

# Lessons Learned From Use of the Toolbox – A Utility Survey

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U.S. Environmental Protection Agency  
LT2 ESWTR

Monitoring Data Analysis, Occurrence Forecasts,  
Binning, and the Microbial Toolbox

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# Approach

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- Contacted utilities in Bin 2 to assess their experience using Tool Box
- Developed list of utilities using **Primacy Agency Reports** and **Calculated Bin Determination Data**
- Also contacted others familiar with these technologies and some State personnel

# Compliance Requirements for Bin 2 Utilities

Schedule	Population Served	Compliance Dates
1	>100,000	2012(1Q) - 2014
2	>50,000 to 99,999	2012(3Q) - 2014
3	>10,000 to 49,999	2013(3Q) - 2015
4	<10,000	2014(3Q) - 2016
4 without crypto monitoring	<10,000	2013(3Q) - 2015

# Bin 2 Databases Used for Contacts

<b>Schedule</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>NA</b>
In Both Databases	6	11	47	5	6
Primacy Agency Database only	6	10	25	36	
Calculated Bin Database only	1	1	0	0	
From EE&T contacts	+2	+1			
<b>TOTAL</b>	<b>15</b>	<b>23</b>	<b>72</b>	<b>41</b>	<b>6</b>

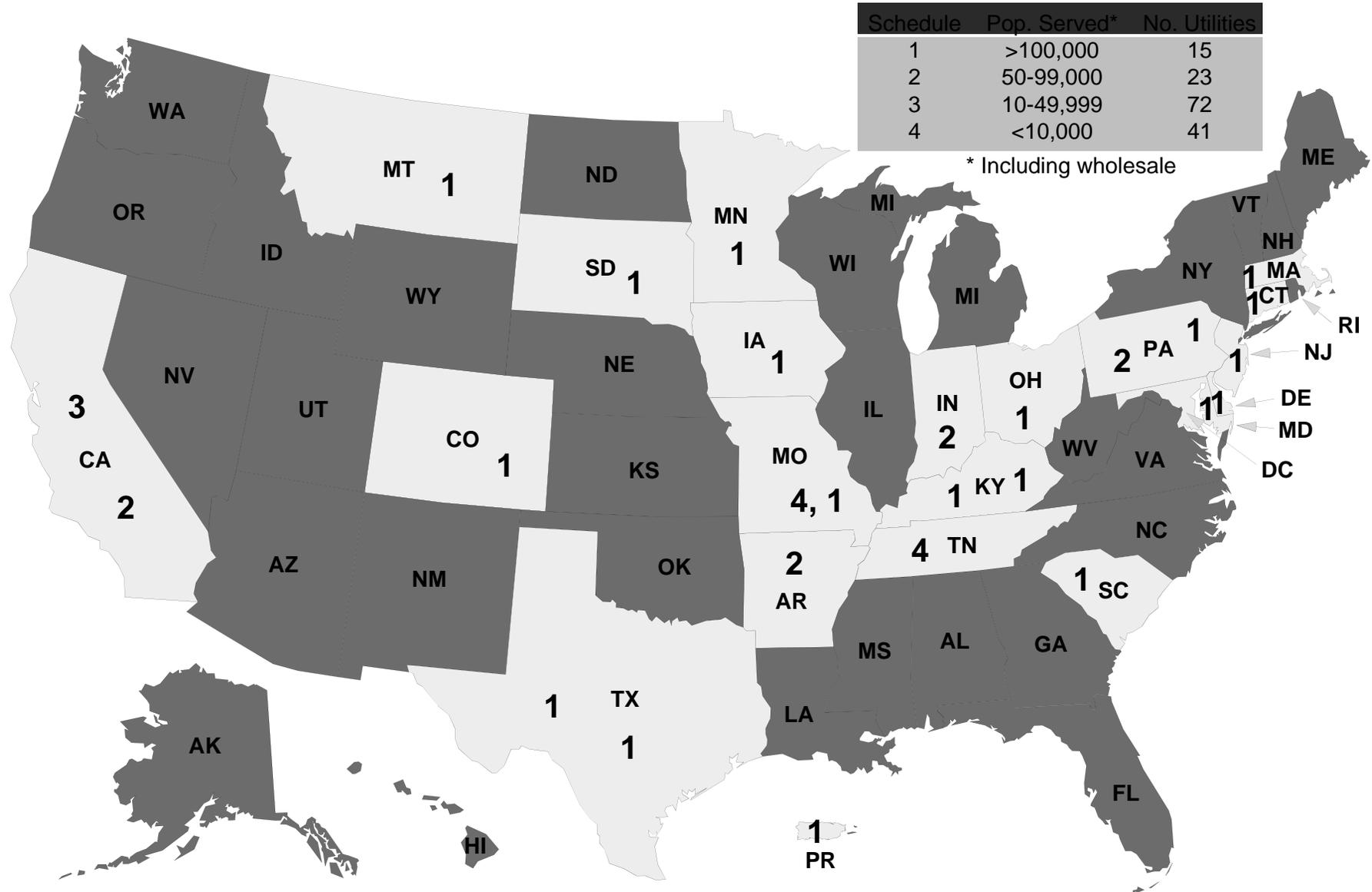
# Database Summary

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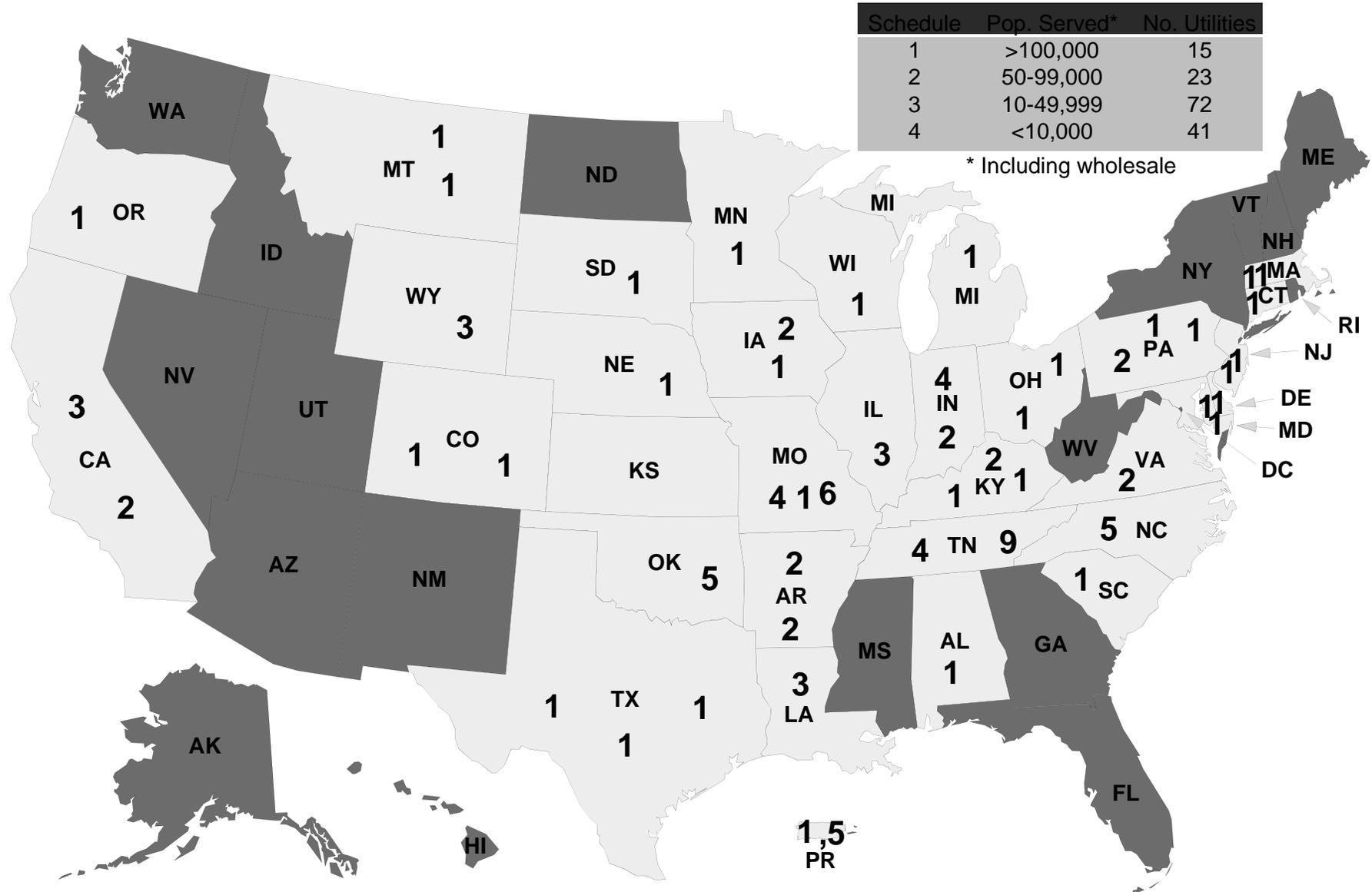
- Primacy Agency Reports
  - 152 utilities in Bin 2
- Calculated Bin Determination Data
  - 77 utilities in Bin 2
  - *75 utilities were in both databases*
  - *3 utilities self identified as Bin 2*
  - *3 utilities claimed they were actually Bin 1*
- EE&T talked to 19 utilities (24 Bin 2 plants) and 4 “implementation experts”



# Schedule 1 and 2 Utilities in Bin 2



# Schedule 1, 2, and 3 Utilities in Bin 2

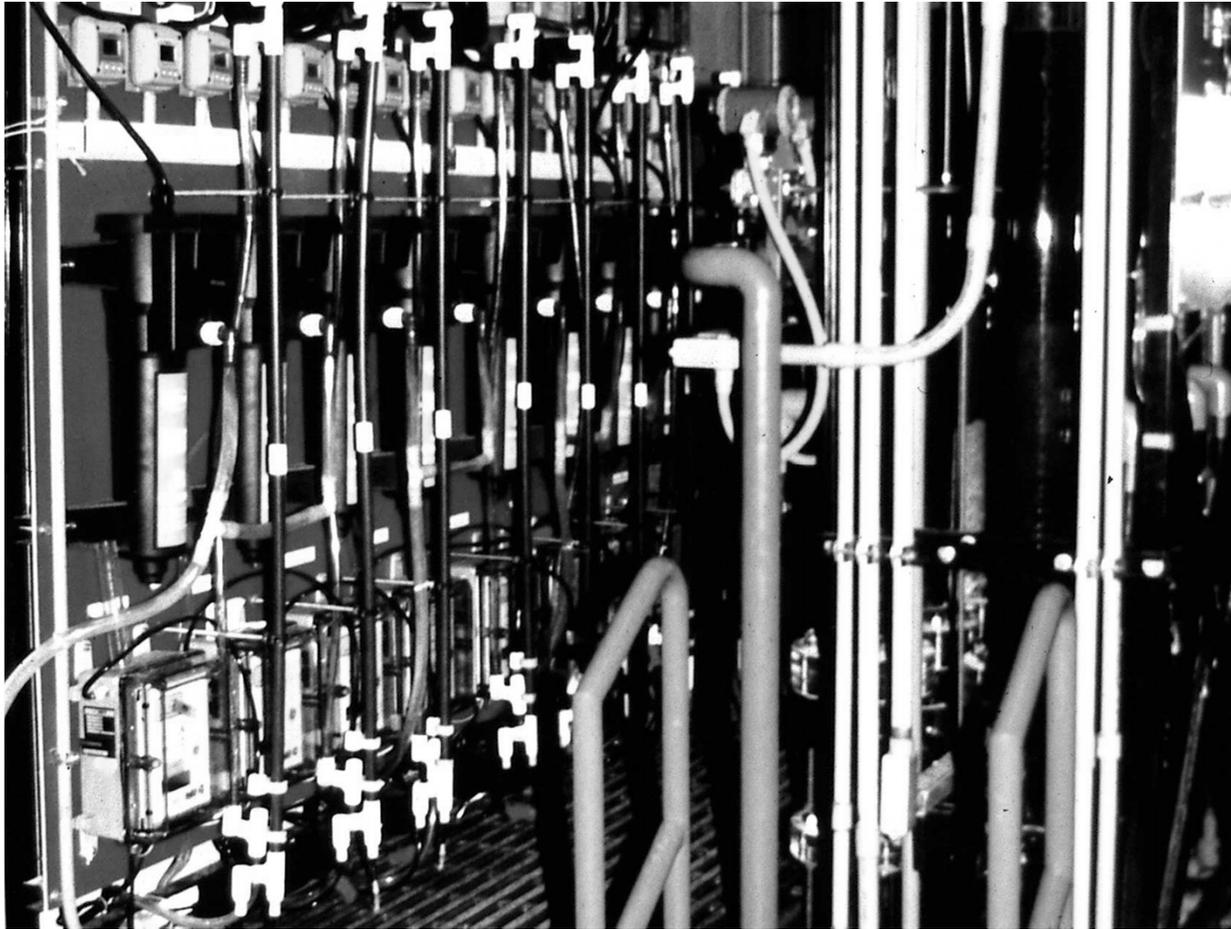


# Tools Used by Utilities Contacted

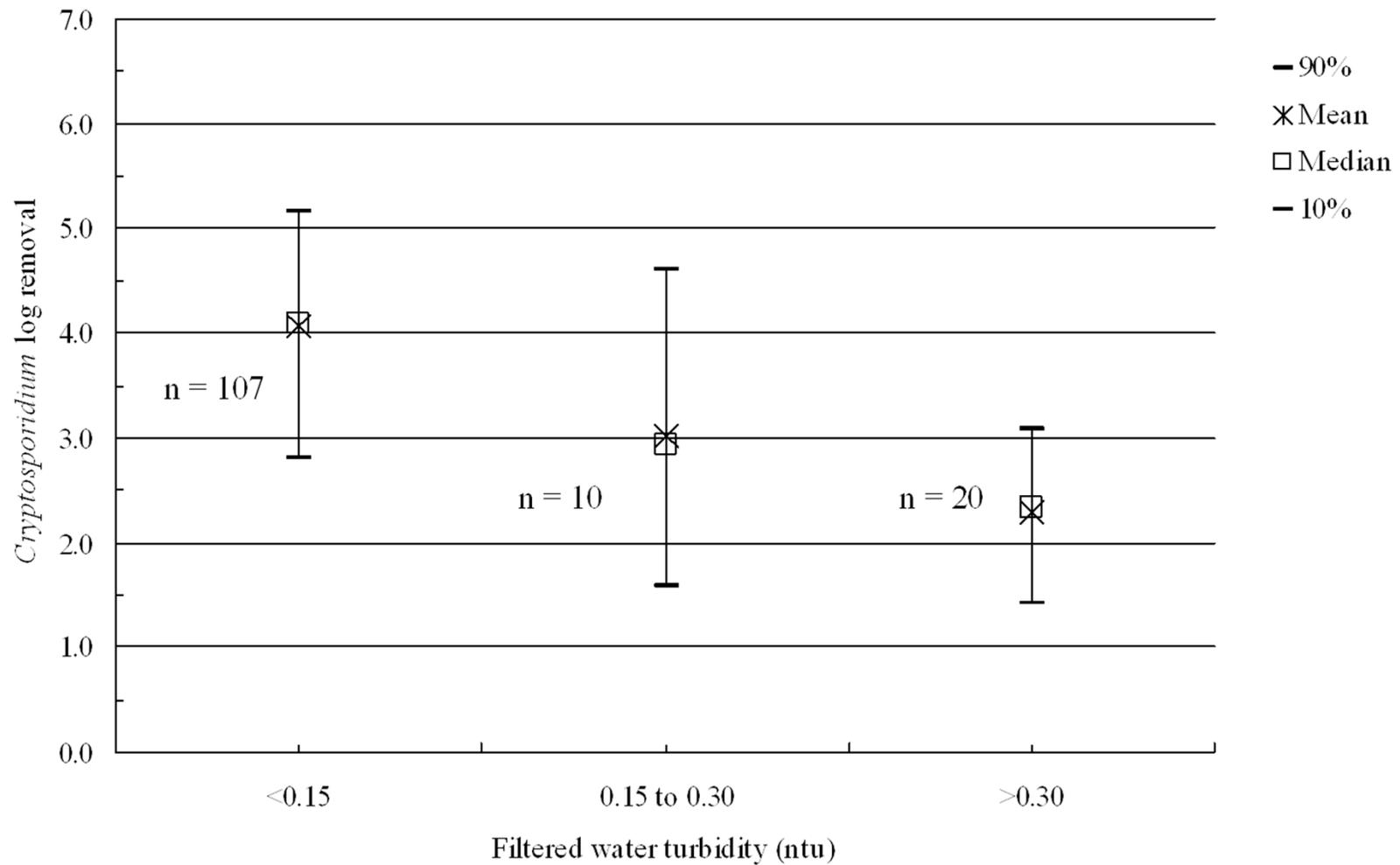
Tool	# Plants
Watershed control Plan	3
Pre Sed with coagulation	1
Bank filtration	3
CFE	7
IFE	7
DOP	5
Membrane	3
UV	8

# Tool Box Strategy Used by Utilities Contacted (# plants)

Tool	Utility (# Plants)
CFE/IFE Only	2
WCP with CFE or IFE	3
DOP	4 (5)
UV	4 (7)
Membrane only	1
Membrane with IFE/CFE	1
Membrane with UV	1
Bank filtration	2
Bank filtration with UV	1
Pre Sed and IFE/CFE	1



**IFE/CFE**



Sources: Dugan *et al.* 1999; EE&T 1996; Hall *et al.* 1994; Patania *et al.* 1995; Swaim *et al.* 1996; West *et al.* 1994.

Figure 7.6 Impact of filtered water turbidity on *Cryptosporidium* removal during pilot-scale challenge studies (<0.15 to 0.30)

# IFE/CFE

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- Most commonly discussed tool
- Some utilities did not use this tool after assessing plant/filter performance
- Utilities that had been in Safe Partnership were familiar, had data to review, willing to consider it
- All utilities required upgraded monitoring equipment, SCADA, filter backwash equipment, media, under drains
- All required changes in operation

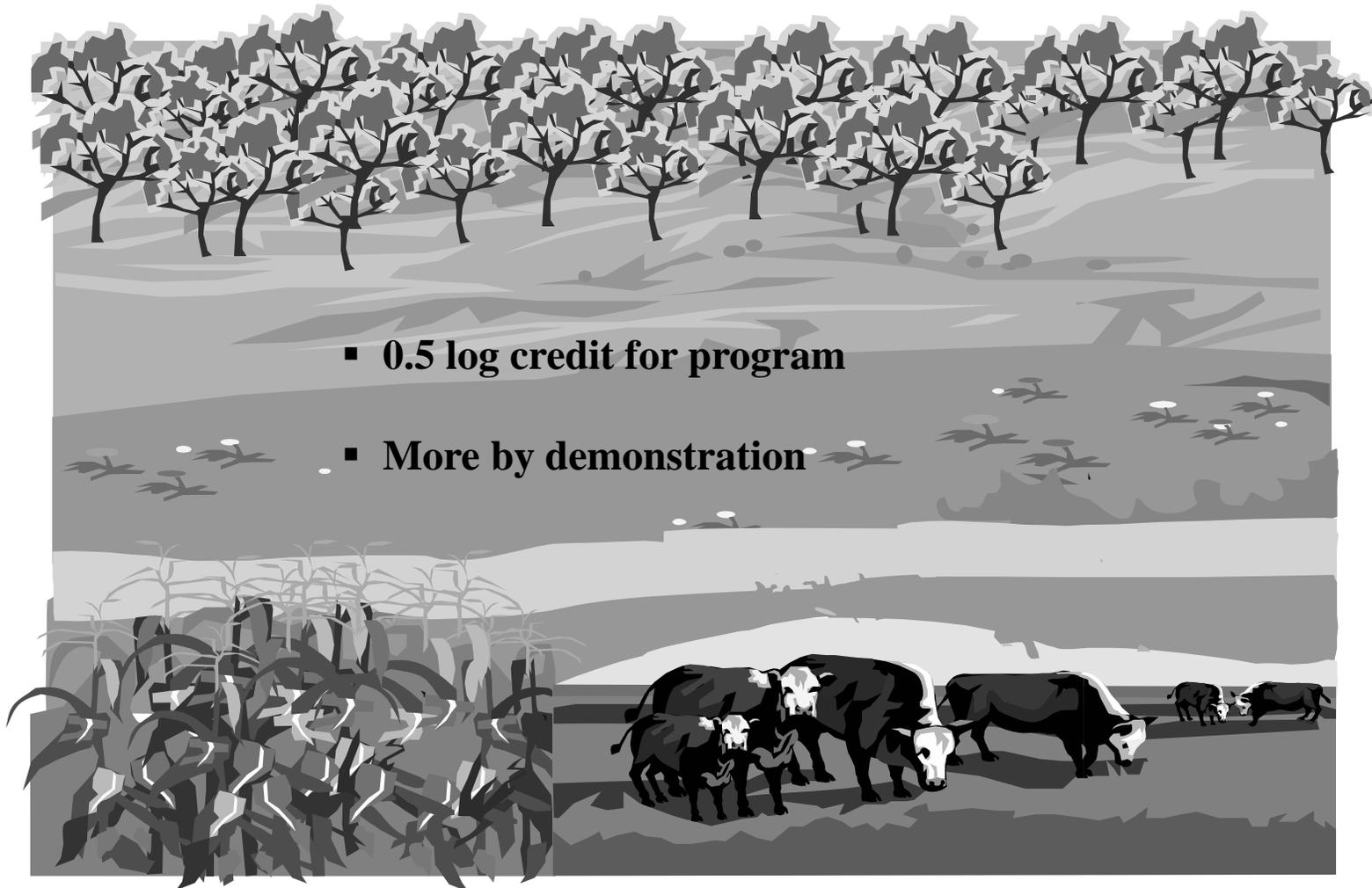
# IFE/CFE (continued)

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- One state reluctant to accept this tool
- No additional data to State; just statement along with MOR that the requirements were met
- Costs ranged from minimal (\$20,000 for new turbidimeters) to \$4 million for full filter upgrades; SCADA changes needed
- Utilities also incur costs due to more water wasted and more frequent backwashing

# Watershed Control Program

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# Watershed Control Program

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- Of the 3 utilities planning to use this credit, one has initially been denied by the State
  - ✓ State indicated that the WCP could only be used as a back up
  - ✓ State has asked for metrics (quality meeting filtration avoidance at plant intake)
  - ✓ State required additional 1 log credit, for total 1.5 log
- Many utilities did not consider because of uncontrolled watershed

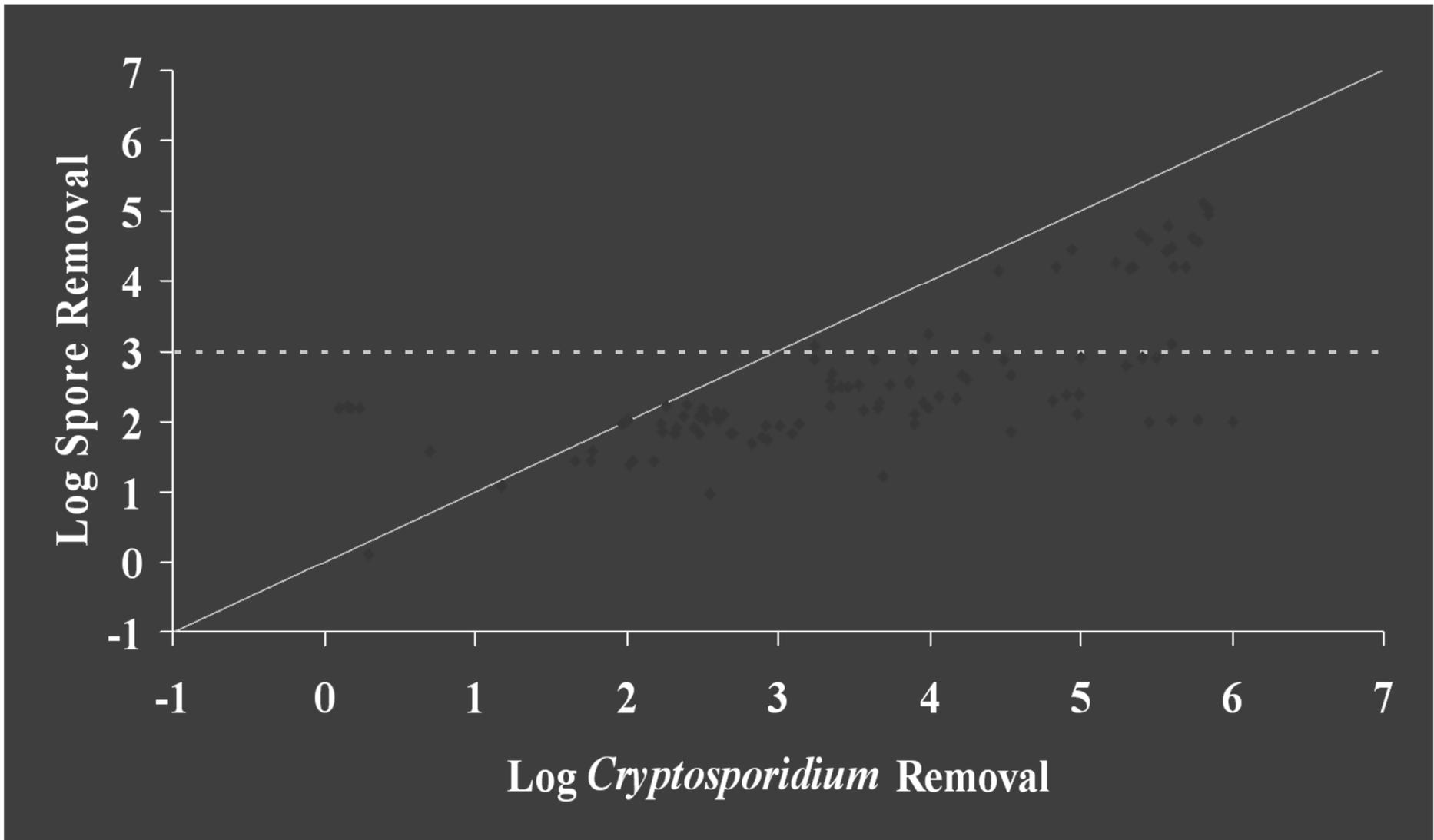
# Watershed Control Program

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- WCP approved for 2 utilities for 0.5 log, one used guidance document criteria (EPA Primacy), other required more measurements and details in program
- Unlikely that States would approve more than 0.5 log credit
- Some states have indicated that they would not approve this Tool
- Some utilities wanted more control of protection

# Demonstration of Performance

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Sources: Clark et al. 2001, Dugan et al. 2001, Huck et al. 2002, Mazounie et al. 2000, Yates et al. 1998

# Demonstration of Performance (DOP)

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- Two utilities used grandfathered studies using spores
- One utility used spores at two plants, enthusiastic about information learned through studies
- One utility used particle counts
- Some utilities mis-read guidance to indicate that crypto was to be spiked, others determined that the procedure was too complex

# Demonstration of Performance (DOP) continued

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- States willing to review studies, but not enthusiastic
- One state thought it would require expertise and resources not available at most plants
- Another state indicated that if a utility suggested this option, they would not approve it
- Utilities indicated EPA guidance too negative

# Riverbank Filtration

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- 2 (3) utilities use this option
- All had this technology in place, or planned
- States required monitoring to show log removal
- One utility required to also install UV

# Membrane Filtration



# Membrane Filtration

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- One plant already had complete MF treatment, so only needed to submit more data to State
- Other 2 plants chose membranes because of existing membranes in part of the plant or to replace pressure filters
- One plant membrane did not treat max flow, so had to have additional credits (CFE/IFE)
- One plant put UV on membrane reject -- recycle

# UV Inactivation



# UV

- 37% of plants contacted chose UV
- Small footprint, easier to retrofit than other options, can be used at most plants
- Confusing for state regulators to review and to monitor
- Some states must follow 10 state standards which conflict with EPA dosage guidance
- Validation is confusing for some states

# UV (Continued)

- Many states felt overwhelmed in learning enough to review plans, dictate record keeping and submittals
- Some utilities felt states overburdened them with reporting requirements because of unfamiliarity with process

# Ozone Inactivation



# Ozone Inactivation

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- Ozone not widely used for Bin 2 (possibly one pre-existing)
- Costs are not competitive, especially in cold climates
- Bromate can be an issue—limits what ozone would be able to do
- Some states do not allow on-line residual monitors which limits practicality of calculating CT

## Tool box strategy used by utilities contacted

<b>Tool</b>	<b>Contacted(24) EE&amp;T 2012</b>	<b>EPA survey (96) 2012</b>	<b>EPA Cost Doc (474) 2005</b>
CFE/IFE Only	8% (29%)	37.5/34.4%	3%
WCP+CFE/IFE	13%	10.4%	0
DOP	21%	3.1%	0
UV	29% (37%)	19.8%	82%
Membrane	13% (4%)	15.6%	4%
Bank filtration	13% (8%)	3.1%	<1%
PreSed with coagulation	4%	2.1%	0
Ozone	0	2.1%	9%
Alternate source	0	3.1%	0
ClO <sub>2</sub>	0	1.0%	0
Bag filter	0	1.0%	
Filter Optimization	0	3.1%	

# What Worked??

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## The Toolbox Approach

All Utilities enthusiastic about tool box approach  
– they liked being able to assess different options that met their plans, site constraints and timetables

DOP, UV, IFE/CFE widely accepted by utilities

Sound technical basis for tools but some acceptance issues

# What Didn't Work?

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## Specific Tools

- Ozone not a good option for most plants
- Watershed control program had resistance from States – will only give 0.5 log at most credit
- Guidance manual unclear/negative about surrogate to use in DOP
- Confusion about pre-sedimentation with coagulation – utilities told couldn't grandfather the technology (redundancy?)

# What Didn't Work?

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## Specific Tools (continued)

- Some States won't allow primary disinfectant credit for UV
- 3<sup>rd</sup> party validation for UV confusing
- UV monthly data requirements burdensome
- UV Guidance document too difficult—some states really proactive, others not sure

# What Didn't Work?

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- Utilities concerned that States not open to assessing Tools
- States feel they have insufficient resources to review/monitor so many Tools
- Being classified as Bin 2 has negative implications for utility, especially when other utilities on the same source were not in Bin 2
- Some States require “back up” treatment credit

# What Can Be Done Better?

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- States could benefit from access to designated expert for each technology
- Revision of 10 state standards re: UV dose
- Consensus on data reporting requirements for UV, membrane, ozone
- Medium pressure/low wavelength inactivation credits
- Revised Guidance based on lessons learned