LT2 Round 1 *Cryptosporidium* Matrix Spike Recovery

by

Michael J. Messner, Ph.D.

USEPA Office of Ground Water and Drinking Water

Outline

- ***LT2 Matrix Spike (MS) Recovery Projections (next slide)***
- Round 1 MS Recovery Data
- Summary

LT2 MS Recovery Projections

- Spike recovery (the fraction of spiked oocysts that are counted, expressed as a percentage) varies from assay to assay.

- Recovery distribution (method 1622/1623)
  - Mean recovery = **40%**
  - Standard deviation of recovery = **20%**
  - RSD = 20% / 40% = **50%**

- We did not attribute additional variability to matrices or laboratories.
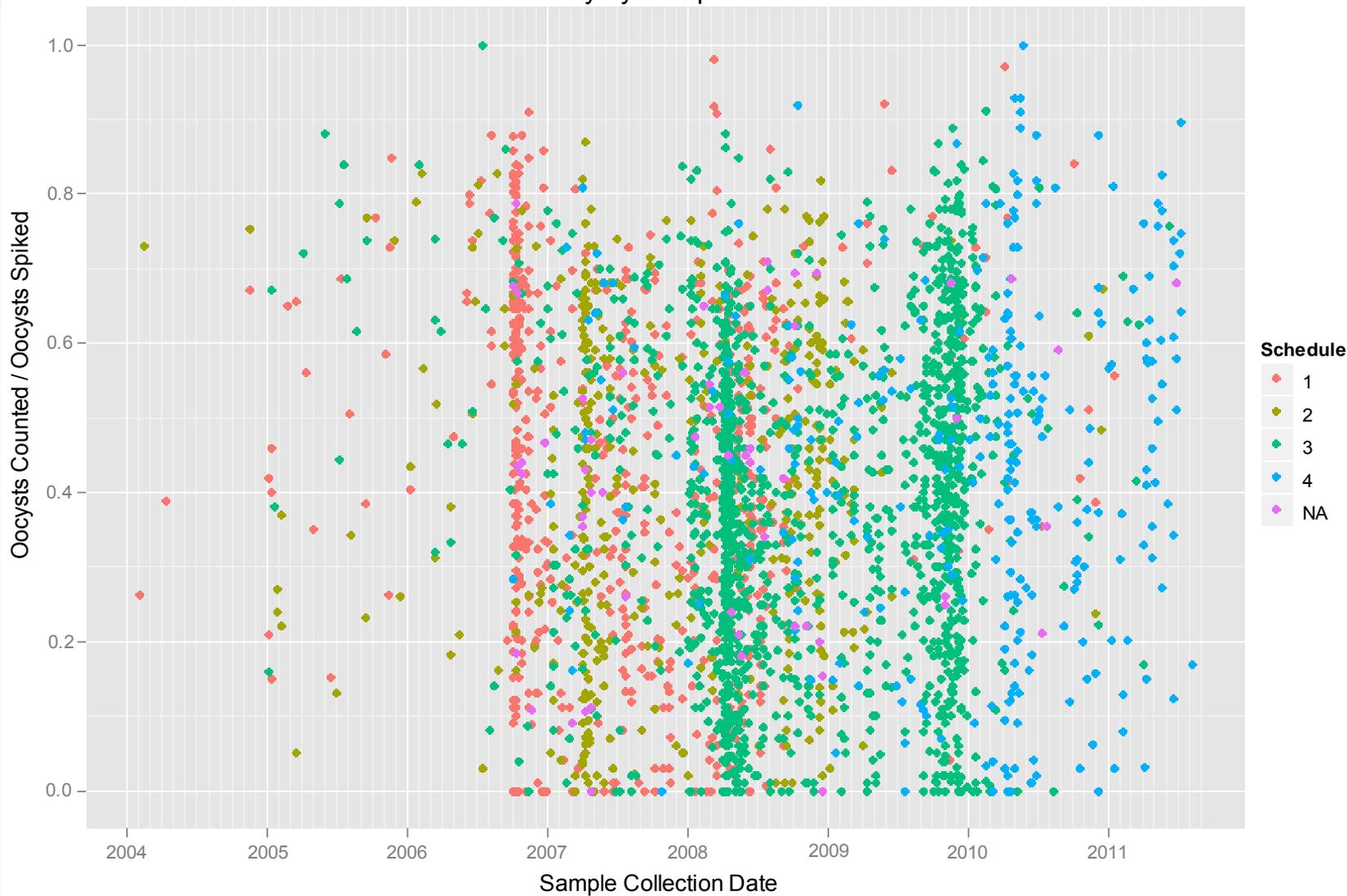
Outline

- LT2 MS Recovery Projections
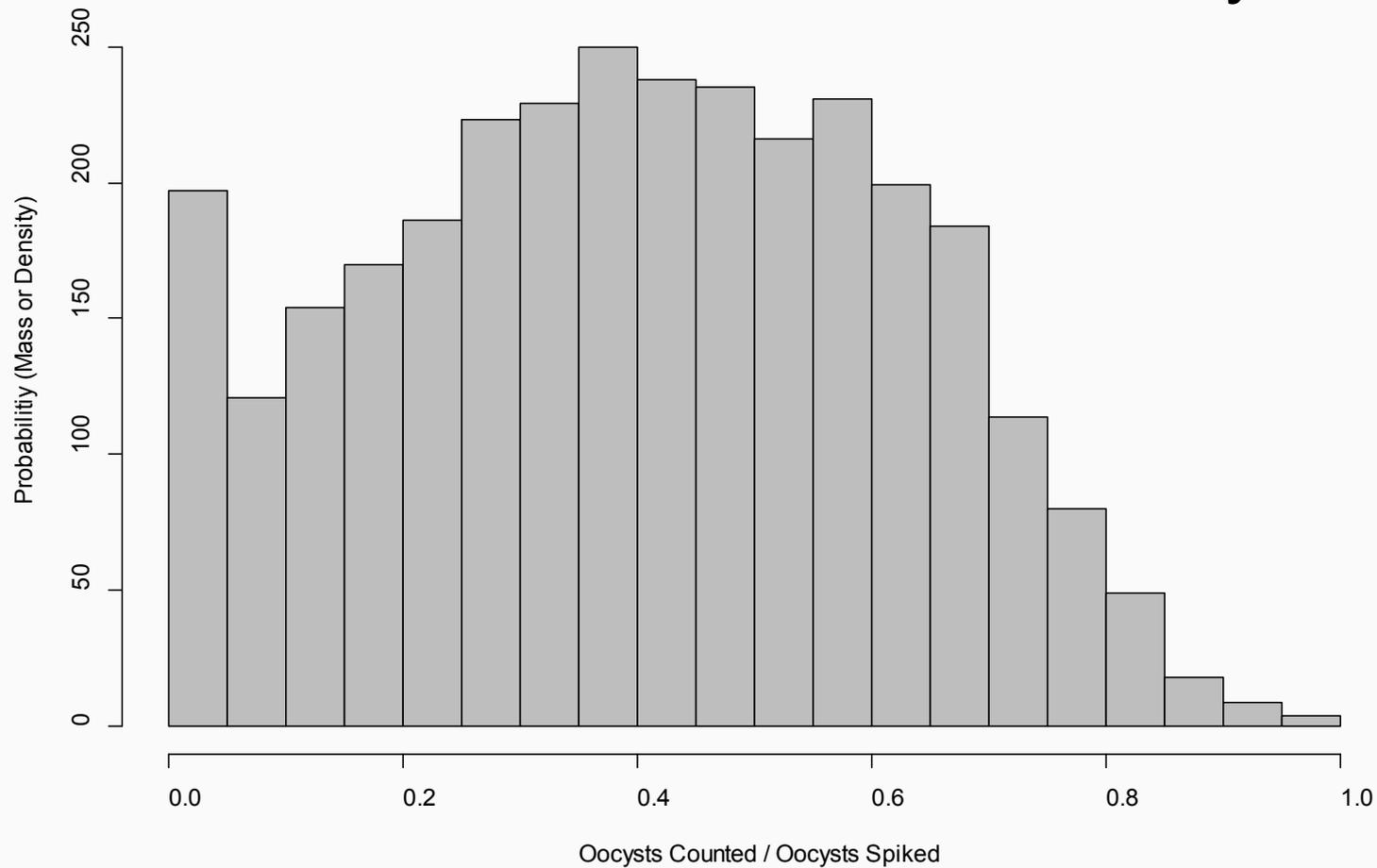- ***Round 1 MS Recovery Data (next 6 slides)***
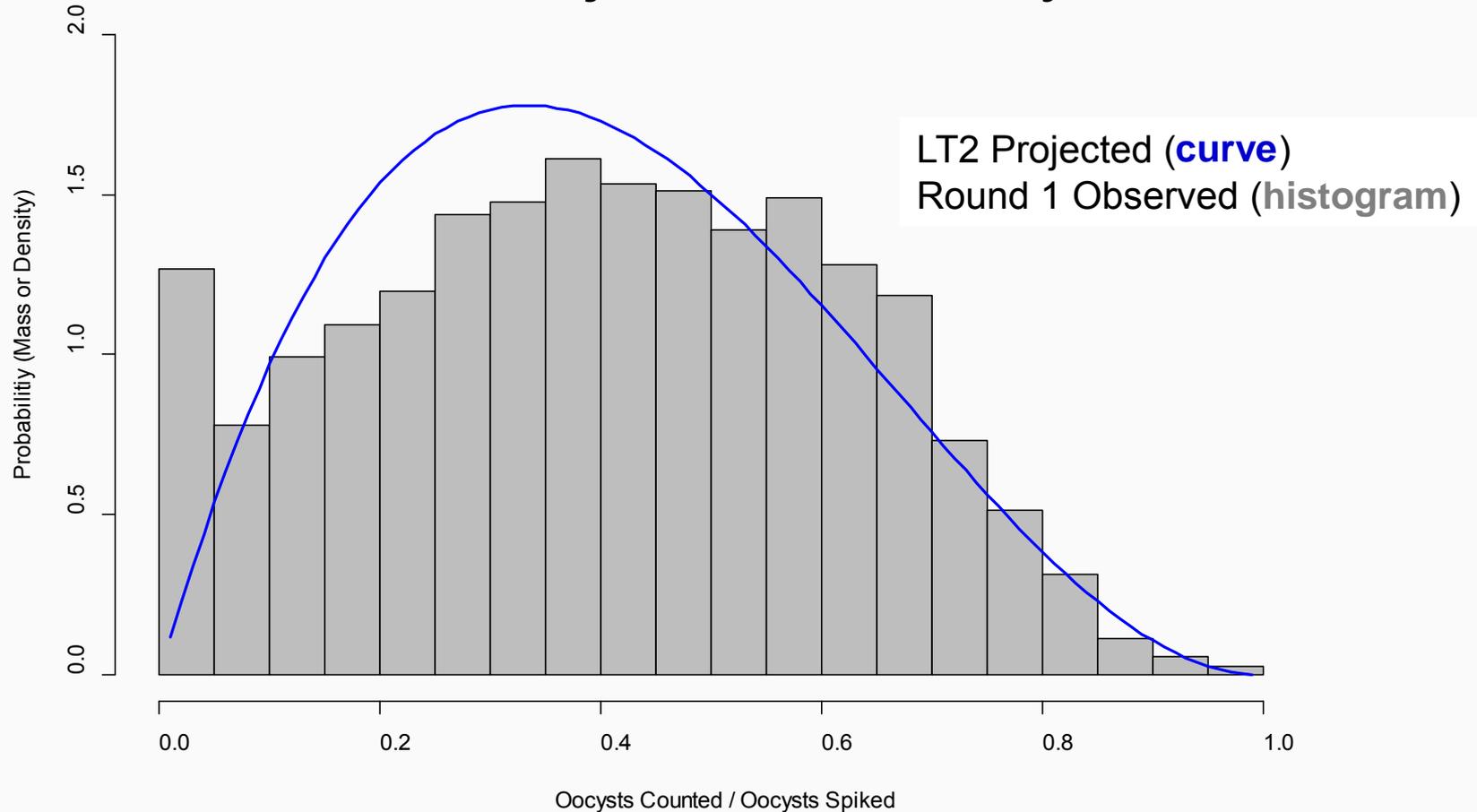- Summary

Observed Recovery by Sample Collection Date

U.S. Environmental Protection Agency

Distribution of Observed Recovery

Observed and LT2-Projected Recovery Distributions

LT2 Projected (**curve**)
Round 1 Observed (**histogram**)

Cryptosporidium MS Recovery Summary Statistics for Samples

- 3107 records are used for understanding recovery
  - *3107 samples with at least 95 oocysts spiked, full sample volume assayed, and recovery not greater than 100% are included.*
  - *127 samples with too few oocysts spiked, less than full volume assayed, and infeasible recoveries are excluded.*
- Observed recoveries range from 0% to 100%.
- Average recovery is **40.4%** (LT2 projected **40%**)
- Standard deviation of recovery is **21.9%** (LT2 **20%**)
- Relative standard deviation of recovery is **54.2%** (LT2 **50%**)
- Small variation due to water type.

Cryptosporidium Mean MS Recovery by Water Type

Water Type*	Number of Facilities	Number of Records	Mean Recovery
Res/Lake (LR)	698	1412	41.7%
River/Stream (FS)	596	1209	39.1%
Both (LR & FS)	57	105	39.4%
GWUDI-FS	70	146	37.0%
GWUDI-LR	35	62	45.1%
NA**	101	173	41.5%
Total	1557	3107	40.4%

*GWUDI = ground water under direct influence of surface water.
**NA = not available. Water Type was missing for some facilities.

Cryptosporidium MS Recovery Summary Statistics for Labs

- Using same 3107 records

- 50 Labs

- Lab-specific average recoveries
  - Minimum = 21.3%
  - Median = 41.4%
  - Maximum = 90.5%

- Between-lab variability is due to both differences in lab performance and matrix effects. *(LT2 assumed no systematic matrix or lab effects.)*

Outline

- LT2 MS Recovery Projections
- Round 1 MS Recovery Data
- ***Summary (next 2 slides)***

MS Recovery Summary

- Overall recovery distribution is very much like that assumed in LT2 EA, but with higher frequency of very low recoveries.

- Large variability remains between Labs and matrices, but the DCTS data are of limited value for separating the contributions of these two variance components (lab and matrix).

Occurrence Summary

- Key statistics regarding reduced occurrence:
  - Zero counts in about **93%** of samples (vs. **86%** for LT2)
  - All-zeros for **51%** of plants (vs. **20%**)
  - Average measured concentration **0.016/L** (vs. **0.053**)
  - **4.7%** of source water means equal or exceed 0.075/L (vs. **14%**)
    - Higher occurrence for flowing streams than reservoirs & lakes
    - Occurrence increases with system size (Schedule)
    - Nearly 10% of schedule 4 facilities have means above 0.075

- *The occurrence reduction appears to be real. The reduction is <u>not</u> due a systematic change in recovery.*