Urban Stormwater Runoff Toxicity Testing: Purpose, Findings, and Uncertainties

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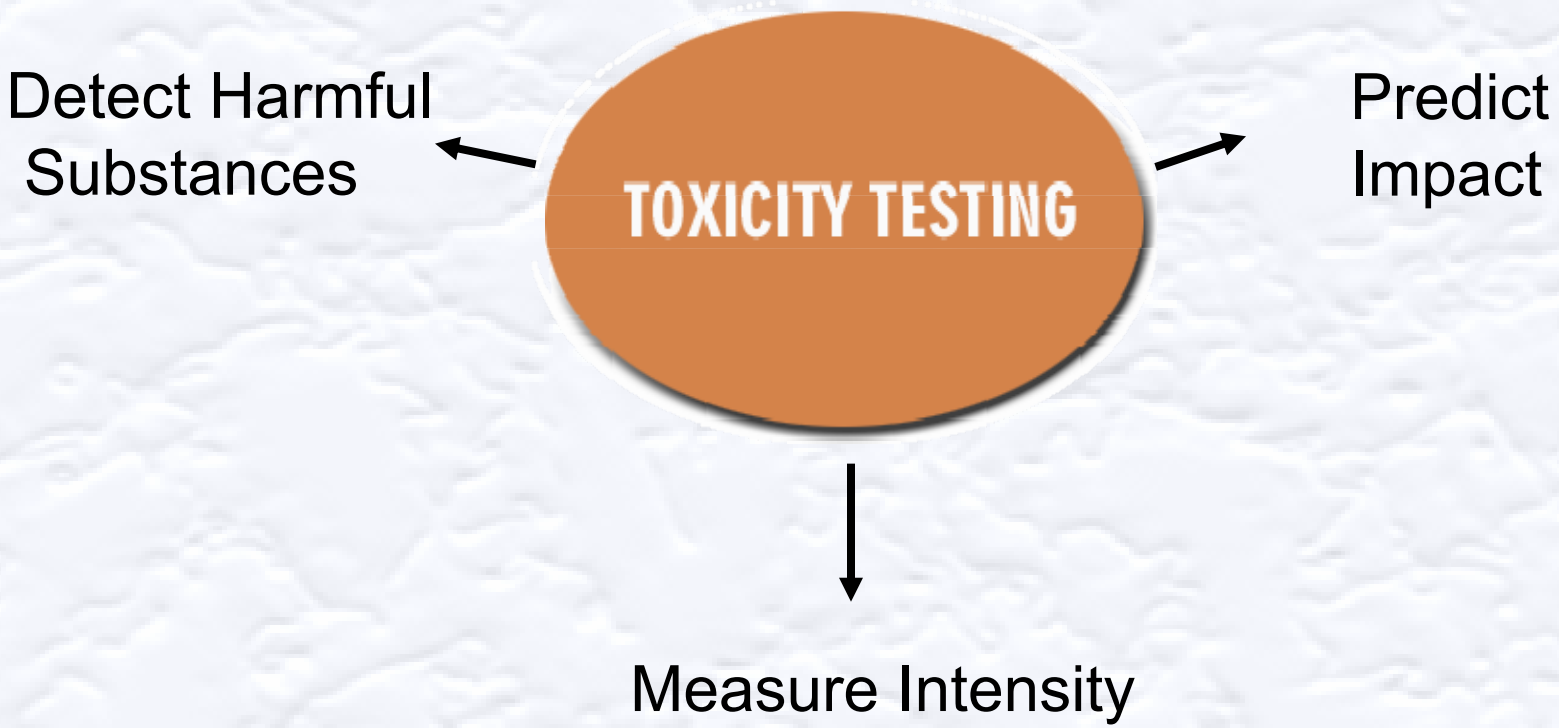
Three major reasons for Toxicity Testing



We can tailor the toxicity test to our purpose

Increase Utility as Regulatory Tool,
i.e., Standardize

But sometimes it pulls us in opposite directions

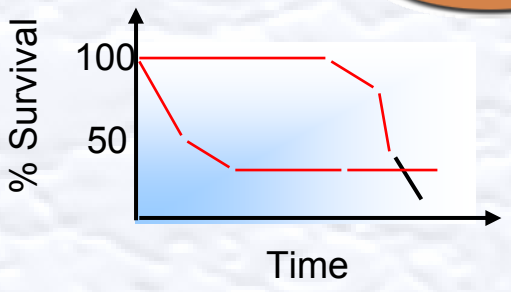
Regulatory purpose: Whole Effluent Toxicity (WET)

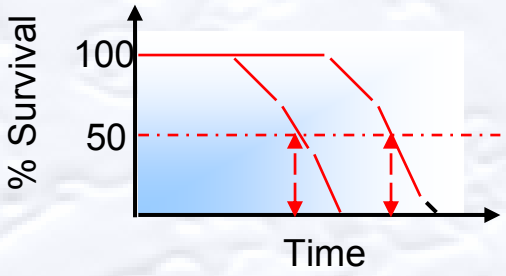
(Detect)

STANDARD DESIGN
STANDARD TEST SPECIES
STANDARD CONDITIONS

WET

(Predict)





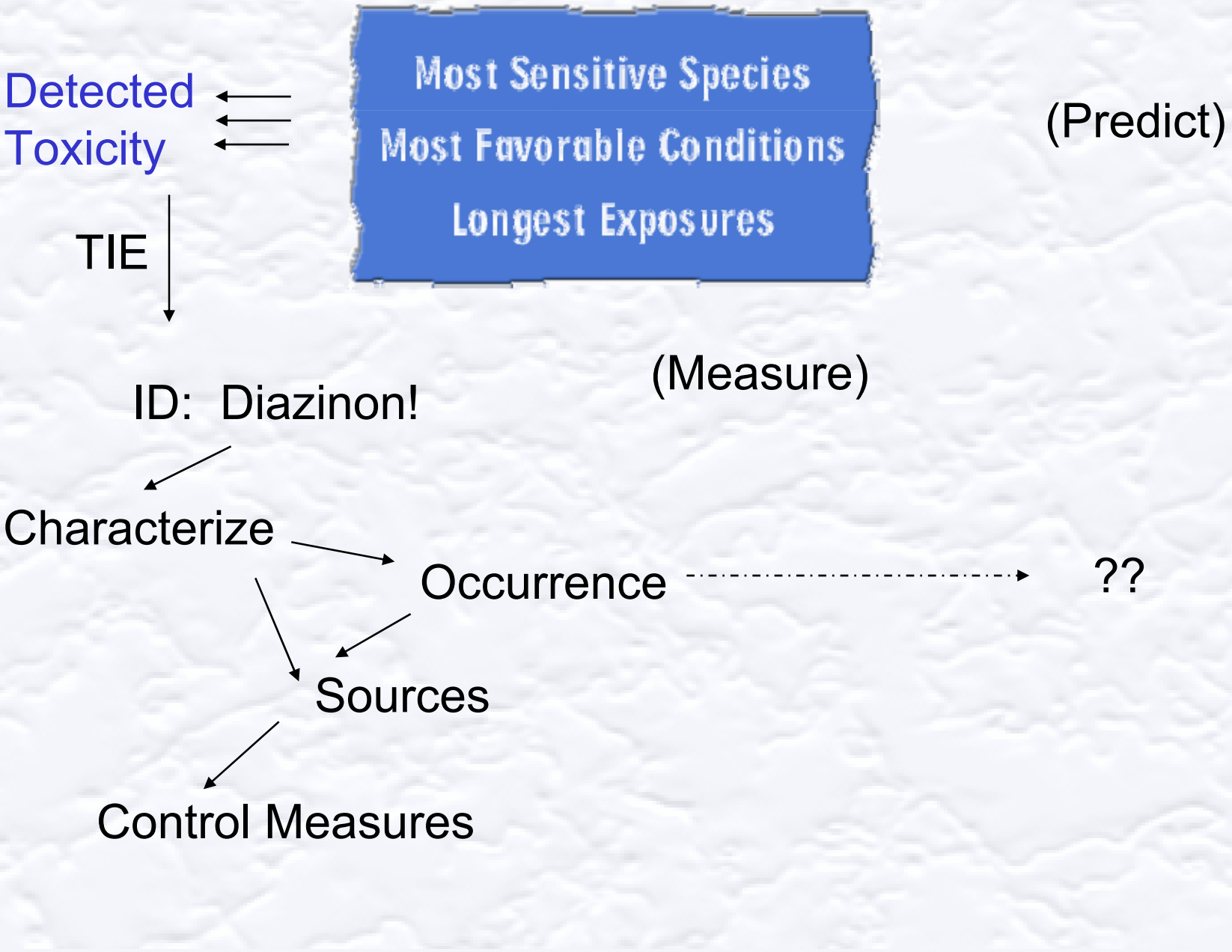
ID ← Shape of Survival Curve → "Saturation"

LT50 → Exposure duration

ID ← OFRD → Population Effect

From WET test results we can learn much more: ID of toxicant, median time to mortality (LT50), Offspring per female per reproductive day (OFRD)

Detect, identify cause, control



Predict impact on aquatic life

(Detect)

Predict Impact

Diminish Uncertainties:

(Measure)

1) Different species (Surrogate/Local)
2) Environmental Conditions (Lab/Field); Temperature!
3) Exposure Duration (days/hrs)
4) Intensity (EMC/Peak)

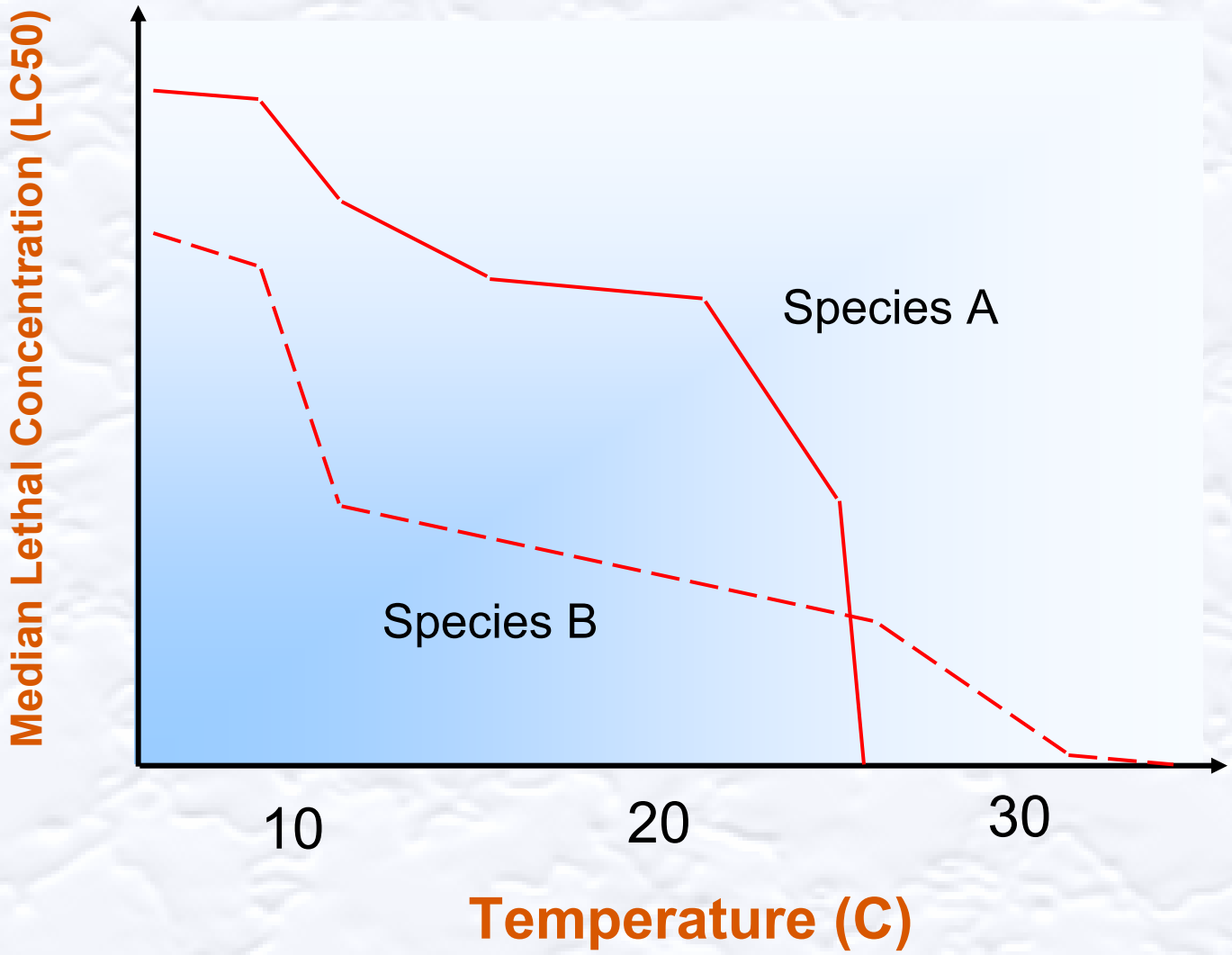
5) Toxicity Endpoints (LC50, LT50, Drift)

Diazinon

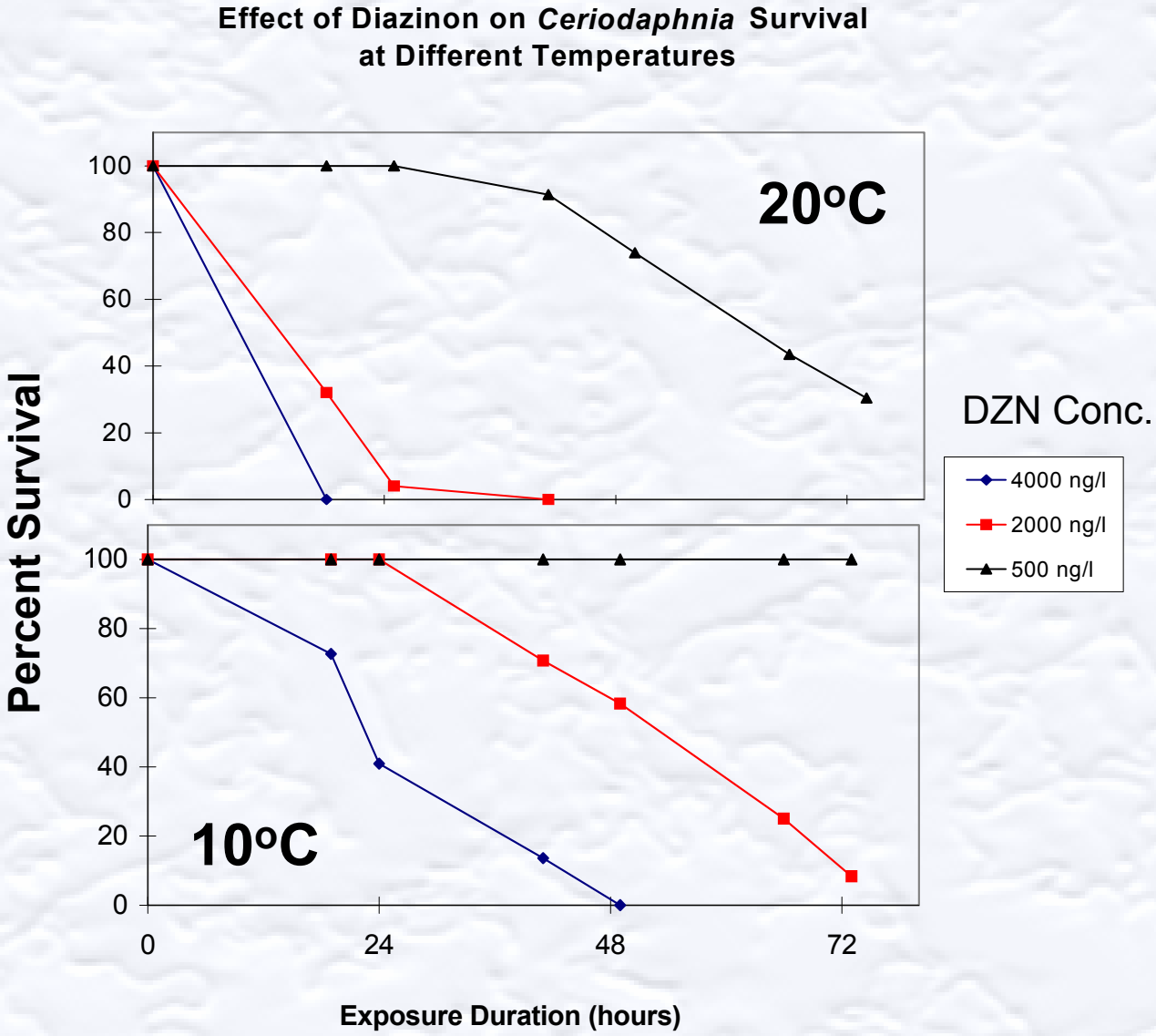
6) Bioavailibility, matrix
7) Additivity, Synergism, Antagonism

8) Sediment Toxicity

Theoretical temperature-dependent response to a toxicant



Ceriodaphnia temperature-dependent response to diazinon (real data)



Ceriodaphnia mortality occurs earlier at the higher temperature

Aquatic Toxicity due to diazinon:

Wet Weather

-- Mass mortality of crustaceans and insect larvae resulting from exposure to pulses of diazinon at winter temperatures is not expected, but there may be mortality among sensitive species

-- Sublethal but detrimental effect on benthic organisms in the creek may cause adverse impact

Dry Weather

-- Unknown

Sediment toxicity:

-- Unknown