

South River Science Team Poultry Study Update

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Human Exposure Evaluation

The key objectives:

- **better identify potential exposure,**
- **define potential risks and uncertainties,**
- **communicate information to the public.**

Human Exposure Evaluation

Exposure Team Members

DEQ: Don Kain, Calvin Jordan, Bill Hayden

DEQ: Jutta Schneider, Vince Maiden, Pat McMurray, Sonal Iyer

EPA: Betty Ann Quinn

VDH: Allen Gutshall, Jonathan Falk, Dwight Flammia, Karen Gruszynski

DGIF: Paul Bugas

DACS: David Brown, Reddy Bommineni

FWS: Anne Condon

DuPont: Mike Liberati, Ralph Stahl, **Tim Bingman**

AECOM: Dana McCue

Human Exposure Evaluation

Exposure scenarios evaluated

- √ Fish Consumption
- √ Recreational Use of River
- √ Potential Drinking Water exposures
- √ Contact with soils on the floodplain
- Potential dietary exposures
 - Domestic consumption, e.g., Garden crops, Beef, Poultry
 - √ Hunting consumption, e.g., waterfowl, small game

Communicating to public on these issues

Poultry Study

Evaluate potential exposure to mercury in poultry raised in the South River floodplain and from background locations within the Shenandoah Valley that have not been impacted by mercury.

- Sample eggs and poultry (specifically chicken) muscle to determine the potential for chickens reared on the South River floodplain to accumulate mercury.
- The information will be used to inform decisions about exposure through potential food consumption of eggs and chickens reared on the floodplain.

Sample Summary Original Flock

Approximate Date Event #	June (1 st) T=1 (baseline)	July (15 th) T=2	Aug (31 st) T=3	Oct (15 th) T=4	Dec (1 st) T=5
Mercury-Impacted Area (Area 1) T = 0; animals (Barred Rocks and Red Star) are 5 months; Individual eggs will be collected from pool of eggs distinguished by breed, if possible.	6 – 12 Individual Eggs (from pool of eggs) 2 Birds sacrificed Each bird: 2 Muscle (breast, leg) - Liver and Gizzard 2 Feathers 2 Blood	6 – 12 Individual Eggs (from pool of eggs) 3 Birds sacrificed Each bird: 2 Muscle (breast, leg) - Liver and Gizzard 2 Feathers 2 Blood	6 – 12 Individual Eggs (from pool of eggs) 3 Birds sacrificed Each bird: 2 Muscle (breast, leg) - Liver and Gizzard 2 Feathers 2 Blood	6 – 12 Individual Eggs (from pool of eggs) 3 Birds sacrificed Each bird: 2 Muscle (breast, leg) - Liver and Gizzard 2 Feathers 2 Blood	6 – 12 Individual Eggs (from pool of eggs) 3 Birds sacrificed Each bird: 2 Muscle (breast, leg) - Liver and Gizzard 2 Feathers 2 Blood
Control Area (Area 3) T = 0; animals (Barred Rocks and Red Star) are 5 months; Individual eggs will be collected from pool of eggs distinguished by breed, if possible.	6 – 12 Individual Eggs (from pool of eggs) 2 Birds sacrificed Each bird: 2 Muscle (breast, leg) - Liver and Gizzard 2 Feathers 2 Blood	6 – 12 Individual Eggs (from pool of eggs) 3 Birds sacrificed Each bird: 2 Muscle (breast, leg) - Liver and Gizzard 2 Feathers 2 Blood	6 – 12 Individual Eggs (from pool of eggs) 3 Birds sacrificed Each bird: 2 Muscle (breast, leg) - Liver and Gizzard 2 Feathers 2 Blood	6 – 12 Individual Eggs (from pool of eggs) 3 Birds sacrificed Each bird: 2 Muscle (breast, leg) - Liver and Gizzard 2 Feathers 2 Blood	6 – 12 Individual Eggs (from pool of eggs) 3 Birds sacrificed Each bird: 2 Muscle (breast, leg) - Liver and Gizzard 2 Feathers 2 Blood
Background - Polyface Farm, - Two local area markets	6 – 12 Individual Eggs at each location 3 Birds at each location; For each bird: 2 Muscle (breast, leg); Liver and Gizzard (if available) This is a single event				
Supplemental Feed	- Supplemental feed will be required. This will be obtained from local area suppliers consistent with methods in the area. - Feed will be analyzed at the start and end of the study as well as if the source of the feed is changed during the study.				

Sample Summary New Flock

Approximate Date Event #	July (last week) T=1 (baseline)	Aug (31 st) T=2	Oct (15 th) T=3	Dec (1 st) T=4
Mercury-Impacted Area (Area 1) T = 0; new laying animals (White Leghorns) added; Individual eggs will be collected from pool of eggs distinguished by breed. Leghorns lay white eggs.	6 – 12 Individual Eggs (from pool of eggs) 2 Birds sacrificed Each bird: • 2 Muscle (breast, leg) • Liver and Gizzard • 2 Feathers • 2 Blood	6 – 12 Individual Eggs (from pool of eggs) 3 Birds sacrificed Each bird: • 2 Muscle (breast, leg) • Liver and Gizzard • 2 Feathers • 2 Blood	6 – 12 Individual Eggs (from pool of eggs) 3 Birds sacrificed Each bird: • 2 Muscle (breast, leg) • Liver and Gizzard • 2 Feathers • 2 Blood	6 – 12 Individual Eggs (from pool of eggs) 3 Birds sacrificed Each bird: • 2 Muscle (breast, leg) • Liver and Gizzard • 2 Feathers • 2 Blood
Control Area (Area 3) T = 0; new laying animals (White Leghorns); Individual eggs will be collected from pool of eggs distinguished by breed. Leghorns lay white eggs.	6 – 12 Individual Eggs (from pool of eggs) 2 Birds sacrificed Each bird: • 2 Muscle (breast, leg) • Liver and Gizzard • 2 Feathers • 2 Blood	6 – 12 Individual Eggs (from pool of eggs) 3 Birds sacrificed Each bird: • 2 Muscle (breast, leg) • Liver and Gizzard • 2 Feathers • 2 Blood	• No sample event	6 – 12 Individual Eggs (from pool of eggs) 3 Birds sacrificed Each bird: • 2 Muscle (breast, leg) • Liver and Gizzard • 2 Feathers • 2 Blood

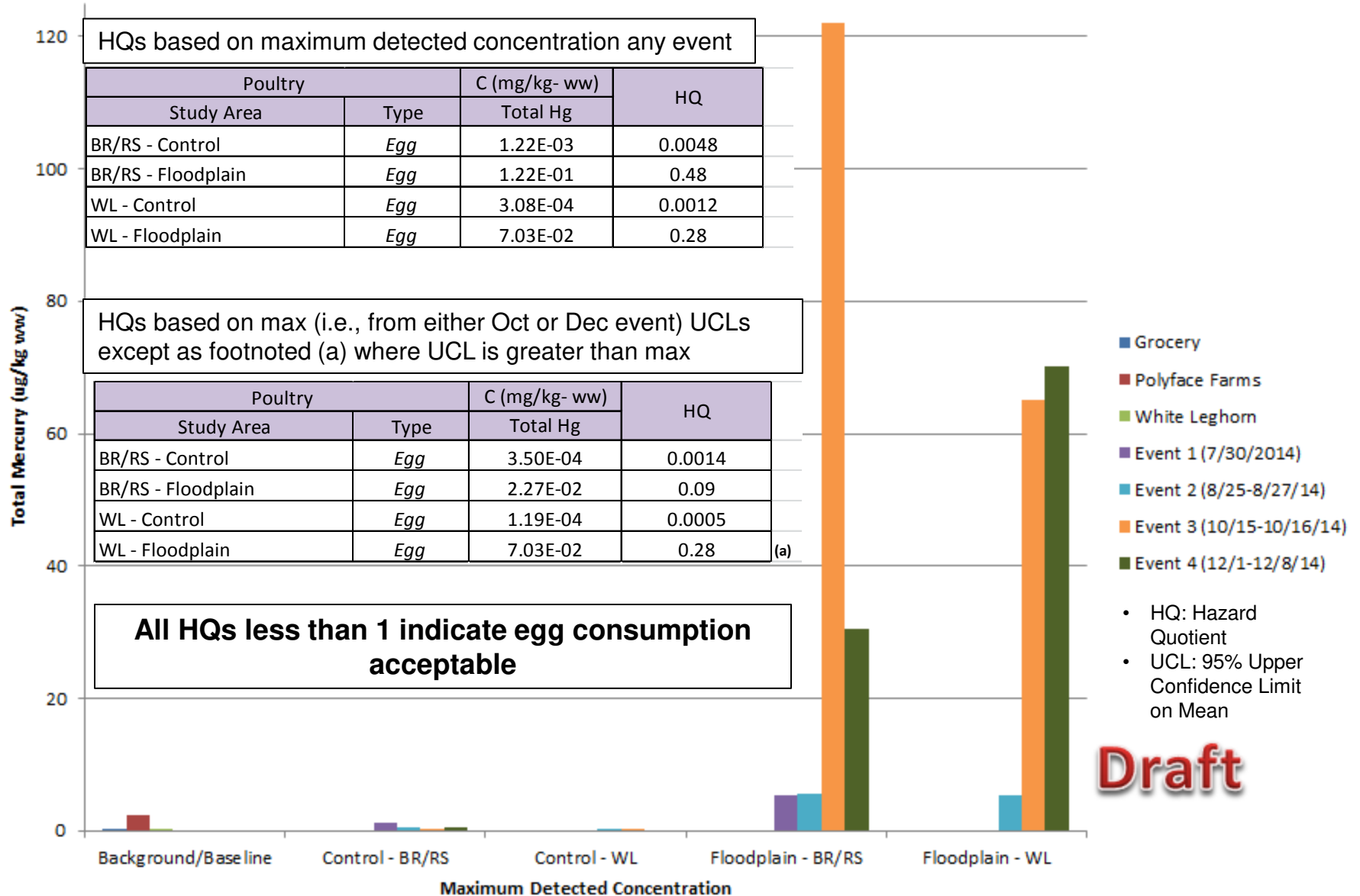


Poultry Study

Status

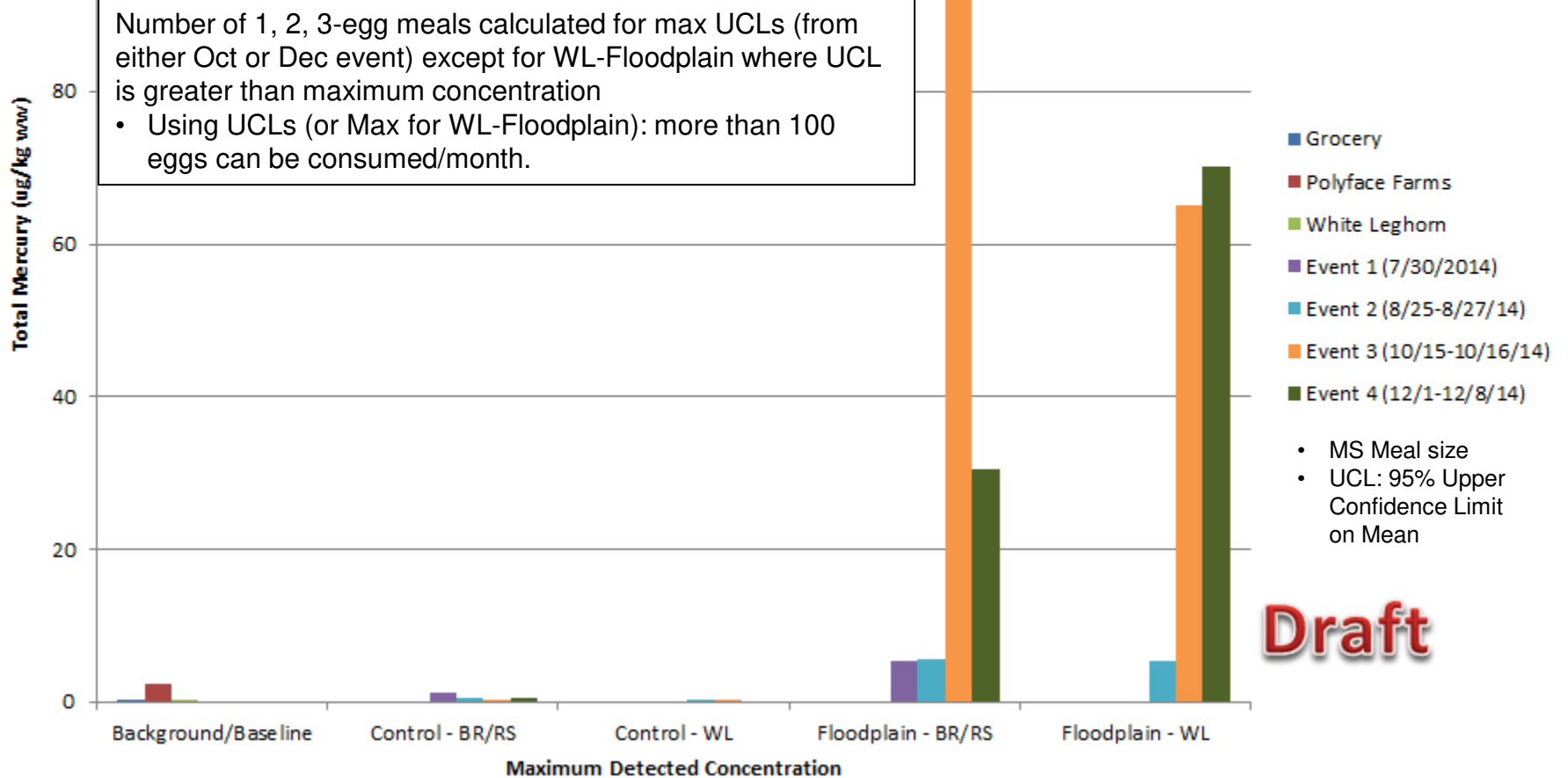
- Study completed in December
- Analysis of samples for all sample events now completed
- Results for all sample events mostly available
 - Exception: December results blood and feathers.
- In process of evaluating results

Hg in Egg Tissue



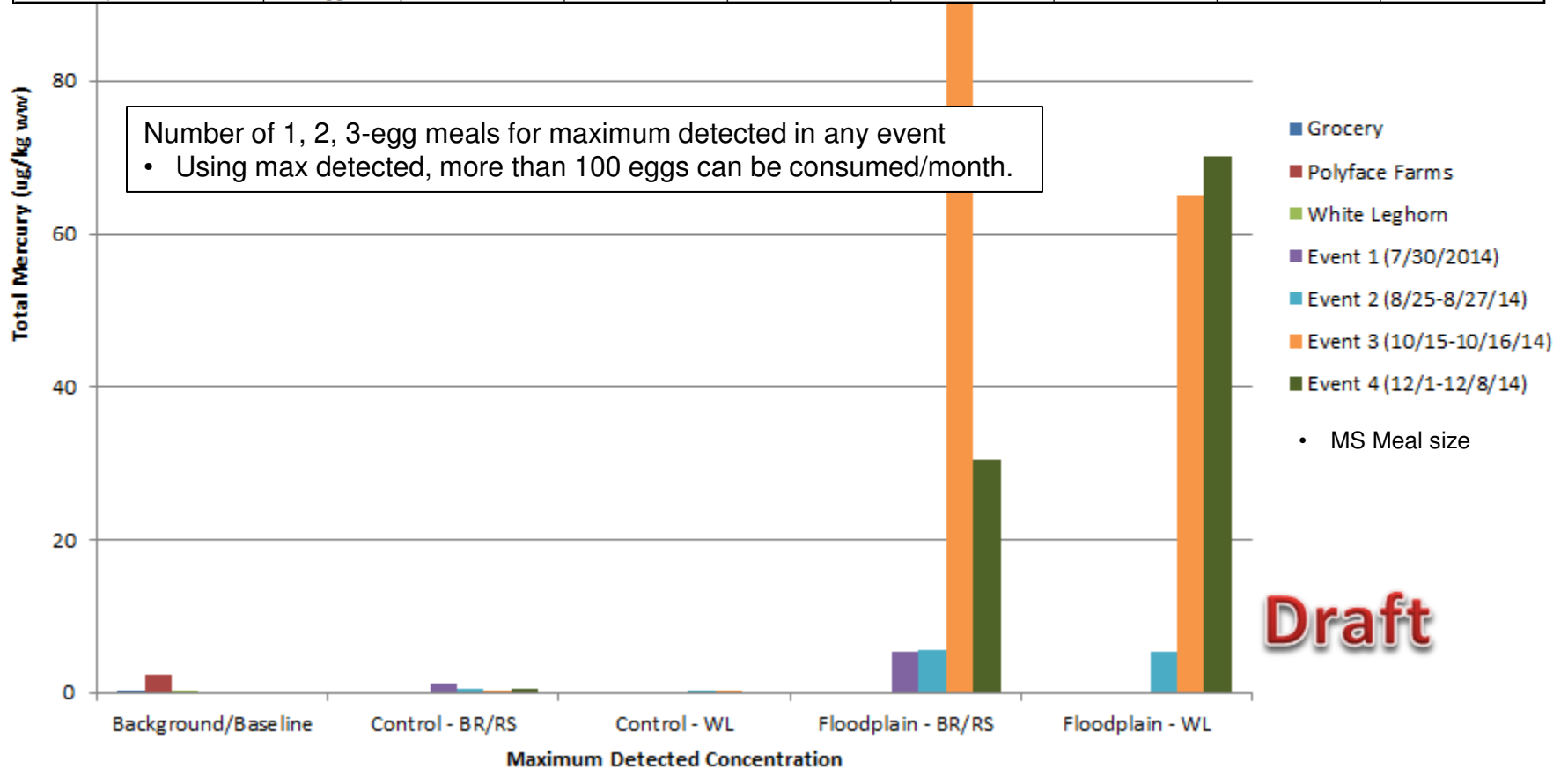
Hg in Egg Tissue

Species		C (mg/kg ww)	MS (kg)	NM (meals/month)	MS (kg)	NM (meals/month)	MS (kg)	NM (meals/month)
Poultry		Total Hg						
Study Area	Type							
Grocery - Background	Egg	2.73E-04	0.06	47239	0.11	23619	0.17	15746
Polyface Farm - Background	Egg	2.49E-03	0.06	5180	0.11	2590	0.17	1727
BR/RS - Control	Egg	3.50E-04	0.06	36814	0.11	18407	0.17	12271
BR/RS - Floodplain	Egg	5.96E-02	0.06	216	0.11	108	0.17	72
WL - Control	Egg	1.19E-04	0.06	108276	0.11	54138	0.17	36092
WL - Floodplain	Egg	7.03E-02	0.06	183	0.11	92	0.17	61

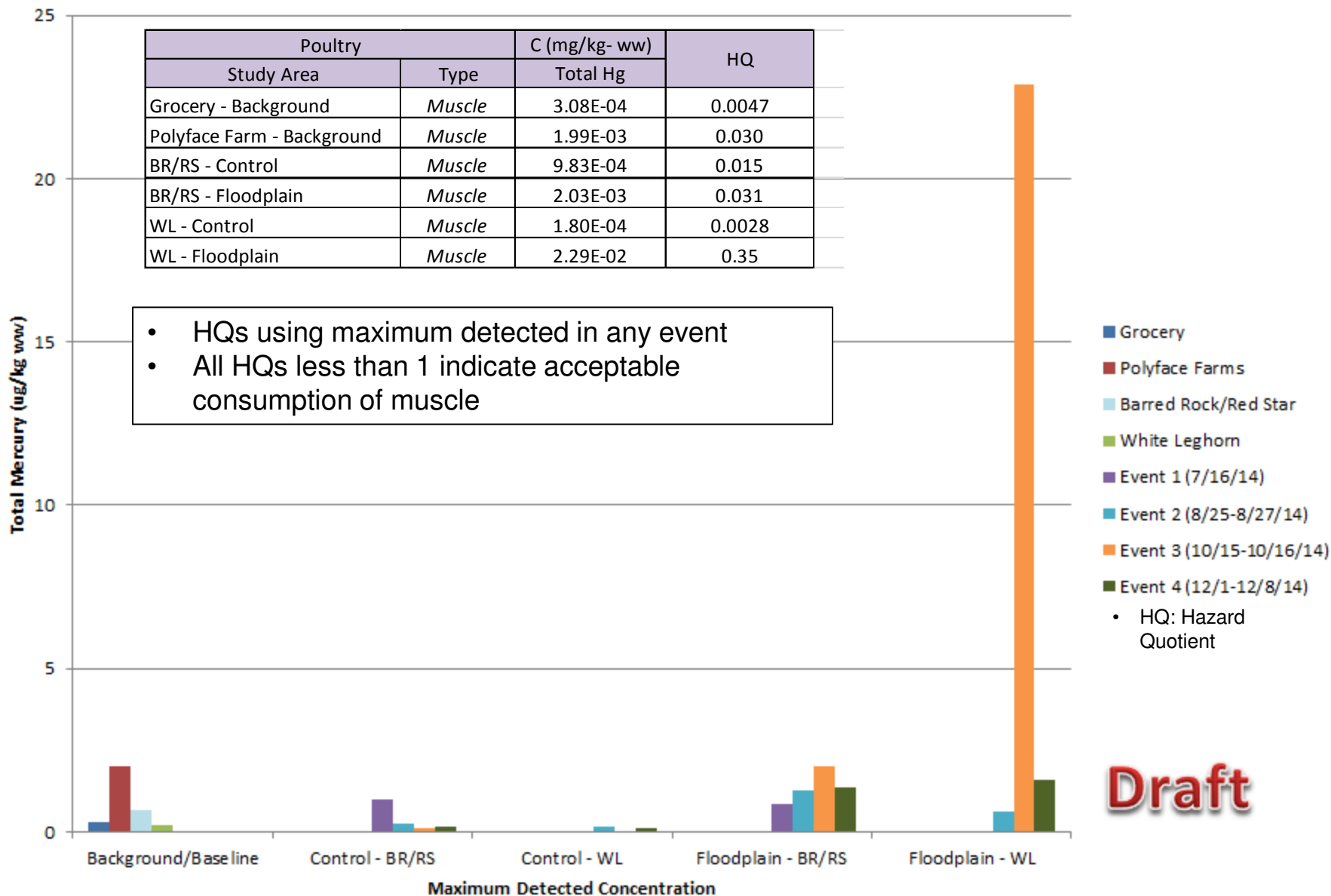


Hg in Egg Tissue

Species		C (mg/kg ww)	MS (kg)	NM (meals/month)	MS (kg)	NM (meals/month)	MS (kg)	NM (meals/month)
Poultry		Total Hg						
Study Area	Type							
Grocery - Background	Egg	2.73E-04	0.06	47239	0.11	23619	0.17	15746
Polyface Farm - Background	Egg	2.49E-03	0.06	5180	0.11	2590	0.17	1727
BR/RS - Control	Egg	1.22E-03	0.06	10532	0.11	5266	0.17	3511
BR/RS - Floodplain	Egg	1.22E-01	0.06	106	0.11	53	0.17	35
WL - Control	Egg	3.08E-04	0.06	41845	0.11	20922	0.17	13948
WL - Floodplain	Egg	7.03E-02	0.06	183	0.11	92	0.17	61

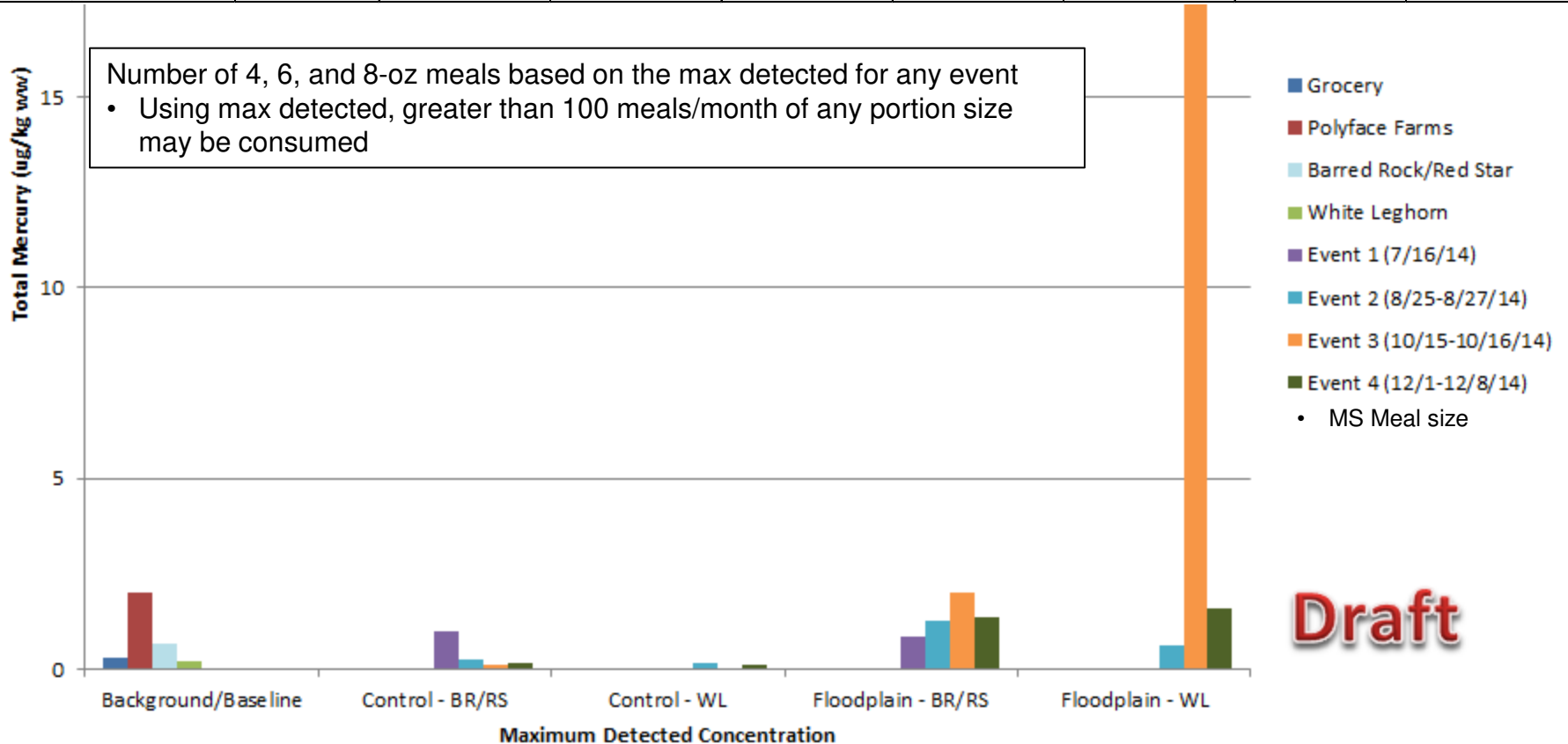


Hg in Muscle Tissue



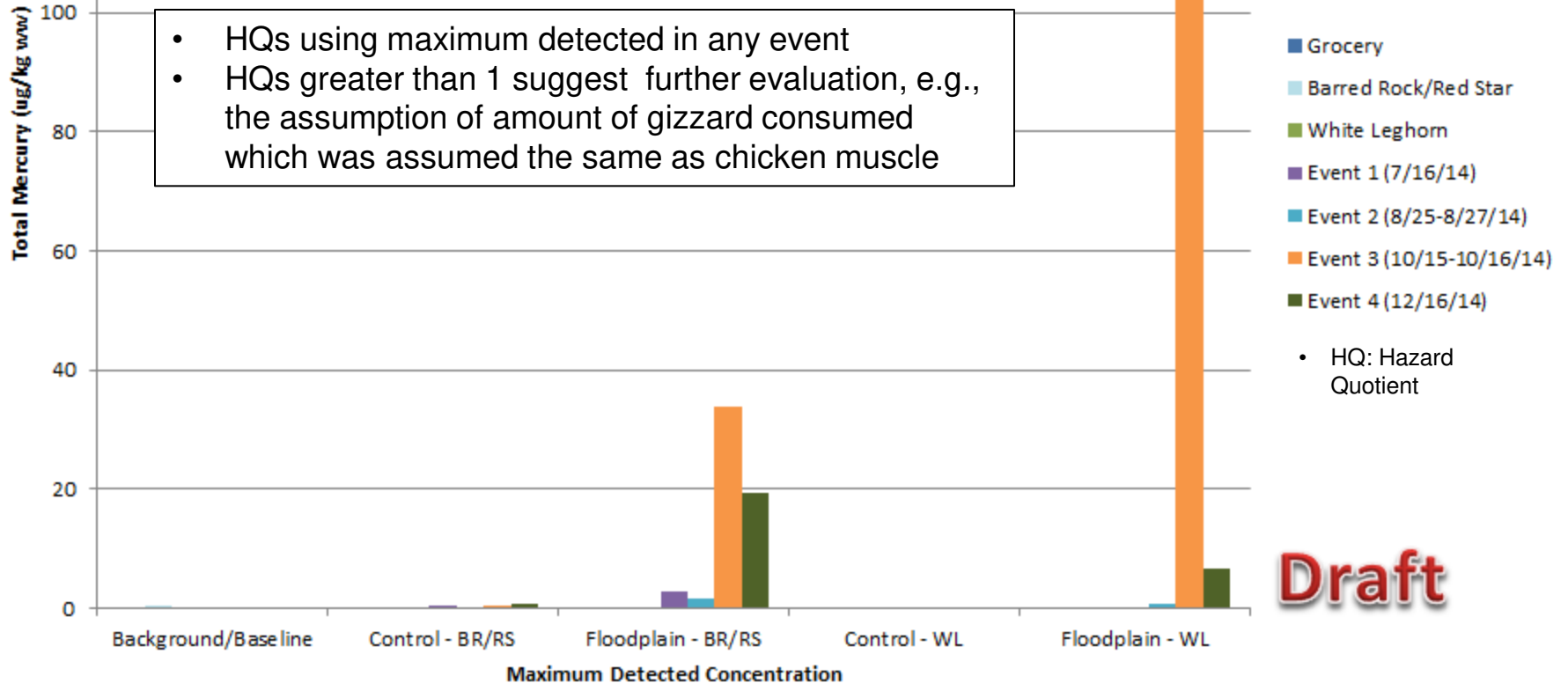
Hg in Muscle Tissue

Species		C (mg/kg ww)	MS (kg)	NM (meals/month)	MS (kg)	NM (meals/month)	MS (kg)	NM (meals/month)
Poultry		Total Hg						
Study Area	Type							
Grocery - Background	Muscle	3.08E-04	0.11	20938	0.17	13959	0.23	10469
Polyface Farm - Background	Muscle	1.99E-03	0.11	3240	0.17	2160	0.23	1620
BR/RS - Control	Muscle	9.83E-04	0.11	6554	0.17	4369	0.23	3277
BR/RS - Floodplain	Muscle	2.03E-03	0.11	3173	0.17	2115	0.23	1587
WL - Control	Muscle	1.80E-04	0.11	35834	0.17	23890	0.23	17917
WL - Floodplain	Muscle	2.29E-02	0.11	281	0.17	188	0.23	141



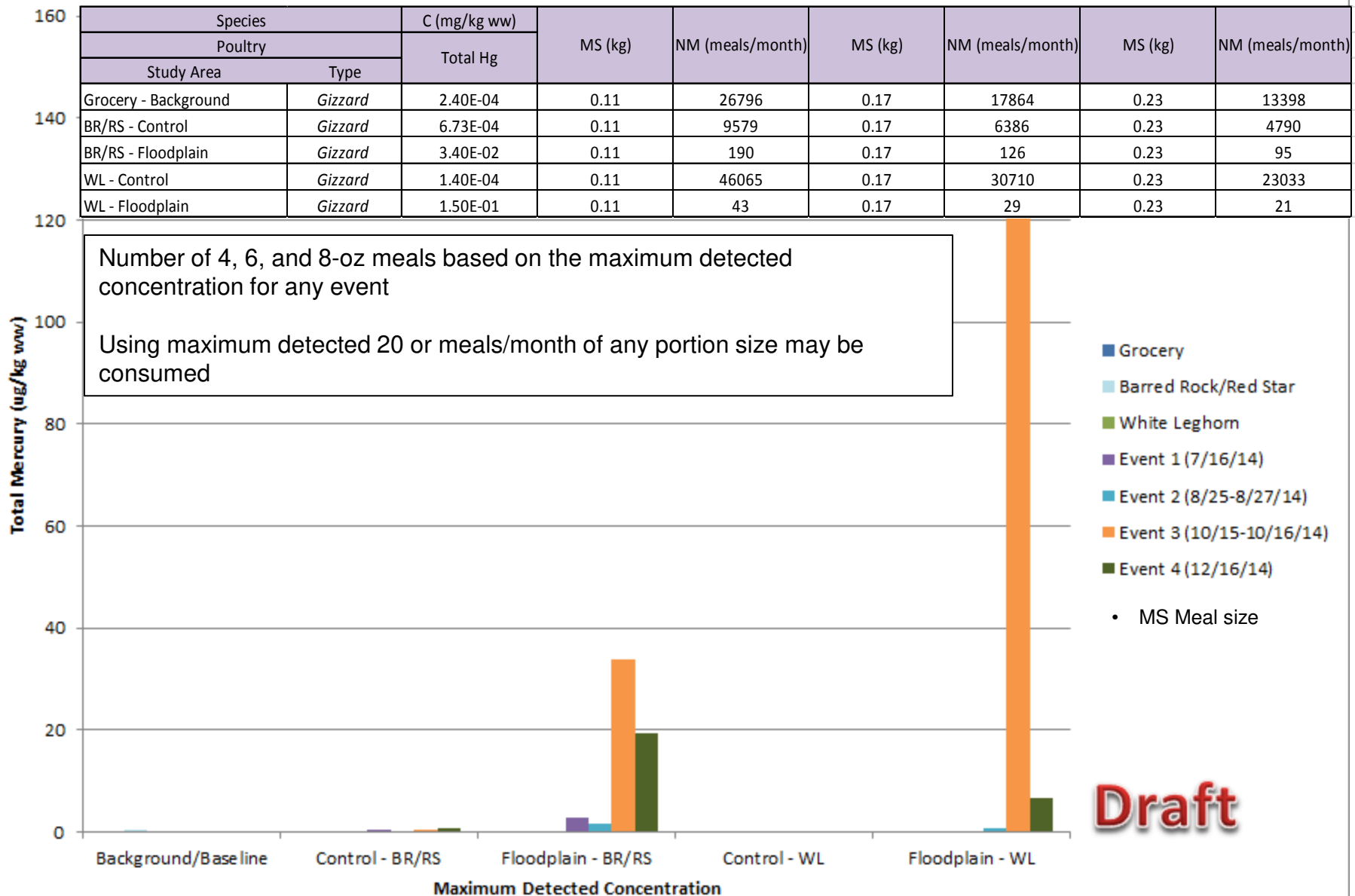
Hg in Gizzard Tissue

Poultry		C (mg/kg- ww)	HQ
Study Area	Type	Total Hg	
Grocery - Background	Gizzard	2.40E-04	0.004
BR/RS - Control	Gizzard	6.73E-04	0.01
BR/RS - Floodplain	Gizzard	3.40E-02	0.5
WL - Control	Gizzard	1.40E-04	0.002
WL - Floodplain	Gizzard	1.50E-01	2



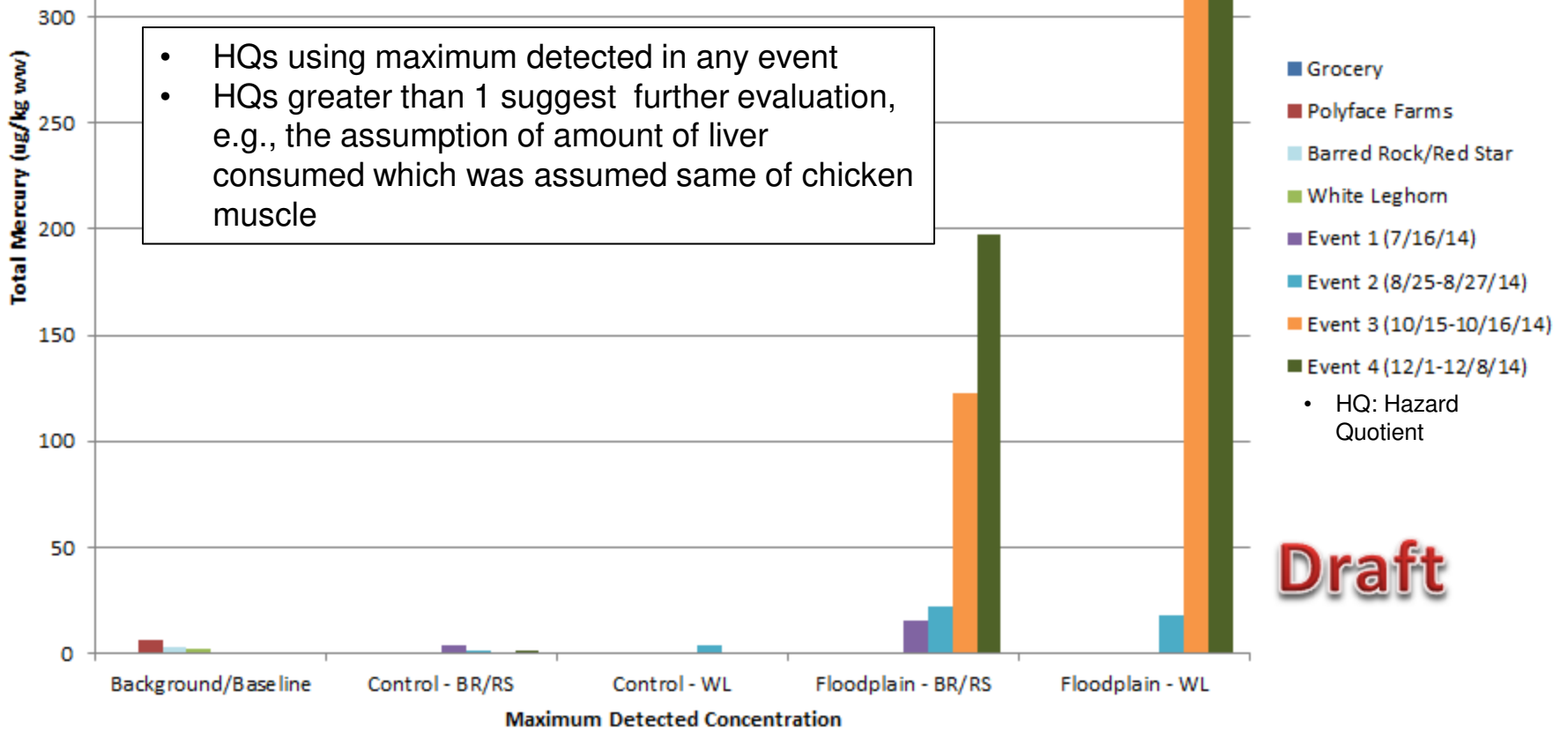
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Hg in Gizzard Tissue



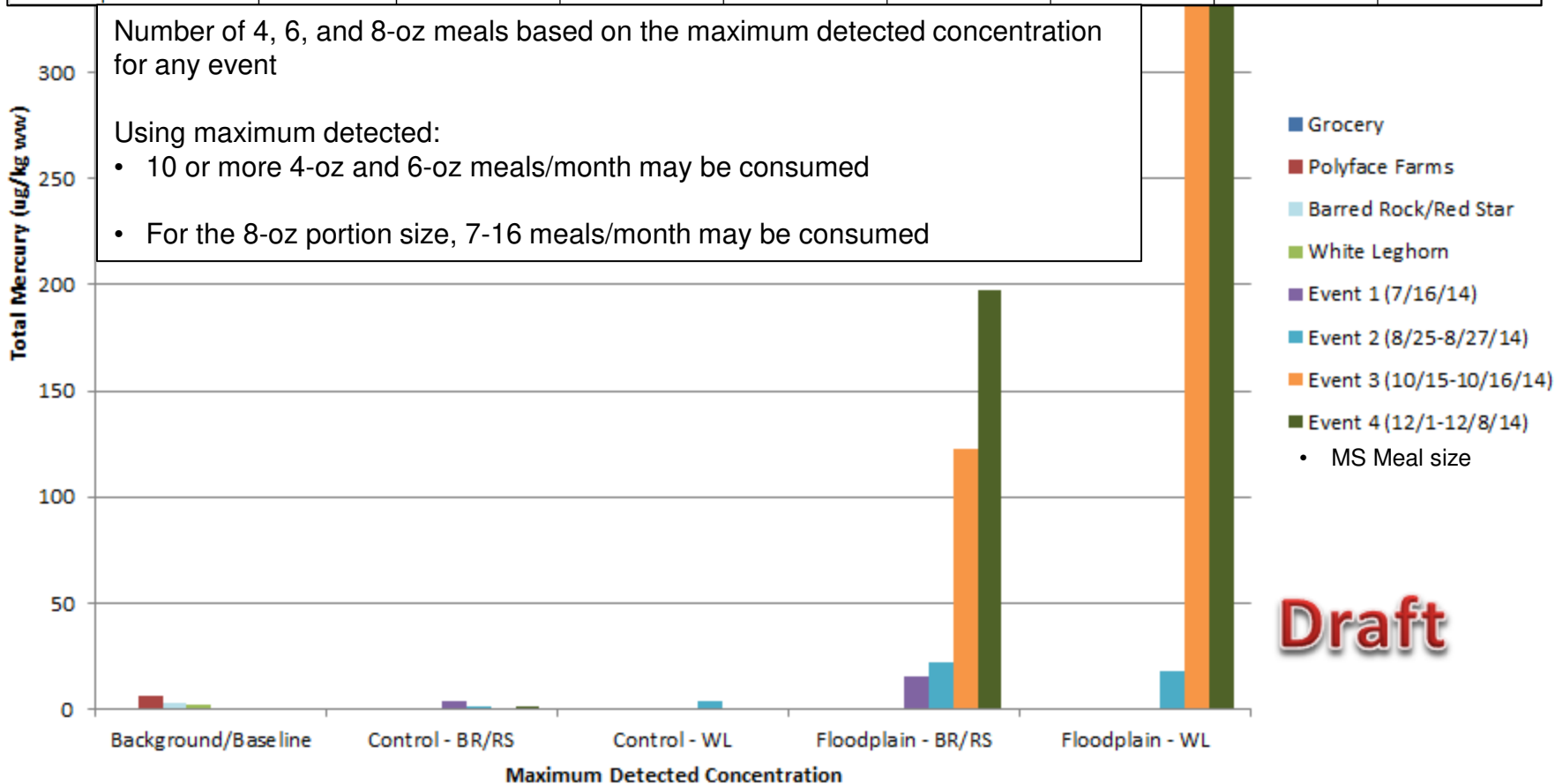
Hg in Liver Tissue

Poultry		C (mg/kg- ww)	HQ
Study Area	Type	Total Hg	
Grocery - Background	Liver	4.00E-04	0.0061
Polyface Farm - Background	Liver	5.95E-03	0.091
BR/RS - Control	Liver	3.42E-03	0.052
BR/RS - Floodplain	Liver	1.97E-01	3.0
WL - Control	Liver	3.39E-03	0.052
WL - Floodplain	Liver	4.37E-01	6.7



Hg in Liver Tissue

Species		C (mg/kg ww)	MS (kg)	NM (meals/month)	MS (kg)	NM (meals/month)	MS (kg)	NM (meals/month)
Poultry		Total Hg						
Study Area	Type							
Grocery - Background	Liver	4.00E-04	0.11	16106	0.17	10737	0.23	8053
Polyface Farm - Background	Liver	5.95E-03	0.11	1083	0.17	722	0.23	541
BR/RS - Control	Liver	1.40E-03	0.11	4597	0.17	3065	0.23	2299
BR/RS - Floodplain	Liver	1.97E-01	0.11	33	0.17	22	0.23	16
WL - Control	Liver	3.39E-03	0.11	1900	0.17	1267	0.23	950
WL - Floodplain	Liver	4.37E-01	0.11	15	0.17	10	0.23	7



Summary

- Sample eggs and poultry (specifically chicken) muscle to determine the potential for chickens reared on the South River floodplain to accumulate mercury.
- The information will be used to inform decisions about exposure through potential food consumption of eggs and chickens reared on the floodplain.
- Observations from preliminary evaluation of results
 - Poultry samples from mercury impacted floodplain show higher mercury levels than background locations and control areas
 - Risk calculations indicate that egg and muscle consumption are acceptable
 - Concentrations in eggs and muscle do not indicate a need to restrict consumption
 - Risk calculations for gizzard and liver suggest the need for further evaluation (e.g., consumption rates set equivalent to chicken muscle)
 - Consumption of gizzard and liver acceptable to some degree

Human Exposure Evaluation

Fact Sheets

- √ Fact sheets completed
 - √ Fact Sheet 1: General Introduction
 - *About the South River Science Team*
 - √ Fact Sheet 2: Exposure Summary
 - *People, Mercury, and the River*
 - √ Fact Sheet 3: Soil Sampling Results
 - *Summary of South River Floodplain Soil Survey*
 - √ Fact Sheet 5: Garden Study
 - *Eating Vegetables Grown on the South River Floodplain*
 - √ Fact Sheet 6: Wildlife Consumption
 - *Eating Waterfowl, Game, and Other Animals from the South River Watershed*
- Other Fact Sheets, as warranted
 - Livestock/Poultry



Thank You
&
Au Revoir!