

Predicting biosolids chemical concentrations requires identifying and bridging data gaps

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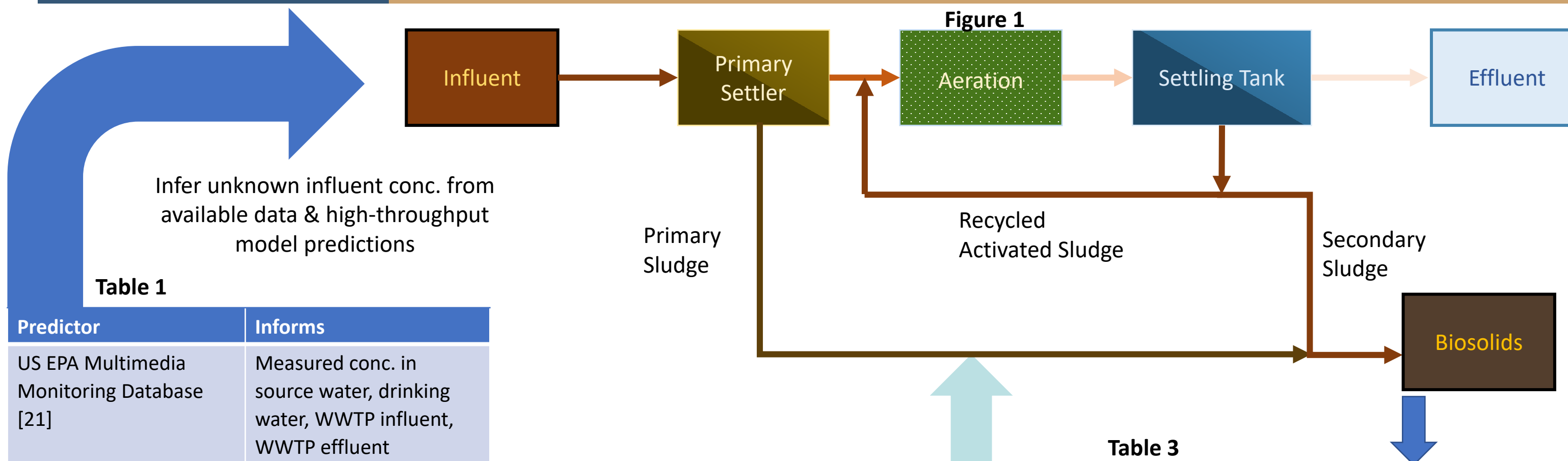


Table 1

Predictor	Informs
US EPA Multimedia Monitoring Database [21]	Measured conc. in source water, drinking water, WWTP influent, WWTP effluent
CompTox Dashboard/OPERA [22]	Phys-chem properties
UP EPA CPDat [23]	Functional use category
SHEDS-HT [24]	Down-the-drain amount
FINE [25]	Down-the-drain amount
EPA Toxic Release Inventory [26]	Industrial release to wastewater

Does param affect this chemical class?

Yes
No
Depends

Table 2

Chemical Class	Temp	pH	Hydraulic Retention Time (HRT)	Sludge Retention Time (SRT)	Microbe Population	Co-metabolism	Biodegradation	Solid-Liquid Partition Coefficient
Metals	[1]	[2]	[2]	[2]	[3]	[2]	[4]	[3]
Antibiotics and pharmaceuticals	[5]	[6]	[7]	[7]	[7]	[7]	[7]	[7]
Consumer Products	PFAS	[8]	[9]	[10]	[10]	[10]	[8]	[9]
	Surfactants	[11]	[12]	[13]	[13]	[14]	[11]	[13]
	PBDE	[15]	[16]	[15]	[15]	[16]	[16]	[15]
Endocrine Disruptors	[17]	[18]	[18]	[18]	[19]		[19]	[20]

Table 3

Training/Test Data	Chemical Classes
US EPA 1988 National Sewage Sludge Survey [27]	Organics, pesticides, metals, and dioxin-like chemicals
US EPA 2001 National Sewage Sludge Survey [28]	Dioxin-like chemicals
US EPA 2009 Targeted National Sewage Sludge Survey [29]	Metals, PAHs, semi-volatiles, inorganic anions, PBDEs, pharmaceuticals, and steroids and hormones

References



Introduction

- Biosolids are an important pathway of exposure to consider in risk-based chemical prioritization
- Current data on chemical concentrations in biosolids is limited, and new chemicals may have no data
- Methods are needed to rapidly predict chemical concentrations in biosolids for substances with limited data.

Discussion

Key Data Gap: Wastewater Treatment Plant (WWTP) parameters vary by plant and affect chemical classes differently. These parameters are a key source of chemical- and WWTP-specific variability in biosolids conc. – yet data on variability are limited or nonexistent

Conclusion

- Rapid predictions of biosolids chemical concentrations should include descriptions of variability across chemicals, across WWTPs, and by chemical class
- Data gaps in WWTP parameters preclude use of detailed WWTP chemical fate models to model variability
- Bayesian inference can be used to determine how to weight different predictors and parameters, and how to quantify uncertainty in model predictions.