Mercury TMDL Stakeholders' Meeting

January 4th, 2010

Aquatic Sampling Program

PRELIMINARY RESULTS

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Fish and Wildlife Research Institute

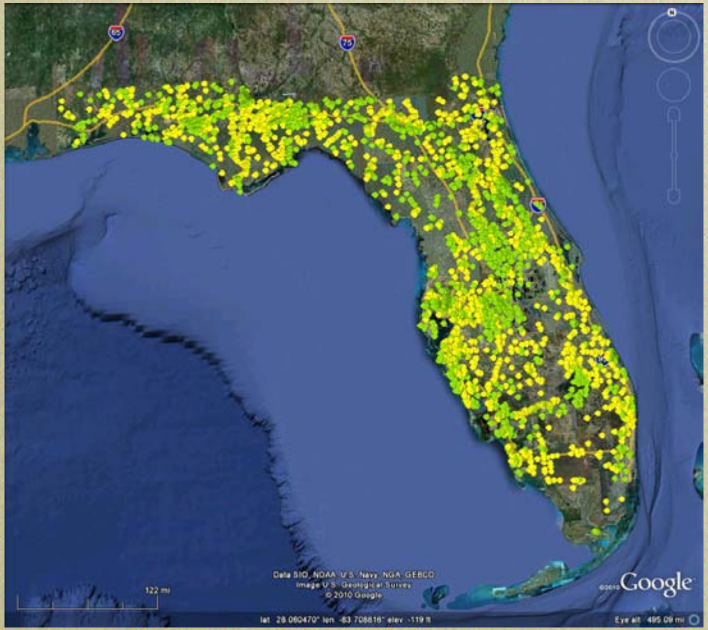
Major Features of Aquatic Field Program

1. TMDL target endpoint will be based on Hg concentrations in largemouth bass (LMB).
2. Sample 128 lakes (LK) and 128 streams (STRM) to develop the distribution curve of Hg concentrations in both types of resources for the entire state of Florida.
3. Distribution serves as the basis for defining appropriate target levels of Hg loading and, when coupled with the atmospheric modeling and source attribution, will determine requisite reductions in emissions of state sources.

PRELIMINARY RESULTS

Sampling Overview

1. Total N sampled = 256 (128 LKS and 128 STRMS)
2. Select sites based on a continuum of key WQ variables.
3. WQ sampling for major ions, nutrients, and dissolved and total Hg and MeHg.
4. Collect and analyze 12 legal size LMB from each water body for THg
5. >3,300 sites to choose from…



PRELIMINARY RESULTS

Procedure for Selecting Study LKS and STRMS*

PRELIMINARY RESULTS

1. Data from FDEP Status and Monitoring Network (SMN)-Regional and statewide scaling to full pop.
2. Eliminate non-freshwater systems (specific conductance > 5,000 μmho/cm or Cl > 1,500 mg/L)
3. Log-transform variables of interest
4. Establish 5 equidistant (ln-values) sampling intervals between the 2.5 and 97.5% cumulative distribution limits. This improves the sampling characteristics at both ends of the distribution.
5. 5 x 5 x 5 sampling matrix yields 125 possible, unique parameter combinations = Cells
6. Lakes and streams then assigned to appropriate cells, and candidate systems for sampling then selected at random.

*Selection procedures previously described by Pollman, "TMDL Work Plan Aquatic Modeling, Presentation to Stakeholders November 5, 2008".

Selection Variables LKS

Variable	Lakes	Streams - Rivers
Acid-base status	pH	pH
Trophic state	Chlorophyll a	NO_3^-
Methylation	Color	Color

Level/Factor	pH	Ln Chlorophyll a	Ln Color
1	≤ 5.130	≤ 0.821	≤ 2.486
2	> 5.130– 6.123	> 0.821 – 1.804	> 2.486 – 3.362
3	> 6.123 -7.115	> 1.804 – 2.788	> 3.362 – 4.239
4	> 7.115 – 8.108	> 2.788 – 3.771	> 4.239 – 5.115
5	> 8.108	> 3.771	> 5.115

PRELIMINARY RESULTS

Full Set SMN Lakes (n = 1,830) 102 cells

		pH1	pH2	pH3	pH4	pH5	# LKS	# Cells
Chla1	Color1	60	46	26	61	28	221	5
	Color2	23	21	36	43	11	134	5
	Color3	25	42	60	50	25	202	5
	Color4	24	24	36	29		113	4
	Color5	17	39	52	14		122	4
Chla2	Color1	4	7	4	21	5	41	5
	Color2	2	8	18	23	12	63	5
	Color3	3	28	34	53	8	126	5
	Color4	16	10	23	37	1	87	5
	Color5	6	5	6	45		62	4
Chla3	Color1	1		1		3	5	3
	Color2		4	10	16	1	31	4
	Color3	1	16	29	34	12	92	5
	Color4	4	13	22	10	2	51	5
	Color5	8	3	6	1		18	4
Chla4	Color1		2			1	3	2
	Color2		1	1	4	9	15	4
	Color3	1	4	21	66	22	114	5
	Color4	8	10	19	32	62	131	5
	Color5	4	5	8	7		24	4
Chla5	Color1							0
	Color2							0
	Color3		4	6	16	29	55	4
	Color4	1	9	19	16	52	97	5
	Color5	8	5	7	2	1	23	5
	# LKS	216	306	444	580	284	1830	
	# Cells	19	22	22	21	18		102

PRELIMINARY RESULTS

Most empty and low count cells were for high concentrations of chlorophyll *a* (low and less variable LMB THg), or for mutually exclusive combinations of pH and Color.

Selected Lakes (n = 133) 89 cells

		pH1	pH2	pH3	pH4	pH5	# LKS	# Cells
Chla1	Color1	2	3	1	2	1	9	5
	Color2	2	3	1	2	2	10	5
	Color3	1	2	3	2	1	9	5
	Color4	2	1	1	3		7	4
	Color5	1	3	2	2		8	4
Chla2	Color1		2	1	1	1	5	4
	Color2		1	1	2	1	5	4
	Color3		2	1	2	1	6	4
	Color4	3	1	1	2		7	4
	Color5	1	1	1	2		5	4
Chla3	Color1					1	1	1
	Color2		1		1	1	3	3
	Color3		2	2	2	2	8	4
	Color4		1	1	1	1	4	4
	Color5			1	1		2	2
Chla4	Color1		1			1	2	2
	Color2		1	1	1	1	4	4
	Color3		1	1	2	2	6	4
	Color4	2	1	2	2	2	9	5
	Color5	1		1	1		3	3
Chla5	Color1						0	0
	Color2						0	0
	Color3		1	2	2	1	6	4
	Color4	1	1	2	2	2	8	5
	Color5	1	1	2	1	1	6	5
	# LKS	17	30	28	36	22	133	
	# Cells	11	20	20	21	17		89

PRELIMINARY RESULTS

Distribution of lakes based on SMN data. Not all cells sampled : Limited population to select from coupled with lack of fish, limits on access, or inappropriate sample site.

Selected Lakes: Actual Results (n = 133) 62 cells

		pH1	pH2	pH3	pH4	pH5	# LKS	# Cells
Chla1	Color1	1		1		**3**	5	3
	Color2				2	1	3	2
	Color3	**1**	1	1		2	5	4
	Color4	1		1			2	2
	Color5	**2**	**1**				3	2
Chla2	Color1			2			2	1
	Color2	2	1	4	2	3	12	5
	Color3	1	3	6		1	11	4
	Color4	1	1	3	1		6	4
	Color5		2	**4**	**2**		8	3
Chla3	Color1						0	0
	Color2		1	3	1	**6**	11	4
	Color3		**4**	7	6	2	19	4
	Color4	2	2	3	2	1	10	5
	Color5	2		2	1		5	3
Chla4	Color1						0	0
	Color2				1	1	2	2
	Color3			4	1	5	10	3
	Color4		2	1	1	2	6	4
	Color5		1		1		2	2
Chla5	Color1						0	0
	Color2						0	0
	Color3					2	2	1
	Color4		2	3		**3**	8	3
	Color5					1	1	1
	# LKS	13	21	45	21	33	133	
	# Cells	9	12	15	12	14		62

PRELIMINARY RESULTS

Distribution based on results of study WQ parameters. Bold red numbers indicate cell where original SMN characteristics matched final results (n = 9). Range of lakes within sampled cells (1-7).

Selection Variables STRMS

Variable	Lakes	Streams - Rivers
Acid-base status	pH	pH
Trophic state	Chlorophyll a	NO_3^-
Methylation	Color	Color

Level/Factor	pH	Ln NO_3^-	Ln Color
1	≤ 4.2089	≤ -4.162	≤ 2.66908
2	> 4.2089 -5.2794	> -4.162 to -2.803	> 2.669 - 3.729
3	> 5.2794 -6.2779	> -2.803 to -1.444	> 3.729 - 4.788
4	> 6.2779 - 7.2764	> -1.444 to -0.085	> 4.788 - 5.848
5	> 7.2796	> -0.085	> 5.848

PRELIMINARY RESULTS

Full Set SMN Streams (n = 1,475) 88 cells

		Color1	Color2	Color3	Color4	Color5	# STRMS	# Cells
pH1	NOX1	1	1	6	15	15	38	5
	NOX2		1	2	3	19	25	4
	NOX3		2	1			3	2
	NOX4						0	0
	NOX5						0	0
pH2	NOX1	3	9	7	22	22	63	5
	NOX2	2	2	1	6	24	35	5
	NOX3	2		4			6	2
	NOX4		1				1	1
	NOX5	1					1	1
pH3	NOX1		6	24	37	25	92	4
	NOX2		5	7	23	4	39	4
	NOX3	3	2	29	7	5	46	5
	NOX4		4	4	2	1	11	4
	NOX5		3	1			4	2
pH4	NOX1	2	11	89	76	12	190	5
	NOX2		16	65	48	13	142	4
	NOX3	2	27	80	76	2	187	5
	NOX4	1	31	61	38	1	132	5
	NOX5	1	5	15	5		26	4
pH5	NOX1	1	11	65	14	6	97	5
	NOX2		6	60	31	5	102	4
	NOX3	17	26	51	22		116	4
	NOX4	7	20	56	7		90	4
	NOX5	9	17	2	1		29	4
# STRMS		52	206	630	433	154	1475	
# Cells		14	21	21	18	14		88

PRELIMINARY RESULTS

Most empty and low count cells are for combinations involving low pH and high NOX as well as mutually exclusive combinations of pH and color (DOC). Elevated NOX likely reflects high groundwater input, especially springs, where low pH levels are unlikely.

Selected Streams (n = 130) 67 cells

		Color1	Color2	Color3	Color4	Color5	# STRM	# Cells
pH1	NOX1		1	1	2	3	7	4
	NOX2			1		1	2	2
	NOX3		1	1			2	2
	NOX4						0	0
	NOX5						0	0
pH2	NOX1		1	1	4	1	7	4
	NOX2	1				3	4	2
	NOX3	1		1			2	2
	NOX4						0	0
	NOX5						0	0
pH3	NOX1		2	2		2	6	3
	NOX2		2	1	4	1	8	4
	NOX3			2	2	1	5	3
	NOX4		1		1	1	3	3
	NOX5			1			1	1
pH4	NOX1	1	2	3	4	2	12	5
	NOX2		3	2	2	2	9	4
	NOX3		4	3	3		10	3
	NOX4		2	2	3	1	8	4
	NOX5			3	1		4	2
pH5	NOX1	1	2	2	2		7	4
	NOX2		2	4	2	2	10	4
	NOX3	2	2	2	2		8	4
	NOX4	2		2	2		6	3
	NOX5	2	2	1	1		6	4
	# STRM	**10**	**27**	**35**	**35**	**20**	**127***	
	# Cells	7	14	19	15	12		67

PRELIMINARY RESULTS

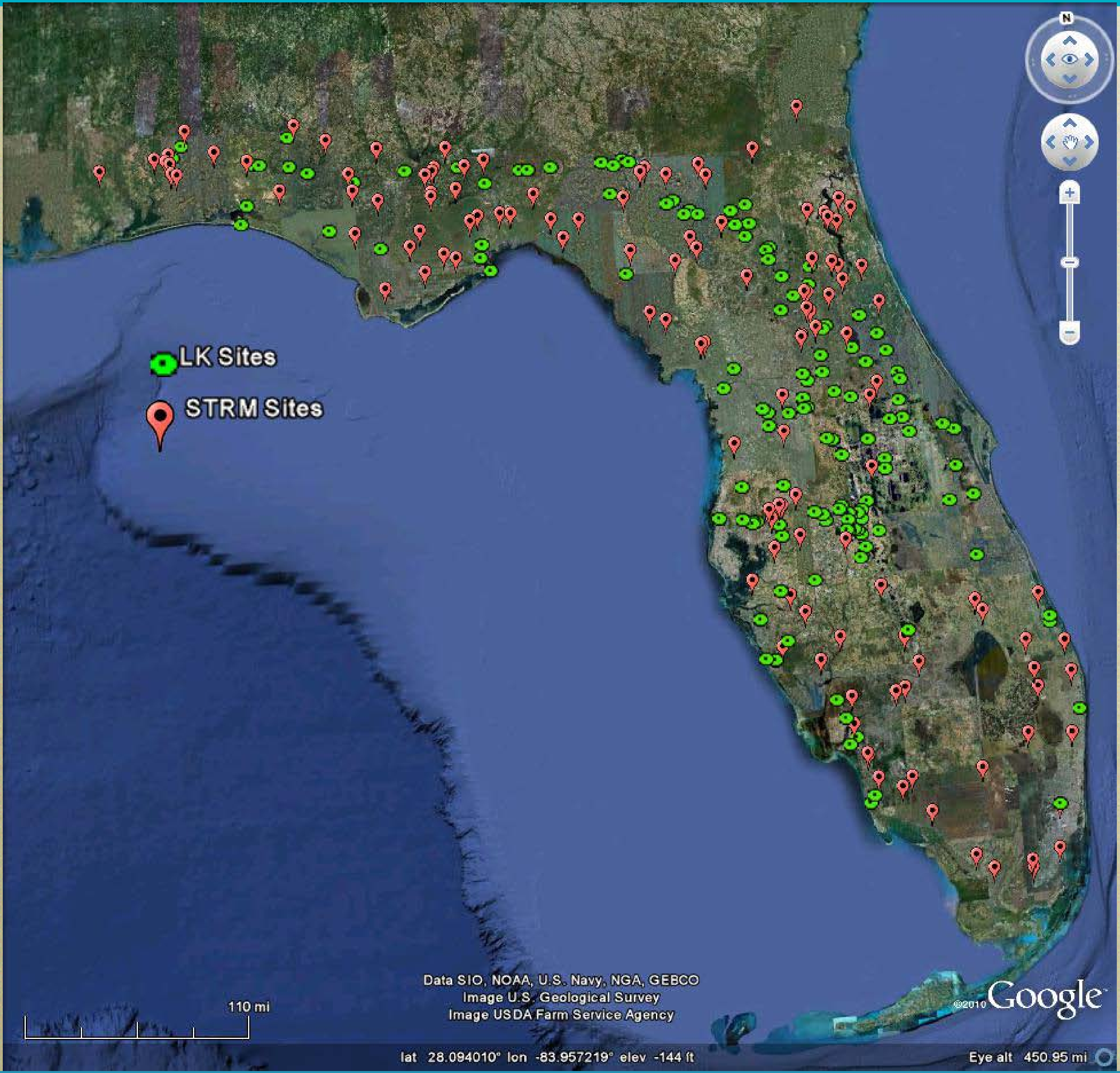
Distribution of STRMs based on SMN data. Not all cells sampled : Limited population to select from coupled with lack of fish, limits on access, or inappropriate sample site. ***3 sites not from SMN Database.**

Selected Streams: Actual Results (n = 130) 53 cells

		Color1	Color2	Color3	Color4	Color5	# STRM	# Cells
pH1	NOX1				1	**3**	4	2
	NOX2					1	1	1
	NOX3					1	1	1
	NOX4						0	0
	NOX5						0	0
pH2	NOX1			1	**2**	**3**	6	3
	NOX2			2			2	1
	NOX3			4			4	1
	NOX4				1		1	1
	NOX5						0	0
pH3	NOX1				2	2	4	2
	NOX2			2	**1**	**3**	6	3
	NOX3		4	1		1	6	3
	NOX4		1	1			2	2
	NOX5		1				1	1
pH4	NOX1		1	1			2	2
	NOX2		**1**	1	3	1	6	4
	NOX3		1	6	2	1	10	4
	NOX4		**1**	**4**	3	1	9	4
	NOX5		3	**1**			4	2
pH5	NOX1		**6**	6			12	2
	NOX2		3	7	**2**	**1**	13	4
	NOX3		**4**	4	5		13	3
	NOX4	**3**	6	3	6	1	19	5
	NOX5	**3**	**1**				4	2
	# STRMS	6	33	44	28	19	130	
	# Cells	2	13	15	11	12		53

PRELIMINARY RESULTS

Distribution based on results of study WQ parameters. Bold red numbers indicate cell where original SMN characteristics matched final results (n = 18). Range of STRMs within sampled cells (1-7).

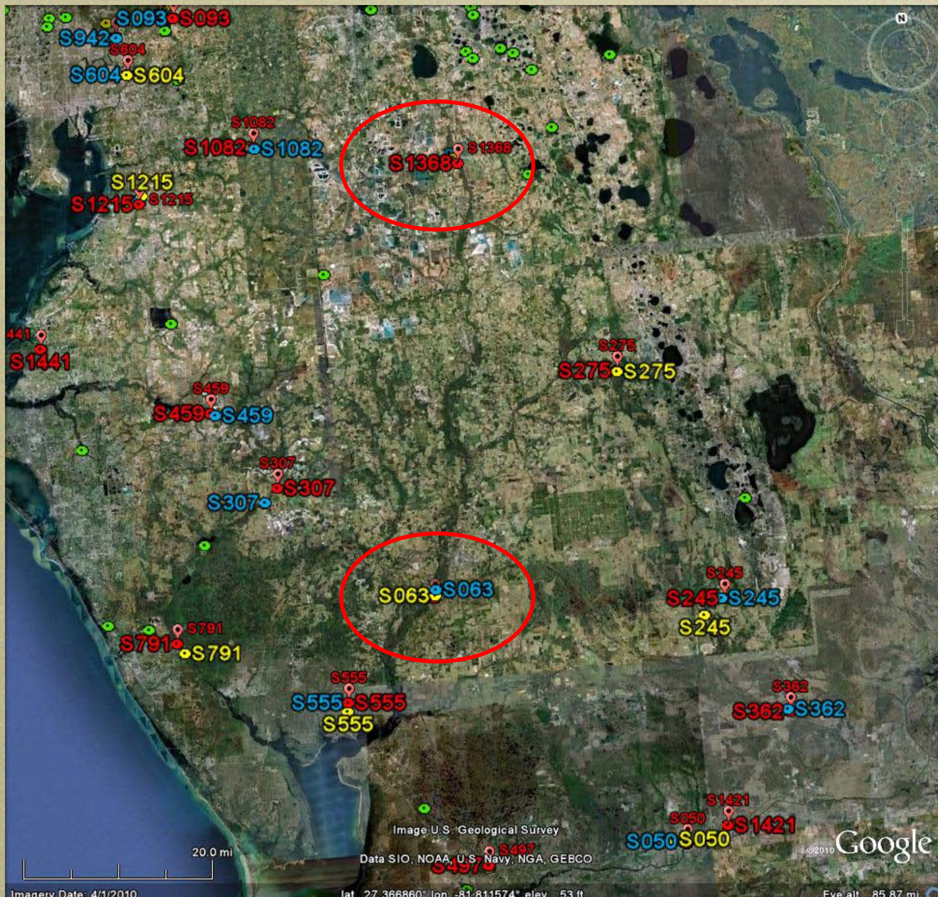


PRELIMINARY RESULTS

PRELIMINARY RESULTS

Peace River (214 km)

- Multiple Samples (3 Categories represented)
- N = 2 Selected: S063 and S1368



S1368 Up Peace		
pH-5	NOX-4	Color-3
pH-5	NOX-4	Color-4

S063 Low Peace		
pH-4	NOX-5	Color-3
pH-4	NOX-4	Color-4

PRELIMINARY RESULTS

Water Quality Sampling Overview

1. Summary of Collections
   - 9/25/08 to 9/15/2010
   - 133 LK and 130 STRM sites were sampled (n = 263).
   - 44 QA samples (field blanks and duplicates) were collected
2. Collection Protocols
   - Mid-Waterbody @ max depth
   - 1X during Study @ 1 meter or 25-50% of max depth
   - Continuous flow peristaltic pump w/ in-line filter
   - In-situ field measures at sample depth/profiles from LKS
   - "Clean/Dirty Hands" methods for ultra-trace mercury collections
3. Samples shipped to FLDEP Central Laboratory for all analysis
   - Overnight for next AM delivery
   - Preservation and shipping according to DEP SOPs and analyte specific holding times.

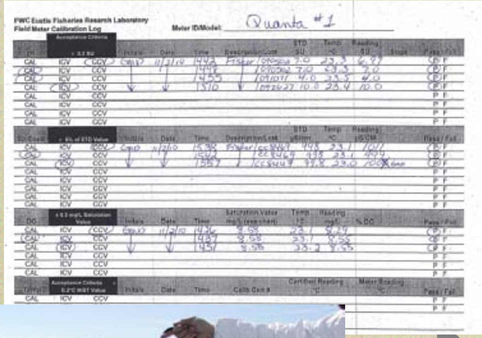
PRELIMINARY RESULTS

Water Quality Sampling Equipment

PRELIMINARY RESULTS

Water Quality Sampling QA

1. Adherence to SOPs (Standard Operating Procedures for Field Activities, DEP SOP 001/01, revision March 31, 2008 effective December 3, 2008).
   - FS 8200 “Clean Sampling For Ultra-trace Metals in Surface Waters”
   - Field: FT1000 (general) and specific field measurement SOP
     - Performed Initial, verification and continuing calibrations
2. Trained Field Staff
3. Field Duplicate Water Quality Samples
   - 1X per sample set~15-20 samples
4. Field Equipment & Lab Blanks
   - 1x per sample set~15-20 samples
5. Internal Laboratory QA
   - FLDEP Laboratory (over 15,000 records)
6. FDEP Field Audit
   - Conducted 4/1/2009
7. Chain of Custody Protocols



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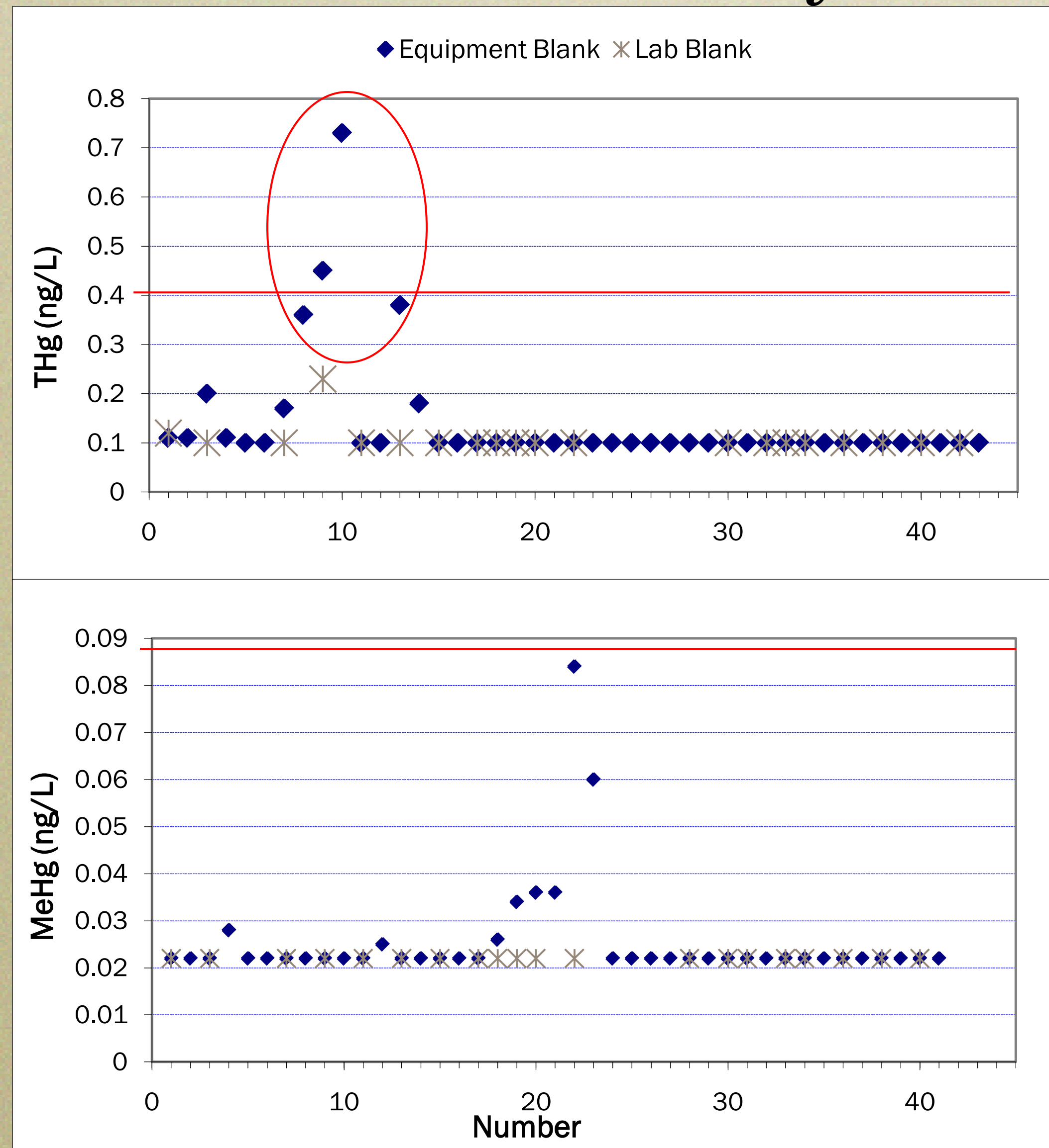
RESULTS

Equipment Blank Results Mercury

		MDL*		PQL*	
Species	Units	Target	>MDL	Target	>PQL
THg (DIS)	ng/L	0.1	5	0.4	1
THg (TOT)	ng/L	0.1	5	0.4	1
MeHg(DIS)	ng/L	0.022	4	0.088	
MeHg (TOT)	ng/L	0.022	6	0.088	



Program Response-Hg EQ BLK

1. THg EQ BIKS
   - THg results were found above the MDL but below the PQL (*n* = 8) and higher than the PQL (*n* = 2).
   - Results impact 26 sites where aqueous THg concentrations < 4X the blank
   - Re-sampled sites for both THg and MeHg
2. MeHg EQ BLKS
   - MeHg results found above MDL but below the PQL (n=10) and none higher than PQL (n=0).
   - No aqueous MeHg concentrations <2X Blank
   - No re-samples; 4 completed with THg re-sample
3. Corrective Actions-Mercury
   - THg: Evaluation of sample lines, MilliQ water vessels, sample bottles inconclusive.
   - MeHg: Evaluation indicated “memory” in vessels utilized to transport MilliQ water.
   - All sample line fittings and tubing replaced and numbered for tracking
   - More rigorous cleaning procedures
   - Equipment refitted or retired after 1 yr (MilliQ Vessels used 1X)
   - EQ BLKS and LAB BLANKS analyzed from same stock at same time

PRELIMINARY RESULTS

Fish Sampling Overview

1. Summary of Collections
   - 9/25/08 to 10/27/2010
2. Sampling Protocol
   - 1X during Study
   - Whole-lake, lobe or area for large lakes, and stream segments
   - Size and species requirements
   - Within same QRT of FY as WQ
3. QA Protocols
   - Training
   - Chain of Custody/Adherence to SOPs
     - DEP-SOP-001/01 Field Procedures and FWC SOPs for fish collections.
   - Internal Laboratory QA
   - Fish Processing and equipment blanks
4. Samples shipped to FLDEP Central Laboratory for all analyses
   - Preservation and shipping according to DEP SOPs and holding times.
   - EPA Method 245.6: Automated Cold Vapor Atomic Absorption following acid digestion; results as mg/kg (ppm) on a wet weight basis

PRELIMINARY RESULTS

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Fish Size and Species Targets

PRELIMINARY RESULTS

- Targeting 12 “legal size” largemouth bass (LMB) per sample
- Size range 2” less than legal up to 20”
  - 254 – 508 mm

Surrogate for LMB Collections

- Spotted sunfish (SPSU) (*Lepomis punctatus*)
- Ubiquitous in rivers, particularly in low order streams in panhandle
- Typical size 2 - 5”
- THg levels well correlated with LMB

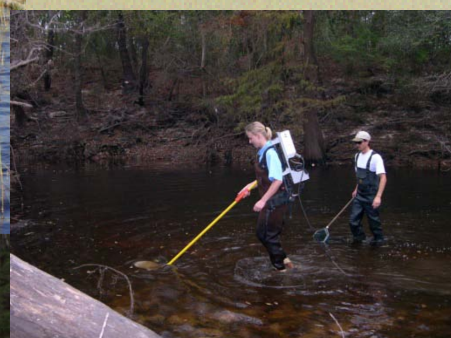
Analytical Procedures

- Total length (mm)
- Weight (g)
- Sex
- Age (yr using otoliths)
- THg (mg/kg in homogenized axial muscle tissue)

Fish Collections with boat mounted and backpack electro-fishing equipment

Site Type/Species	SITE N
LK Sites LMB	130
STRM Sites	129
➢LMB & SPSU	73
➢LMB Only	47
➢SPSU Only	9
➢22 Spotted bass (M. *punctulatus)*	6

PRELIMINARY RESULTS



Mean and Range of fish THg, TL, and Age

Species		N	THg (ppm) Mean	THg (ppm) Range	Total Length (mm) Mean	Total Length (mm) Range	Age (yr) Mean	Age (yr) Range
LMB	ALL	2,810	0.46	0.02 - 2.9	327 (13")	104 (4") - 580 (23")	3.2	0 - 13
	LK	1,650	0.40	0.02 – 1.7	337 (13”)	120 (5”) – 565 (22”)	3.2	0 – 12
	STRM	1,160	0.54	0.03 – 2.9	315 (12”)	104 (4”) – 580 (23”)	3.0	0 - 13
SPSU		925	0.26	0.01 - 0.99	125 (5")	56 (2") - 197 (8")		

LKS Sample size

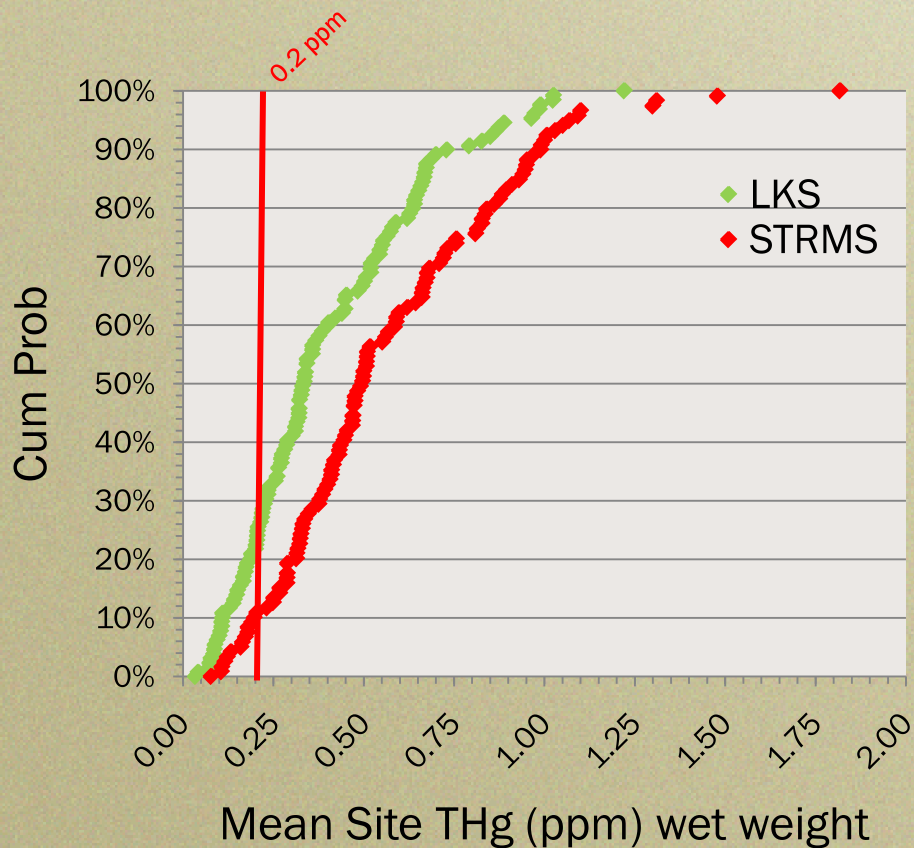
- LMB 4-29 per site; mean = 13

STRMS Sample size

- 120 sites with LMB 1-20 per site; mean = 10
- 82 sites with SPSU 1-18 per site; mean = 11

PRELIMINARY RESULTS

Cumulative Frequency Distribution of THg by Site Means



	THg Concentration (ppm)	
Prob.	LK	STRM
100	1.22	1.82
95	0.96	1.07
90	0.73	0.99
75	0.57	0.76
50	0.34	0.49
21.6	0.20	
20	0.18	0.31
10.8		0.20
10	0.11	0.19
1	0.05	0.11
N	166	88

PRELIMINARY RESULTS

- 78% of Mean LK LMB ≥ 0.2 ppm
- 89% of Mean STRM LMB ≥ 0.2 ppm

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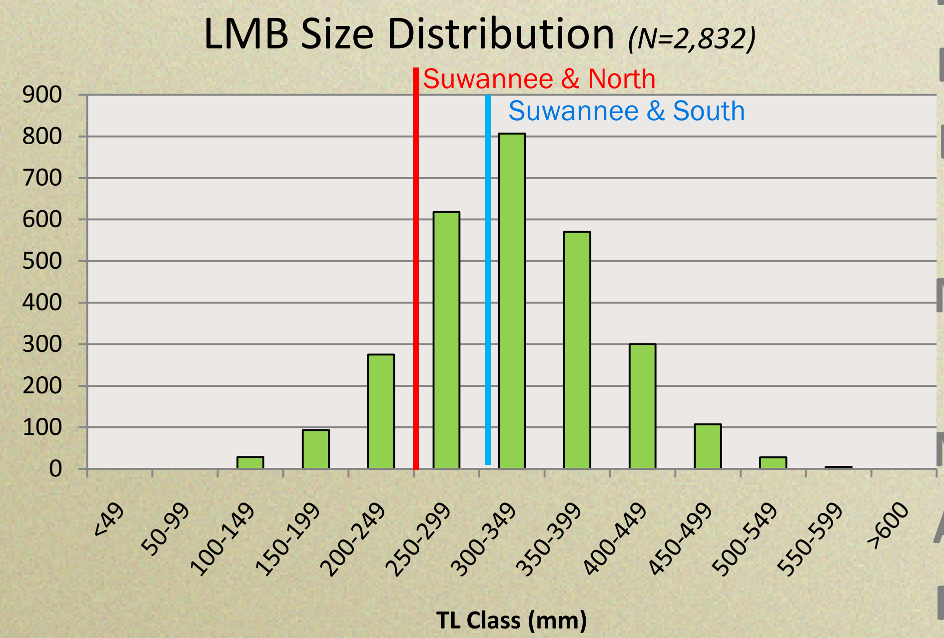
Size Distributions

1. Project goals not met
   - Suwannee River and North 10-20” (254 – 508 mm)
   - South of Suwannee 12-20” (305 – 508 mm)
2. App 14% under target size
3. Slow growth in low-productive systems
   - Soft-water lakes
   - low pH streams
4. Population available at time of sample - timing

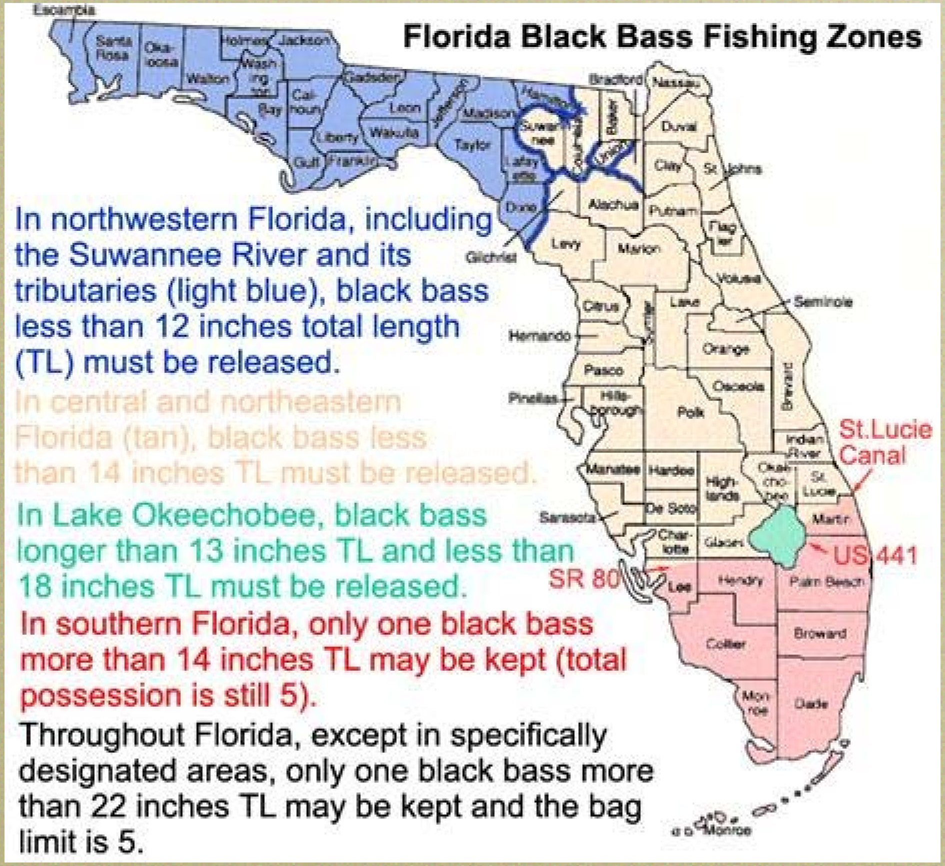


P R E L I M I N A R Y

R E S U L T S

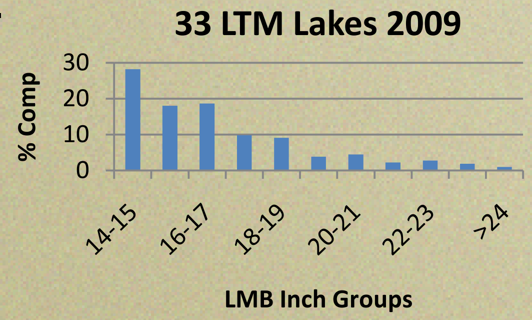
Selecting a Human-Health Endpoint

PRELIMINARY RESULTS



LMB

- Ubiquitous distribution
- High rage of MeHg bioaccumulation
- Harvest rates typically low: “catch and release”
- **Harvest**: Indicate highest harvest rates in the 14-16” size class from state waters
- **Composition**: Does not necessarily reflect harvest, but 14-17” size class most numerous.



Status of Results

1. Summary results for WQ and Fish provided to DEP
   - Pending Verification
   - Minus 8 SPSU
2. Full dataset to report
   - Field Data sheets
   - Equipment calibration
   - Chain of Custody and processing logs
   - Laboratory reports
   - QA reports and summarized results
   - Fish THg Standardization
   - SPSU/LMB predictive model
3. Google maps/arcGIS layers of locations

P R E L I M I N A R Y

R E S U L T S

PRELIMINARY RESULTS

Summary

1. Sampled LKS and STRMS represent a continuum of variables controlling trophic state, Hg methylation, and pH
   - 133 LKS from 62 combinations of CHLA, Color, and pH
   - 130 STRMS from 53 combinations of CHLA, NOX, and pH
2. Fish samples collected from 130 LK and 129 STRM sites
   - 3 LK and 1 STRM WQ but no fish
   - Sample size for fish; 4-29 per site
   - 9 STRM sites with SPSU only
3. 70% and 76% of LMB in LKS and STRMS, respectively, exceeded 0.2 ppm.
4. Strict adherence to DEP SOPs for Field Activities
5. WQ and Fish samples collected concurrently during a 2 yr period.

PRELIMINARY RESULTS

Re-Sample Response for Non-Hg Samples

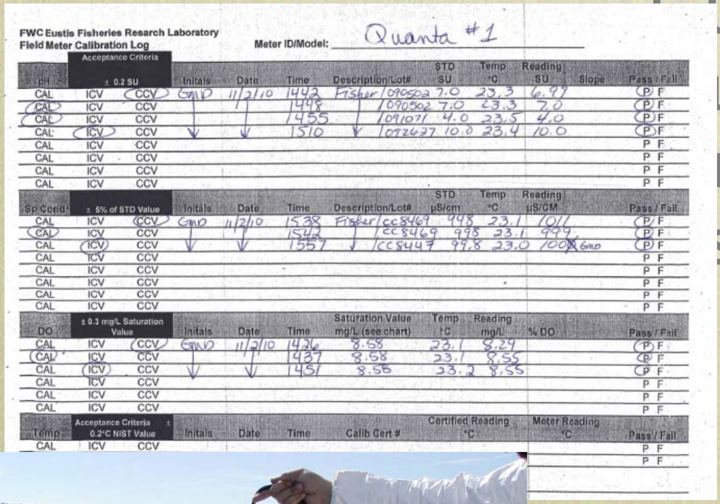
1. Re-Sample Events
   - ➢ Incorrect location (n=1)
   - ➢ Improper preservation (n=4)
   - ➢ Match fish collection date (n=3)

PRELIMINARY RESULTS

Field Analytical Methods

- DEP SOP FT1000 (general) and specific field measurement SOP
- Performed Initial, verification and continuing calibrations

Variables	FLDEP SOP	Units	Total Samples
Site Depth		m	292
Sample Depth		m	296
Water Temperature	FT 1400	°C	296
Specific Conductance	FT 1200	µmhos/cm	296
Dissolved Oxygen	FT 1500.	mg/L	296
pH	FT 1100.	units	296
REDOX Potential		mv	267
Secchi Depth	FT 1700	m	290


FWC Eustis Fisheries Resarch Laboratory
Field Meter Calibration Log

Meter ID/Model: Quanta #1

pH	Acceptance Criteria ± 0.2 SU		Initals	Date	Time	Description/Lot#	STD SU	Temp °C	Reading SU	Slope	Pass / Fail
CAL	ICV	CCV	GMD	11/2/10	1442	Fisher/090502	7.0	23.3	6.99		P F
CAL	ICV	CCV			1448	/090502	7.0	23.3	7.0		P F
CAL	ICV	CCV			1455	/091071	4.0	23.5	4.0		P F
CAL	ICV	CCV			1510	/092627	10.0	23.4	10.0		P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F

Sp Cond	± 5% of STD Value		Initals	Date	Time	Description/Lot#	STD µS/cm	Temp °C	Reading µS/CM	Pass / Fail
CAL	ICV	CCV	GMD	11/2/10	1538	Fisher/CC8469	998	23.1	1011	P F
CAL	ICV	CCV			1542	/CC8469	998	23.1	999	P F
CAL	ICV	CCV			1557	/CC8447	99.8	23.0	100 GMD	P F
CAL	ICV	CCV								P F
CAL	ICV	CCV								P F
CAL	ICV	CCV								P F
CAL	ICV	CCV								P F
CAL	ICV	CCV								P F

DO	± 0.3 mg/L Saturation Value		Initals	Date	Time	Saturation Value mg/L (see chart)	Temp °C	Reading mg/L	% DO	Pass / Fail
CAL	ICV	CCV	GMD	11/2/10	1426	8.58	23.1	8.29		P F
CAL	ICV	CCV			1437	8.58	23.1	8.55		P F
CAL	ICV	CCV			1451	8.58	23.2	8.55		P F
CAL	ICV	CCV								P F
CAL	ICV	CCV								P F
CAL	ICV	CCV								P F

Temp	Acceptance Criteria ± 0.2°C NIST Value		Initals	Date	Time	Calib Cert #	Certified Reading °C	Meter Reading °C	Pass / Fail
CAL	ICV	CCV							P F
									P F

Status of WQ Results

1. Summary results for WQ (and Fish) provided to DEP
   - Pending final verification
2. Full data report will include
   - Field Data sheets
   - Equipment calibration and cleaning logs
   - Chain of Custody and processing logs
   - Laboratory reports
   - QA reports and summarized results
3. Google maps/arcGIS layers of locations

P R E L I M I N A R Y

R E S U L T S

Field Equipment Blank Summary

			MDL*		PQL*	
Parameters	Units	N	Target	>MDL	Target	>PQL
Alkalinity	mg/L	22	0.65 - 2.0		2.5 - 8	
Ammonia-N	mg/L	22	0.01		0.0	
Calcium	mg/L	22	0.075	1	0.3	
Chloride	mg/L	22	0.2	3	0.5	3
Chlorophyll-a	µg/L	12	0.55	1	1.7	
Color (apparent)	PCU	22	5		5	
DOC	mg/L	22	1		5	
Magnesium	mg/L	22	0.04	1	0.16	
Mercury (DIS)	**ng/L**	**23**	**0.1**	**5**	**0.4**	**1**
Mercury (TOT)	**ng/L**	**22**	**0.1**	**5**	**0.4**	**1**
Mercury- methyl (DIS)	**ng/L**	**23**	**0.022**	**4**	**0.088**	
Mercury- methyl (TOT)	**ng/L**	**22**	**0.022**	**6**	**0.088**	
NOx-N	mg/L	22	0.004	2	0.01	
Potassium	mg/L	22	0.3		1.2	
Residues- Nonfilterable	mg/L	22	4		16	
Sodium	mg/L	22	0.5		2	
Specific Conductance	µmhos/cm	22	2	3	8	3
Sulfate	mg/L	22	0.2		0.5	
TKN-N	mg/L	22	0.08		0.2	
TP	mg/L	22	0.004		0.01	

* MDL (minimum detection limit) and PQL (Practical Quantitation Limit) taken from Table 5.1 QA Targets for Accuracy, Precision, andMDLs/PQLs in FLDEP Quality Manual, March 2009.

PRELIMINARY RESULTS

Field Dup Water Quality Samples

PRELIMINARY RESULTS

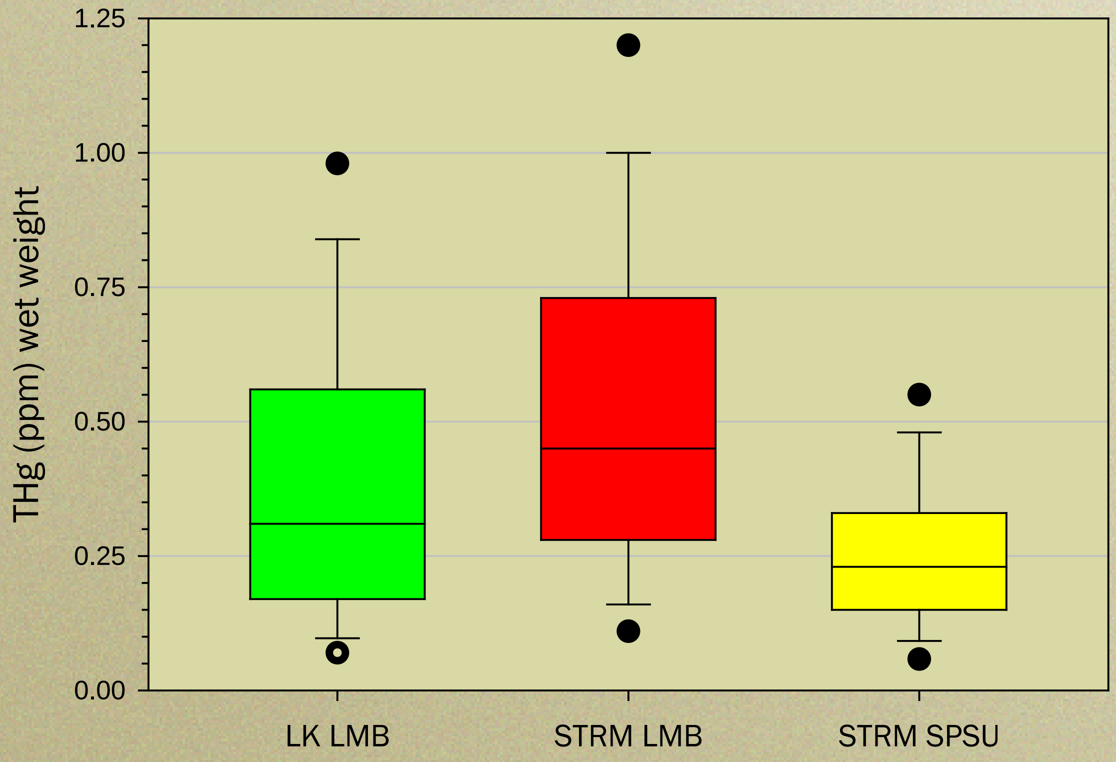
Variables	Units	Relative Percent Difference (%RPD)* Target	N	Min	Max	Mean	Exceed Target
Alkalinity	mg/L	<20	19	0	18.2	3.1	
Ammonia-N	mg/L	<20	19	0	18.9	5.7	
Calcium	mg/L	<20	20	0	9.3	2.3	
Chloride	mg/L	<20	20	0	1.5	0.2	
Chlorophyll-a	µg/L		19	0	51.0	10.3	
Color (apparent)	PCU	<20	19	0	0.0	0.0	
DOC	mg/L	<20	19	0	3.0	0.8	
Magnesium	mg/L	<20	20	0.0	11.6	2.3	
Mercury (DIS)	ng/L	<25	22	0	25.0	9.0	
Mercury (TOT)	ng/L	<25	22	0	20.4	5.7	
Mercury- methyl (DIS)	ng/L	<30	21	0	21.8	6.6	
Mercury- methyl (TOT)	ng/L	<30	21	0.0	28.6	6.2	
NOx-N	**mg/L**	**<20**	**19**	**0**	**28.6**	**4.9**	**2**
Potassium	**mg/L**	**<20**	**20**	**0**	**40.0**	**5.9**	**1**
Residues- Nonfilterable (TSS)	**mg/L**	**<10**	**19**	**0**	**58.8**	**10.7**	**9**
Sodium	mg/L	<20	20	0	5.9	1.6	
Specific Conductance	µmhos/cm	<20	19	0	2.3	0.4	
Sulfate	mg/L	<20	19	0	7.4	2.2	
TKN-N	**mg/L**	**<20**	**19**	**0**	**38.1**	**8.0**	**1**
TP	mg/L	<20	19	0	19.0	4.3	

* RPD: Relative Percent Difference taken from Table 5.1 QA Targets for Accuracy, Precision, andMDLs/PQLs in FLDEP Quality Manual, March 2009.

Median LMB and SPSU THg for LKS and Streams

Box: 25 and 75%,

Points: 5 and 95%

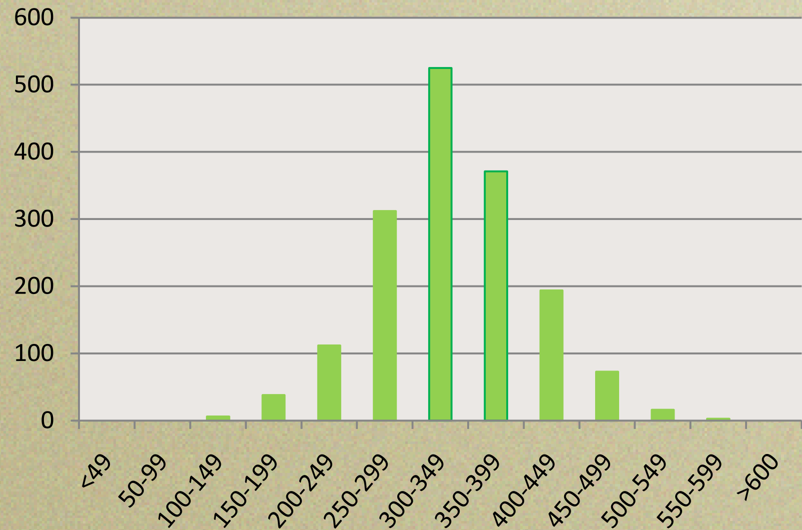


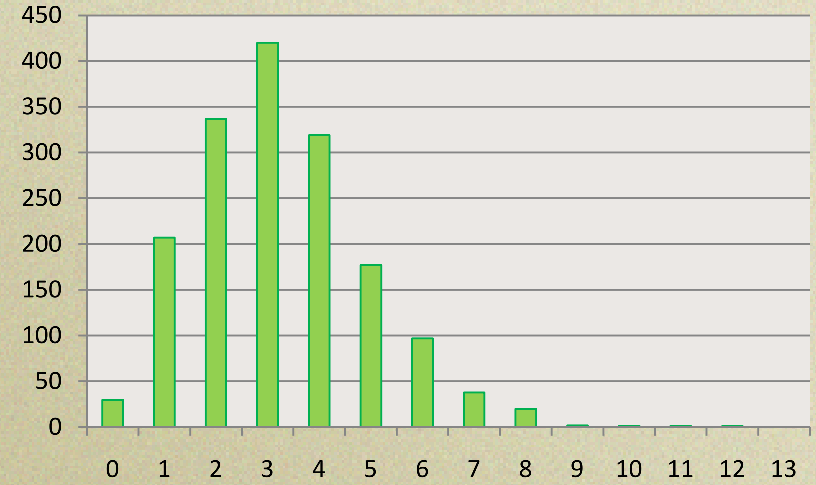
PRELIMINARY RESULTS

LMB Total Length

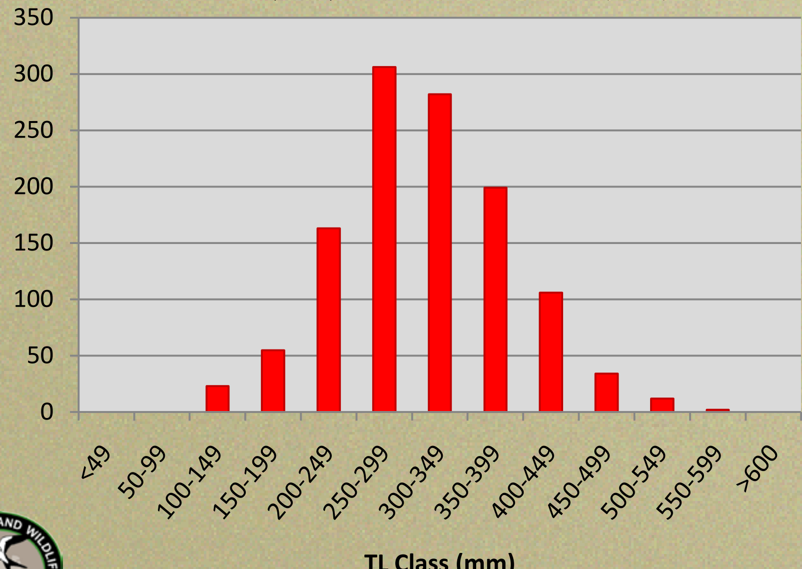
LMB Age

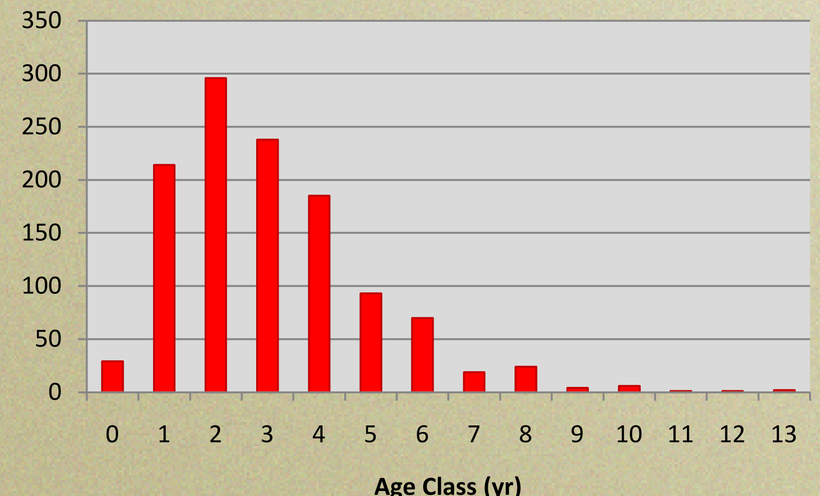
LK (N=1,650)





STRM (N=1,182)





PRELIMINARY RESULTS