Microbial Toolbox Options: Two States' Perspectives

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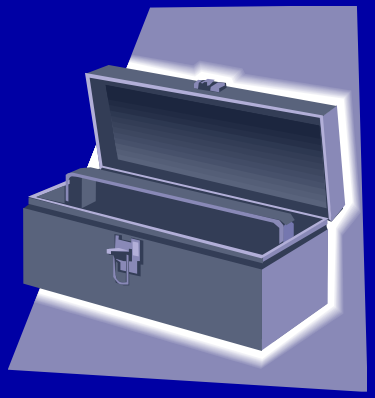
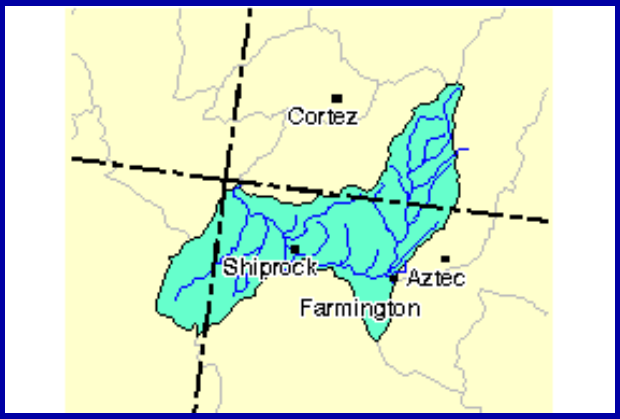
Today's Presentation

- Two states' experiences with the Microbial Toolbox
  - Slides represent what is happening in New Mexico and Iowa, not necessarily in other states
  - Advantages/disadvantages presented are in the context of why systems and states might prefer certain tools over others



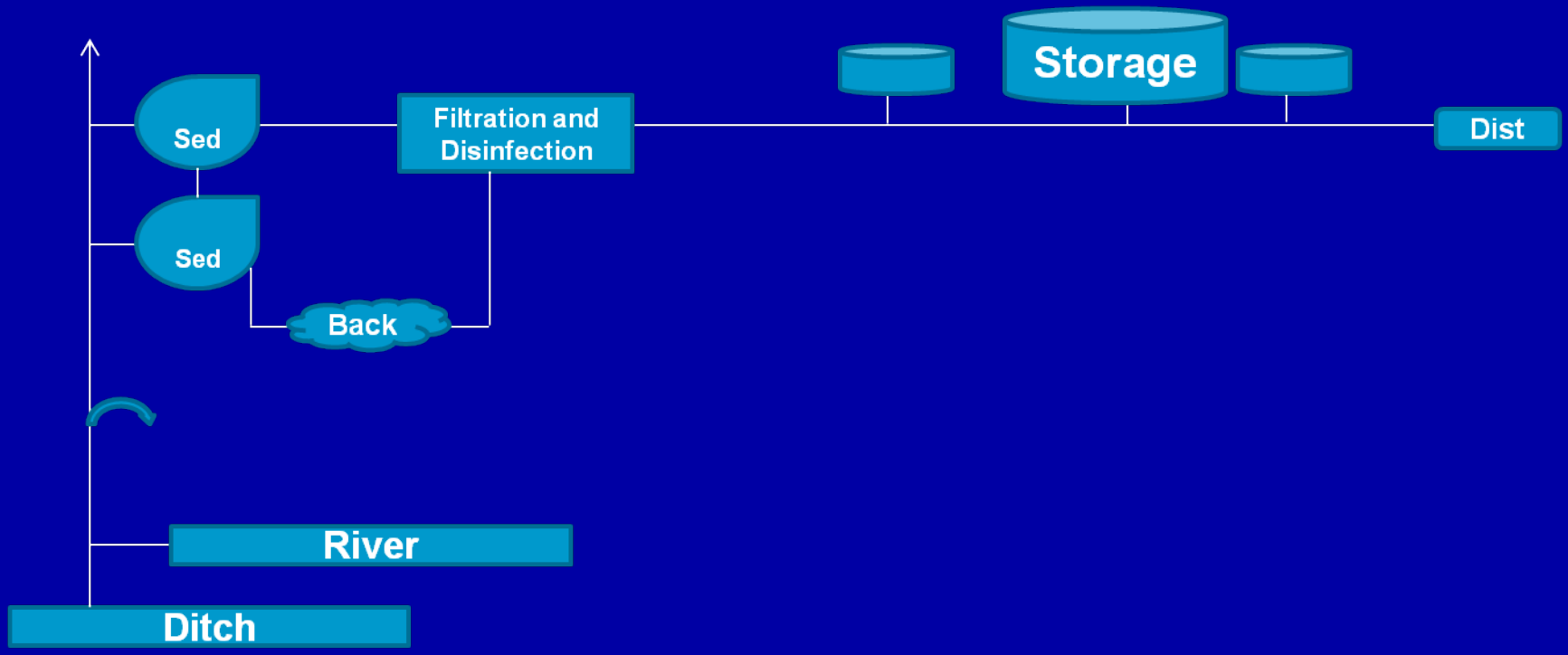
Source Protection and Management Tools

- Watershed control program
  - Large watersheds make inventories and assessments difficult
  - Many point sources of *Cryptosporidium* in agricultural states
  - Difficult to implement control strategies on private property
  - Would require ongoing oversight to ensure continued validity of credit



Source Protection and Management Tools

- Alternative source/intake management
  - Timing
  - Investment



Pre-filtration Tools

- Pre-sedimentation basin with coagulation
  - 2 of 34 plants in Iowa have existing pre-sedimentation basins treating 100% of flow, neither feed coagulant ahead of basins
    - Use of this tool would require additional coagulant and sludge removal
  - Systems without existing pre-sedimentation basins would need space and capital to implement this tool

Pre-filtration Tools

- Two-stage lime softening
  - Feasible for those plants already using two-stage softening for 100% of flow
    - 1 of 34 plants in Iowa uses two-stage lime softening on a continuous basis, but has split treatment
  - Plants with single-stage softening would require space and capital investment or would have to reduce capacity to meet two-stage requirements
    - Adding second stage would result in additional chemical and sludge removal costs

Pre-filtration Tools

- Bank filtration
  - Only applicable to specific systems (vertical or horizontal wells with average daily turbidities < 1 NTU)
  - Flooding/erosion may change the characteristic of the bank over time
  - Extensive monitoring required to establish and maintain credit
  - 2 of 34 plants in Iowa currently use bank filtration for credit
    - One system using credit for redundancy in meeting IESTWR
    - One will cease using this credit when UV is installed

Treatment Performance Tools

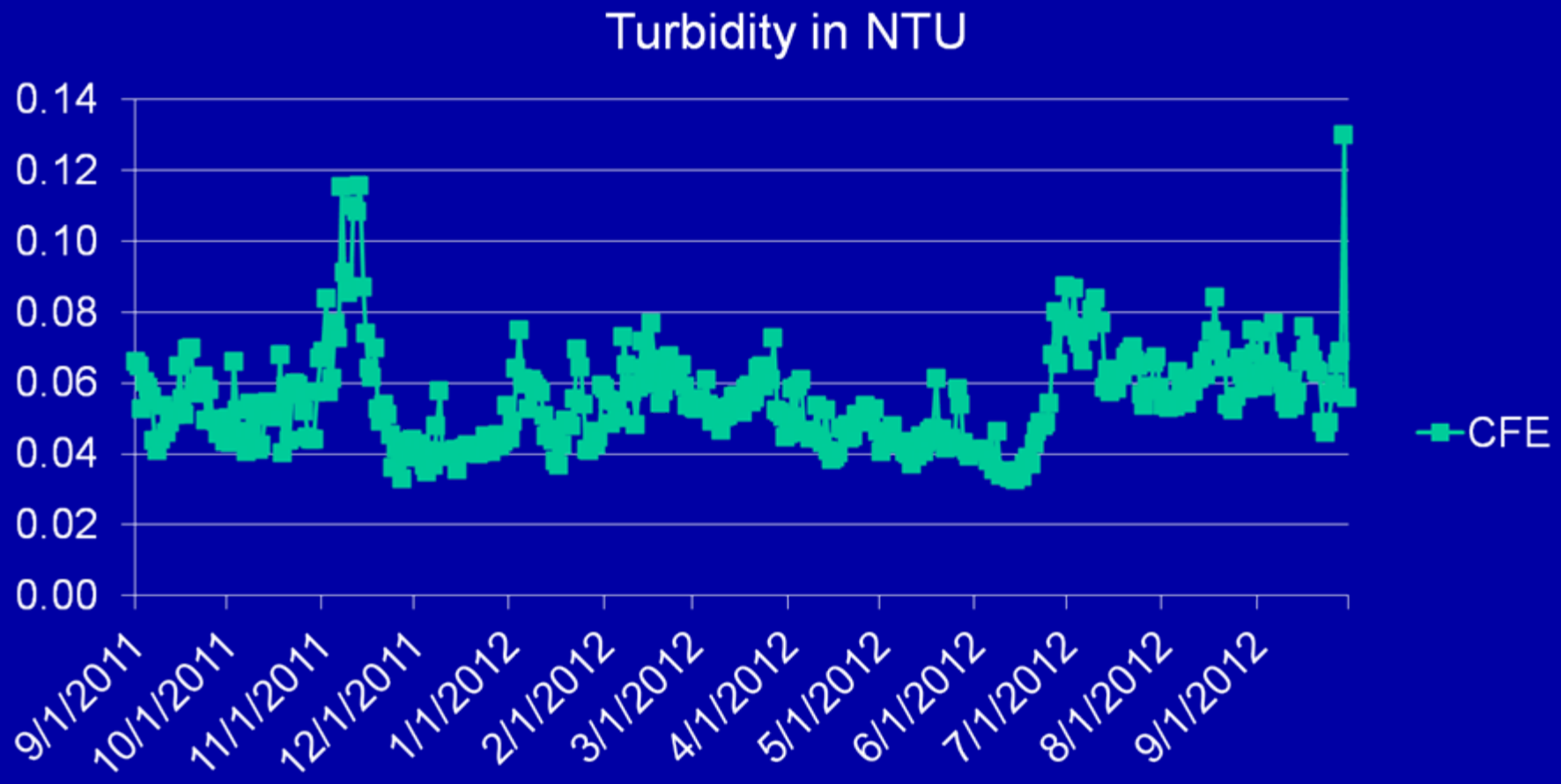
- Combined and individual filter performance
  - Data integrity issues could lead to false conclusions regarding the potential success of these tools
    - Systems could exclude brief turbidity spikes
    - Relies on proper calibration of turbidimeters
    - Relies on proper SCADA programming
  - Oversight necessary to ensure the validity of credit over time

Treatment Performance Tools

- Combined and individual filter performance
  - Difficult to document the basis for log removal credits assigned to these tools
  - Reluctant to award this credit in Iowa due to these issues and conflict with national optimization goals

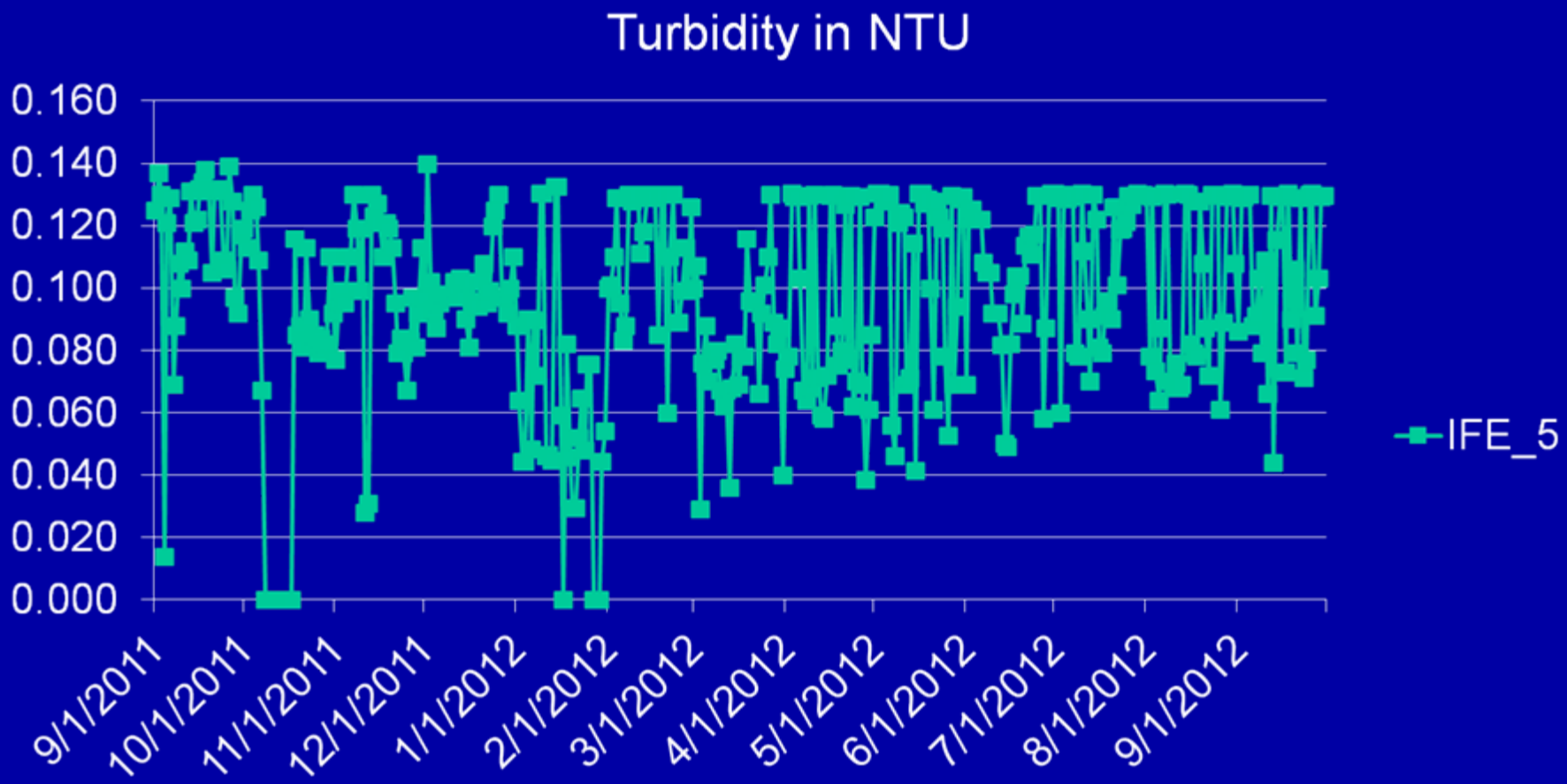
Treatment Performance Tools

Combined filter performance



Treatment Performance Tools

Individual filter performance



Treatment Performance Tools

- Demonstration of performance
  - Requires extensive monitoring and a continuing high level of management at the treatment plant
  - Requires extensive review by the state

Additional Filtration Tools

- Bag or cartridge filters (individual filters or in series)
  - Not presently used in Iowa
  - Challenge Test
  - Safety Factor

Additional Filtration Tools

Membrane filtration

Monthly Operating Form for Pressure Decay Testing (ALCR from Darcy Model)[1]

Low verifiable decay rate (psi/min)			0.04	BP_{max} (backpressure on the system during the test)		83	inches of water	
Month	July	Log Removal Credit		Water System Name		Water System Name		
Year	2012	(LRC)	4	Water System Number		NM35WSSID		
V_{sys} in L		51		Test duration (minutes)		5		
Q_p, Design capacity (L/min)		99		VCF (dimensionless)		1		
UCL (psi/min)		0.06		Total No. of UCL Violations		0		
Elevation - ft above MSL		7000		BP_{max} (backpressure on the system during the test)		3.68	psi	
Atmospheric pressure at elevation (psi)		11.5		Maximum allowable TMP (psig)		30	Y=	0.615
Maximum Temperature		68.0	°F	*Name of Water Operator,* Dated		*5-Aug-12*		

Day	Pressure (psi) Initial	ΔP	ΔP_{test} (psi/min)	Within UCL?	Corrective Action Taken (if required)	Filtrate Flow, gpd (one per month)	TMP (psi)	ALCR	LRV_{DIT}
1	26.1	0.04	0.007	Yes	None Required		30	27.8	5.5
2	25.98	0.05	0.009	Yes	None Required		30	27.8	5.4
3	25.98	0.08	0.016	Yes	None Required		30	27.8	5.2
4	25.96	0.07	0.014	Yes	None Required	14,773	30	27.8	5.2
5	25.74	0.06	0.011	Yes	None Required		30	27.8	5.3
6	25.94	0.05	0.010	Yes	None Required		30	27.8	5.4
7	25.82	0.04	0.008	Yes	None Required		30	27.8	5.5

Fields to be completed by the water system operator

[1] From Membrane Filtration Guidance Manual EPA 815-R-06-009 November 2005, Page 4-50

- 5 of 34 plants in Iowa currently using membranes, none for LT2ESWTR credit

Additional Filtration Tools

- Second-stage filtration
  - Would require large capital investment to treat 100% of production unless system already had second-stage filtration in place
  - 1 of 34 plants in Iowa presently has second-stage filtration capability

Additional Filtration Tools

- Slow sand filtration
  - Not presently used in Iowa
  - Primary filtration
  - Secondary filtration

Inactivation Tools

- Chlorine Dioxide
  - Major disadvantage is ongoing monitoring/sampling/analysis requirements
  - 8 of 34 plants currently using chlorine dioxide in Iowa for DBP control

Inactivation Tools

- Ozone
  - 1 of 34 plants currently using ozone in Iowa

Inactivation Tools

- Ultraviolet light (UV)
  - Tool of choice for both Bin 2 systems in Iowa
  - Requires capital investment and ongoing energy cost, but can fit into an existing footprint, depending on design
  - Additional capacity is relatively cheap, provides additional safety factor
  - Intensive review required by state
    - Large learning curve
    - Ongoing issues with medium pressure UV, such as uncertainty of action spectrum correction factors for challenge microorganisms


ASDWA
Association of State Drinking Water Administrators

Thank you!