lines: Attribute Information

NAME NED_ELEV	SECTION	SAMPLE BANK	CLOSEST RIVER MILE	* PLANNED VISITS	POOL/REACH
Mieckelppi Rivar 145	HinoisTewa	Left	427	1	2aol 16

DETAIL	TRAN	ID	DESIGN_NO	LON_DD	LAT_DD	OR_AZ	5B_DIST	NSB_DIST	CH_WIDTH
X-Site	х	A01	360	-50.6855	41.4619				
1.9 Point	X	#02	300	-59.6524	41,4609				
2/3 Point	X	.905	300	-51.6545	41.4627				
Cross Channel Transact/MCS Int.	X	#94	300	-91.6312	41.4599		10		
Cross Channel Transact/MCS Int.	X	.905	300	-51.6555	41.4636				
Transect X	х	/105	300	-		315.94	255.52	248.98	544.50
25 km Site	Ŷ	#07	366	-91.6813	41.4633				
300m Sile	2	.938	300	-51.6492	41,4650				
Primary 500m Upstream MCS Transect	х	A22	300	-51.6473	41.4631				
Sacandary 500m Dewnstream MCS Transact	х	AL0	300	-59.6562	41.4575				

DATA DICTONARY

DETEMD - Develoption TAM - Develoption TAM - Develoption and page 2 DEXEMPS - Develoption and the LOSS _ DO - Longitude in a decimal degrees LACS, DO - Longitude in a decimal degrees LAC, DO - Longitude in a decimal degrees DAL, DO - Longitude in a decimal degrees DAL, DO - Longitude in a decimal degrees DAL, DO - Longitude in a decimal NOM_ DOD - Distance to accele hand in a networ CU, VADDTI - Detance's to accele hand in a metron **All distance values are la cadara **All distance futures are la dispress. **All coordinate ratios was derived using projections: Coordinate and the second second projections: Coordinate and the second second second projections: Coordinate and the second second second projection of the second secon

Inverse Flattening: 298.157222100000020000



EMAP-GRE Site Domice

GRW04449-300

Figs 1 of 2






Site Anatomy (large scale)

- "X-site" comes from design file
- Channel transect
 - Transect is perpendicular to the main-channel and through the X-site.
 - Thalweg station is the deepest point of channel transect.
 - River-right and River-left stations are along transect half-way between thalweg and shore.
- Shore transects.
 - Primary transect
 - 500 m upstream (fish, littoral biota, WQ, habitat)
 - Secondary transect
 - 500 m downstream (fish and fish habitat only)



Site Anatomy (Primary transect)



Primary shore transect has 11 stations (A-K) at 50 m intervals. Different things happen at different stations.

Secondary transect has 6 fish habitat stations at 100 m intervals. Upstream end is 500 m and downstream end is 0 m. Site verification involves a lot of rules and guidelines to minimize the possibility that bias in sample location will creep in.

Verification emphasized in training and EPA holds hands with cooperators through the process.



Section 5 Water chemistry and plankton

Objective is to characterize integrated water chemistry and plankton at the site as indicators of condition and stress (WC)

What is being collected:

• Water Chemistry:

- Bulk grab for analysis
- Meter Chemistry

DO, pH, conductivity, temperature, turbidity

- Clarity Secchi
- Dissolved Inorganic Carbon (DIC) grab

• Plankton:

- Phytoplankton
- Microzooplankton
- Macrozooplankton

Lab analysis (Lab TBD)

- Alkalinity
- Metals (As, Pb, Se, Al, Fe, Ni, Zn)
- Ammonia, NOx, Total N
- Total P
- TOC
- SO4, CI
- Na, Ca, K, Mg
- Chlorophyll a
- DOC, DIC
- 15N, 13C (of seston)

Depth and width integrated sampling



Samples and meter data collected at 3 depths at each of 3 stations

Samples composited for the site

Typical rig with #35 sounding weight

High volume hose for plankton

Low volume clean hose for water sample

Meter sensors

Volumes for water and plankton samples

Bulk water	8 L 🖌	
Alkalinity	500 mL 🔍	
Phytoplankton	2 L	
Macrozooplankton (63-um mesh)	180 L filtered	
Microzooplankton (20-um mesh)	18 L filtered	

Plankton collection (Macrozooplankton)



Guzzler pump

63-µm mesh plankton net



Water Quality "Field" Sample Processing

- Filter aliquots of churned bulk sample for Chl, TSS, geomarkers, etc.
- Extract churned aliquot for lab analysis
- Make replicate turbidity measurements



Lab processing for LMR

- Water chemistry: TBD, currently UMESC
- Zooplankton: TBD, currently INHS and SMSU
- Phytoplankton: TBD, currently same lab as periphyton (UMD-Ely)

Section 6 Aquatic Vegetation

- Most relevant for impounded Upper Mississippi River
- Based on USGS LTRM methods
- Probably not applicable to LMR main channel habitats

Section 7 Riparian Habitat

Objective is to characterize the riparian zone adjacent to the primary transect as an indicator of condition and stress

Riparian sample locations





Riparian Measurements

- Bank and channel width measurements
 - Bank heights and channel wetted widths
 - Shoreline type
 - Macrohabitat type

Riparian measurements

- Land cover
- Canopy density
- Vegetation structure
- Invasive plant species
- Human influence
- Channel form and general site assessment

Issues

- Requires getting out of the boat and into the jungle
- Safety issues
- Measuring levees, batture lands...?
- May be able to characterize human disturbance of the riparian zone from the boat.

Section 8 Fish

Objective is to get a standardized representative sample of the near-shore fish assemblage. It is very important to avoid sampling bias toward large fish, game fish, rare fish, etc. Not every species in the river at a site will be collected.

Daytime electrofishing

- Suggested crew configuration
 - 2 netters using 1/4" mesh dip nets
 - 1 driver
- 1 EMAP site = two 500 meter shoreline electrofishing zones (Primary & Secondary)
 - Fish using ~3000 Watts of pulsed DC
 - Sample each 500 meter zone from upstream to downstream for a minimum of 1800 seconds
 - Zone is shore to 30 m out or 6 m depth, whichever is closer





Sample Processing

- Identify all fish to species
 Use AFS Common Name
- Record DELT anomalies
- Record Length & Weight
- Save target species for tissue analysis
- Fish smaller than 12 cm are preserved for identification in the lab
- Voucher photos and specimens

Examples of DELT Anomalies



a. Example of deformities (DE) showing a normal spine (top) and curved spine (bottom).



b. Example of severe eroded fins (ER).



c. Example of body surface lesions (LE) (note reddened area in front of fins).



d. Example of raised tumors (TU) on the body surface.

Photo vouchers		
IS JA	01	10
	PHOTO FISH VOUCHER	
	ORS04466-001	
My Line	0712212004	
	Transect (1°) 2°	
M	Common Name	OF

Fish Habitat

- Near shore substratum characterized by tactile evaluation of bottom composition
- The "copper pole" technique
- Fish cover estimated by observation
- Based on ORSANCO methods

Section 9 Fish Tissue Contaminants

Objective: characterize whole-fish tissue contaminant load of target large and small fish species as indicator of exposure risk to piscivorous wildlife

Processing

- Analysis based on whole fish samples
- One large-fish sample from each site (5 fish < 2 kg ea)
- One small-fish sample from each site (50 400 g total)
- Fish retained from efishing catch based on a target species list
- Sampled shipped to EPA lab for analysis

Fish Species Priority List

Priority	Common name	Size range (mm)	3-cm size
	Primary ta	arget species	
1	emerald shiner	< 120	1 - 4
2	river shiner	< 120	1 - 4
3	spotfin shiner	< 120	1 - 4
4	bullhead minnow	< 120	1 - 4
5	silver chub	< 120	1 - 4
6	another minnow species	< 120	1 - 4
7	gizzard shad	< 150	1 - 5
	Secondary	target species	
1	sauger	120 - 180	5 - 6
2	sauger	180 - 240	7 - 8
3	sauger	>240	<u>></u> 9
4	largemouth bass	180 -240	7 - 8
5	largemouth bass	240 - 300	8 - 10
6	largemouth bass	> 300	<u>></u> 11
7	other black bass	> 180	<u>></u> 7
8	brown trout	> 120	<u>></u> 5
9	rainbow trout	> 120	<u>></u> 5
10	channel catfish	120 - 180	5 - 6
11	channel catfish	450 - 510	16 - 17
12	channel catfish	180 - 450	7 - 15
13	freshwater drum	>120	<u>></u> 5
14	shorthead redhorse	>120	<u>></u> 5
15	other redhorse species	>120	<u>></u> 5
16	bluegill	>120	<u>></u> 5
17	longear sunfish	>120	<u>></u> 5
18	other sunfish species	>120	<u>></u> 5
19	common carp	>180	<u>></u> 7
20	smallmouth buffalo	>120	<u>></u> 5
21	river carpsucker	>120	<u>></u> 5

Target species list for Upper Basin may need to be re-evaluated for LMR

Table 9-1.	Target analytes for composite fish tissue samples. Detection limit for
	mercury is 0.01 ppm. Detection limit for all other analytes is 0.001 ppm. Number
	in parentheses is the CAS number. Number followed by a # is the Ballschmitter-
	Zell number.

Mercury (7439-97-6) Aldrin (309-00-2) Chlordane-cis (5103-71-9) Chlordane-trans (5103-74-2) 2.4'-DDD (53-19-0) 4,4'-DDD (72-54-8) 2.4'-DDE (3424-82-6) 4.4'-DDE (72-55-9) 2,4'-DDT (789-02-6) 4.4'-DDT (50-29-3) Dieldrin (60-57-1) Endosulfan I (959-98-8) Endosulfan II (33213-65-9) Endrin (72-20-8) Heptachlor (76-44-8) Heptachlor Epoxide (1024-57-3) Hexachlorobenzene (118-74-1) Hexachlorocyclohaxane [Gamma-BHC/Lindane] (58-89-9) Mirex (2385-85-5) trans-Nonachlor (3765-80-5) cis-Nonachlor (5103-73-1) Oxychlordane (27304-13-8) PCB Congeners 2,4-Dichlorobiphenyl, #8 (34883-43-7) 2,2',5-Trichlorobiphenyl, #18 (37680-65-2) 2,4,4'-Trichlorobiphenyl, #28 (7012-37-5) 2,2',5,5'-Tetrachlorobiphenyl, #52 (35693-99-3) 2,2',3,5'-Tetrachlorobiphenyl, #44 (41464-39-5) 2.3',4,4'-Tetrachlorobiphenyl, #66 (32598-10-0) 2.2',4.5.5'-Pentachlorobiphenvl, #101 (37680-73-2) 3,3',4,4' Tetrachlorobiphenyl, #77 (32598-13-3) (coplaner) 2.3',4,4',5-Pentachlorobiphenvl, #118 (31508-00-6) 2,2',4,4',5,5'-Hexachlorobiphenyl, #153 (35065-27-1) 2.3.3'.4.4'-Pentachlorobiphenyl, #105 (32598-14-4) 2,2',3,4,4',5-Hexachlorobiphenyl, #138 (35065-28-2) 2.2'.3.4'.5.5'.6-Heptachlorobiphenyl, #187 (52663-68-0) 2,2',3,3',4,4'-Hexachlorobiphenyl, #128 (38380-07-3) 2,2',3,4,4',5,5'-Heptachlorobiphenyl, #180 (35065-29-3) 2,2',3,3',4,4',5-Heptachlorobiphenyl, #170 (35065-30-6)

Analyte list needs to be updated

Percent Moisture and Lipid content

Decachlorobiphenyl, #209 (2051-24-3) 3,3',4,4',5 Pentachlorobiphenyl, #126 (coplaner)

2,2',3,3',4,4',5,6-Octachlorobiphenyl, #195 (52663-78-2) 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl, #206 (40186-72-9)

Polybrominated Diphenyl Ethers (PBDE) congeners 47, 99, 100, 153 and 154

Section 10 Benthic macroinvertebrates

- Kick sampling (littoral)
- Snag sampling (channel)

Objective is to characterize nearshore benthos at site scale (kick) and to evaluate usefulness of an alternative water-column method (snag)



Kick samples collected at all 11 littoral stations

Kick Sampling

- Sample is a composite of up to 22 0.26-m kicks
- Two 30-s kicks at each of 11 stations
- Standard kick net with 500-µm mesh
- Sample any littoral habitat (no targeted habitats) that can be safely sampled

Kick Sampling, cont.

- Kick from low water mark to 0.6 m deep
- Sweep sample in slackwater areas
- Composite all 22 kicks
- Samples shipped to contract lab for sorting and identification



Is kick sampling in LMR a unsafe or sub-optimal approach?

Snag sampling

 Semi-quantitative water column adjunct to benthic sampling

Specialized snag net



Typical "planter" snag configuration






Quick survey of LWD debris along littoral transect



Section 11 Periphyton and Sediment

Objective is to collect a representative periphyton sample for taxonomic analysis and a representative fine sediment sample for toxicity testing (*Hyalella*)

Periphyton

- Composite scrape, scoop, or brush samples from all littoral stations collected by wading
- Can mix substrates at site
- Shipped to cooperator for taxonomic analysis



Sediment

- Composite of fine sediment samples from all stations at a site collected by wading
- Target sample volume = 5 L
- Shipped to EPA lab for toxicity testing



Will we need a new manual for LMR?



Office of Research and Environmental Protection Development Washington, DC 20460

United States

Agency

Great River Ecosystems Field Operations Manual EMAP-GRE II - The Lower Mississippi River



Environmental Monitoring and Assessment program

- New reaches
- New design
- New data forms?
- New sample labels?
- New Indictors ?
- New gears ?
- New methods?
- New logistics?
- New labs?



Discussion

- What won't work at most sites?
 - Unsafe
 - Unfeasible
 - Suboptimal
- What are the alternatives?
- What indicators should be added?
 - Analytes
 - Indicator types
- Do we have the optimal Index period?
- Is there regional expertise we don't know about?

