



Factors affecting the release of aquatic herbicides from pellets and granules

Brett Wells Bultemeier

Formulations

- The end form of the herbicide
- How the active ingredient is “packaged”
- Determined by chemistry, packaging, ease of use.....

WP

DF

EC

SC

UF

G



Granules

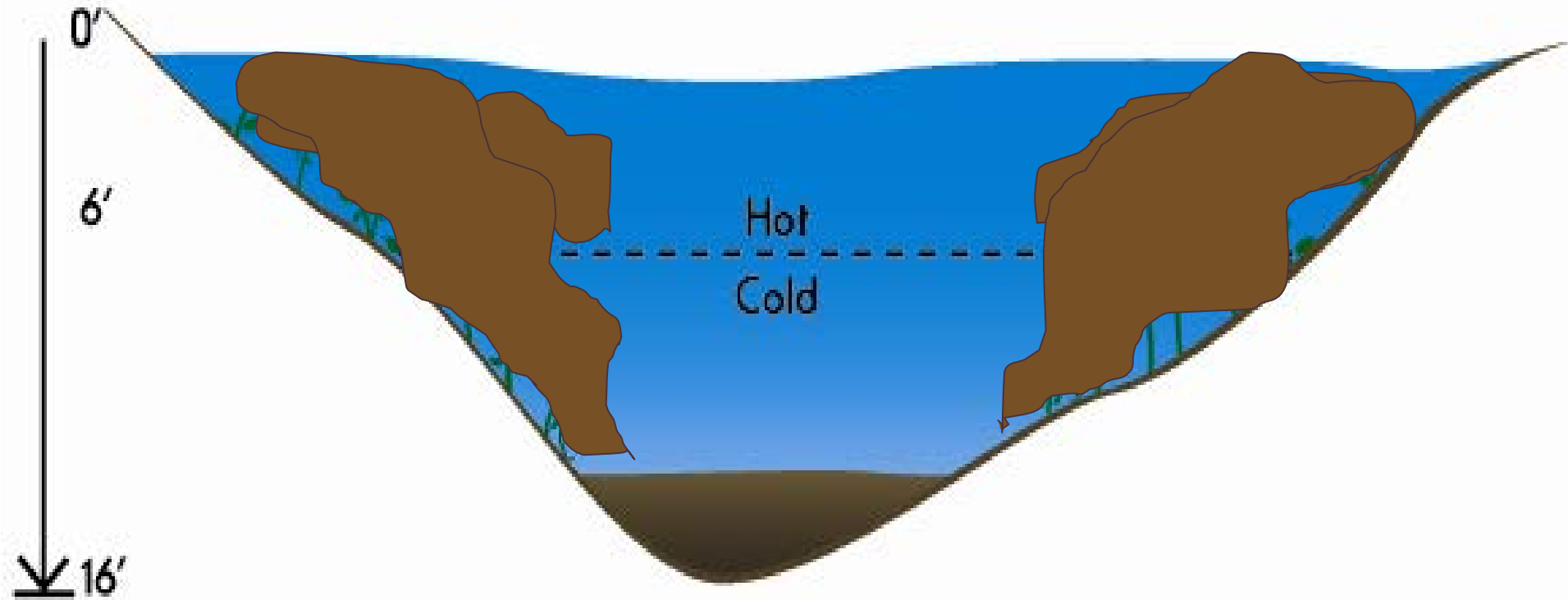


- Granules have been used to control aquatic plants for many years
- Granule = formulation of herbicide where a solid carrier is utilized
 - Clay pellet, granule, polymer etc...

Justifications for use

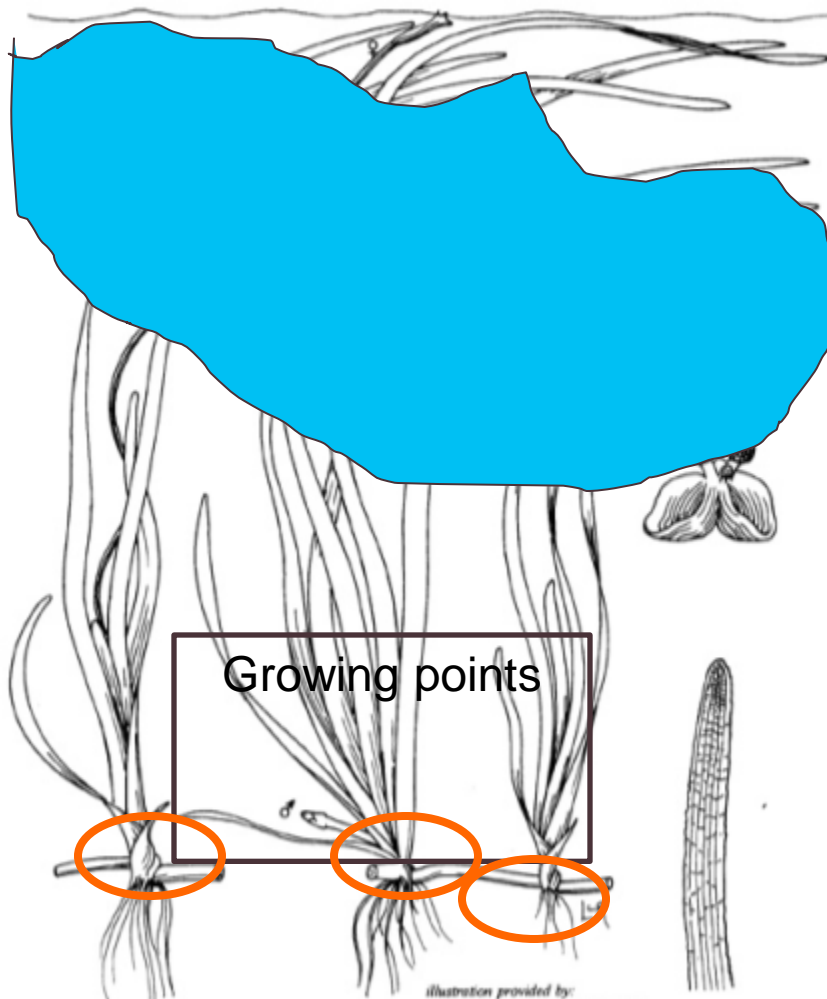
- Will go below the thermocline
- More precise placement?
- Allows an extended release of herbicide?

Thermocline



● Placement

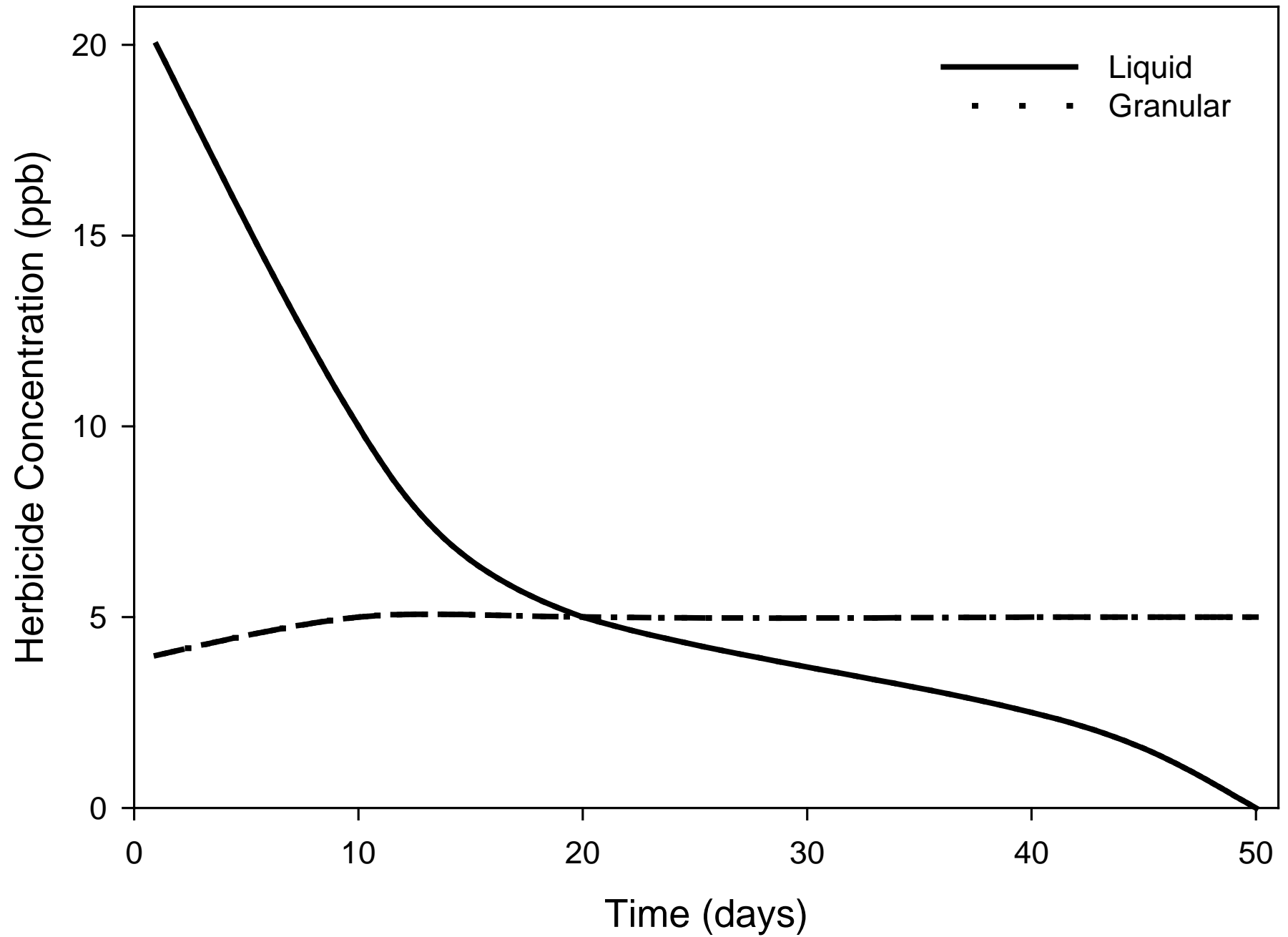
Vallisneria americana
Tapegrass



- Use less herbicide by targeting treatment?
- Keeps herbicide on site, less drift?
- Concentrate herbicide on the bottom?

Extended Release of Herbicide?

- Allows extended release without retreatment
- In flowing water prevents rapid loss of herbicide



Management Focus

- Research focus has been on liquids
- Concentration exposure time (CET) critical
 - How long at what concentration to control plants
 - endothall= short exposure (hrs) high rates (ppm)*
 - fluridone= long exposure (days) low rates (ppb)*

Current list of aquatic granules

- Copper
- Endothall
- Triclopyr
- 2,4-D
- Fluridone
 - Quick to slow release

Products

- Endothall (polymer)- Aquathol Super K
 - high solubility, short exposure, low binding
- Triclopyr (clay)- Renovate OTF
 - medium solubility, medium exposure, medium binding
- Fluridone (clay, extruded clay, polymer)- Sonar Q, One, PR, SRP
 - low solubility, very long exposure, high binding

Objectives

- What is the release of herbicide from granules in static water
- **Quantify the impact that water movement has on the release of herbicide from granules**
- **Determine the impact sediment has on release**

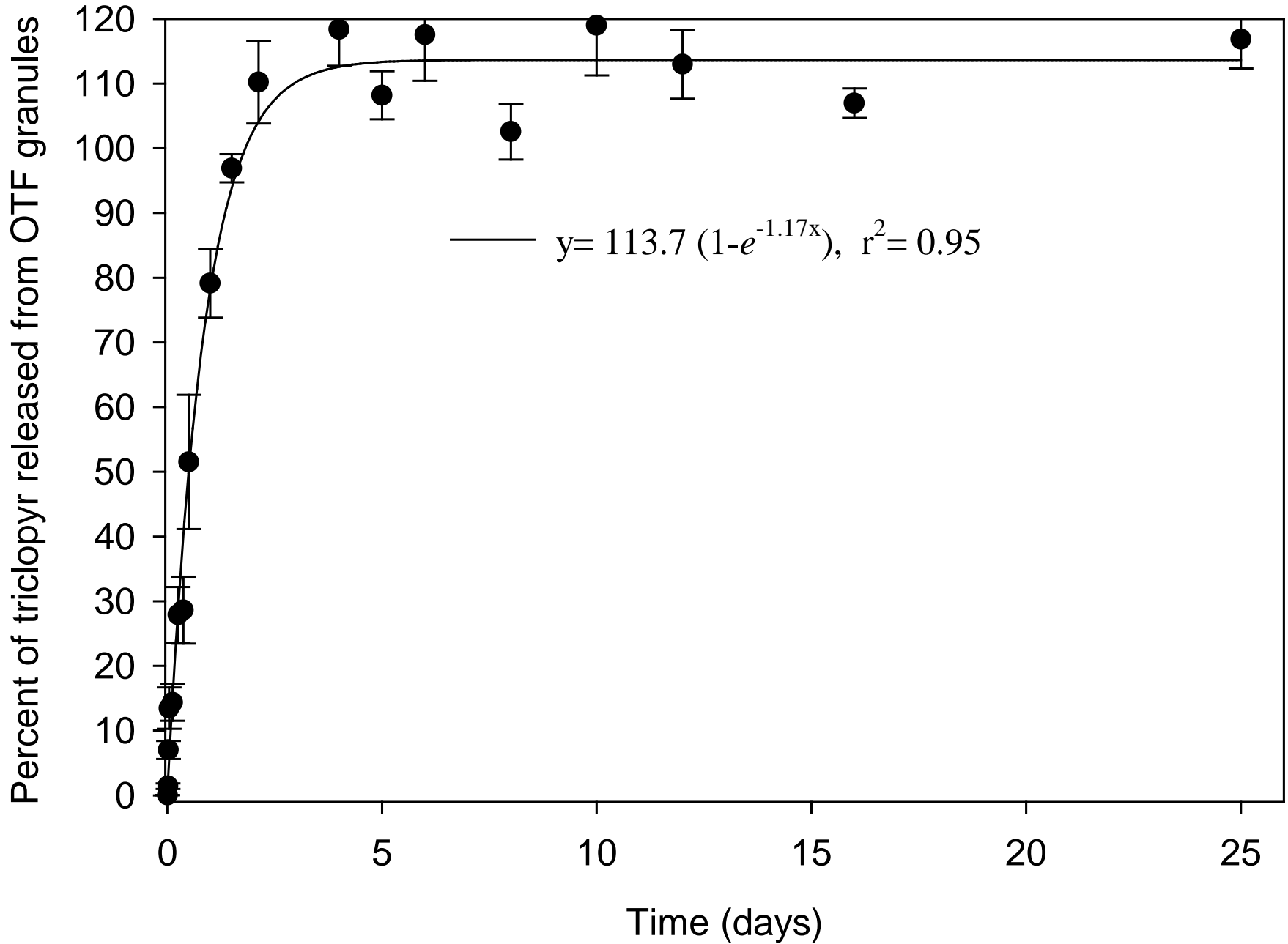
Static Experiments

Static

- Ranged from 12 hrs-72 days for 50% release
- Herbicides differed from each other and fluridone release impacted by formulation

Results

Static



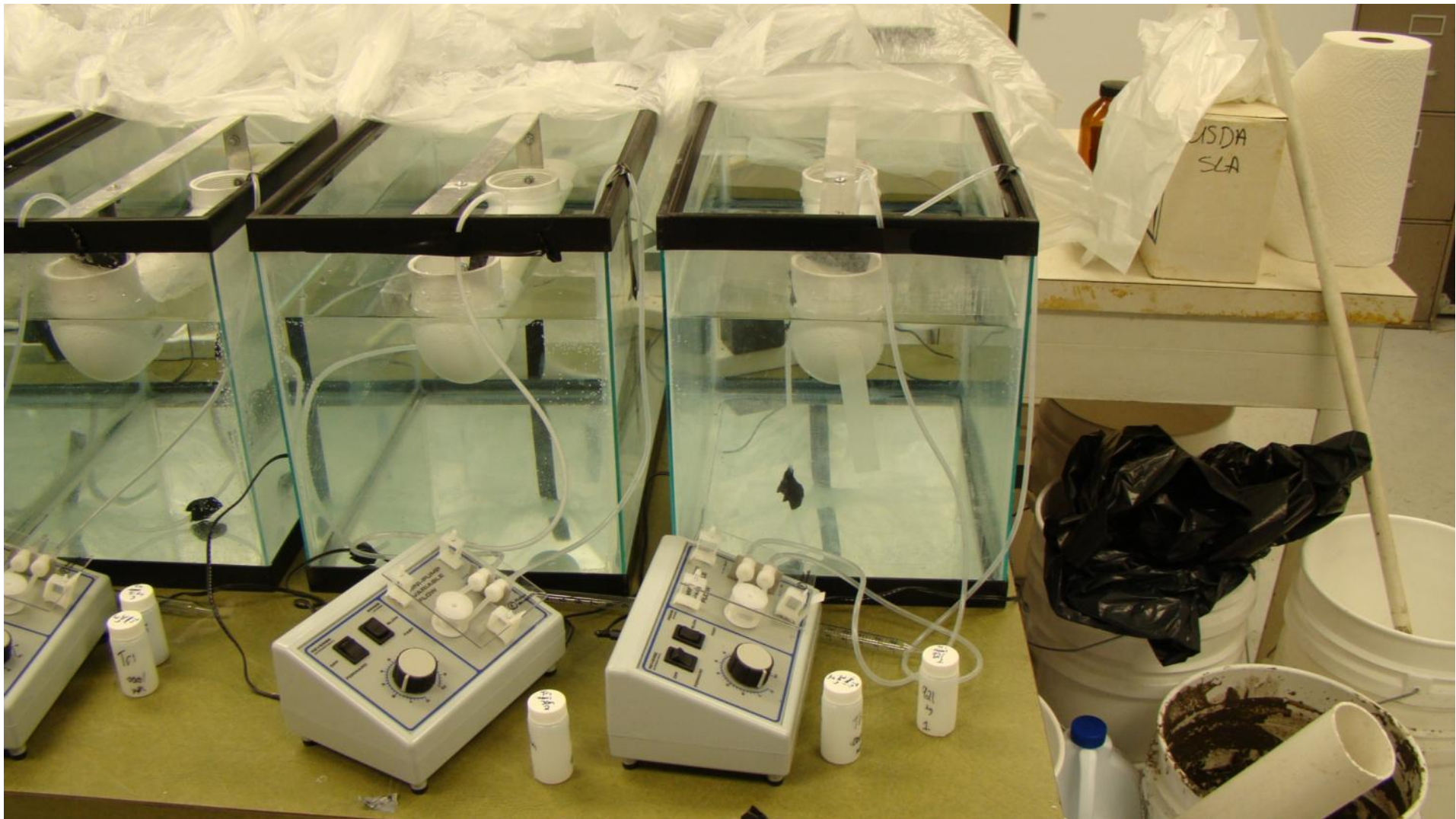
Fluridone

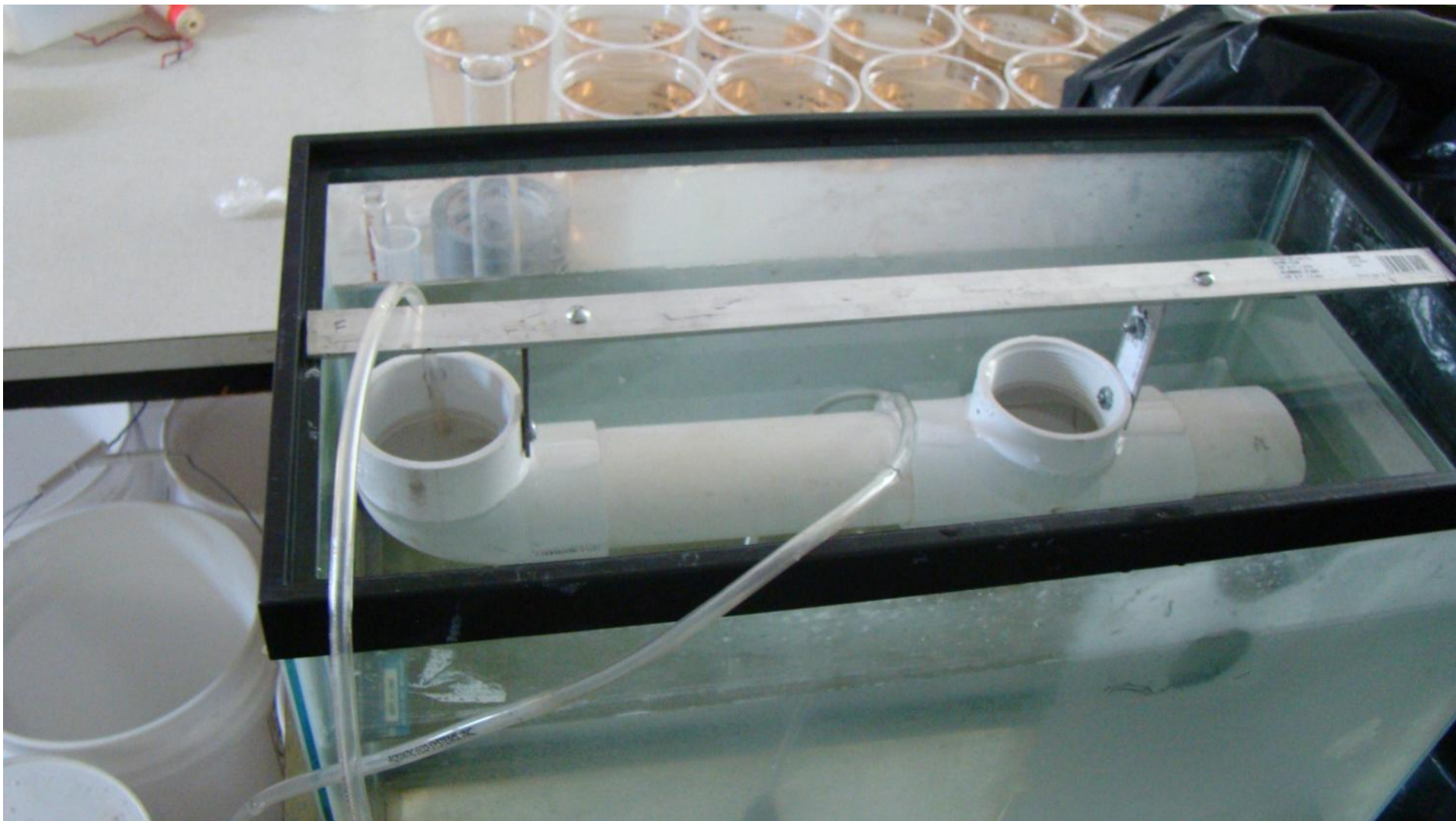
	50%	95%
Sonar Q	27 days	68 days
Sonar PR	12 days	N/A
Sonar ONE	39 days	N/A
Sonar SRP	72 days	N/A

Endothall and Triclopyr

	50%	95%
Endothall	3.5 days	9.9 days
Triclopyr	12 hours	37 hours

Water Movement Experiments





Results

Triclopyr

	50%	95%
Static	12 hours	37 hours
.00001 MPH	9 hours	31 hours
.001 MPH	3 hours	17 hours

MPH

- 0.00001 MPH was 1 turnover per day
 - 1.3 feet per day
- 0.001 MPH is 100 turnovers per day
 - 127 feet per day
- How much water moves in a pond/lake?

Water Movement

- Water movement speeds up release of herbicide
- Boundary Layer?

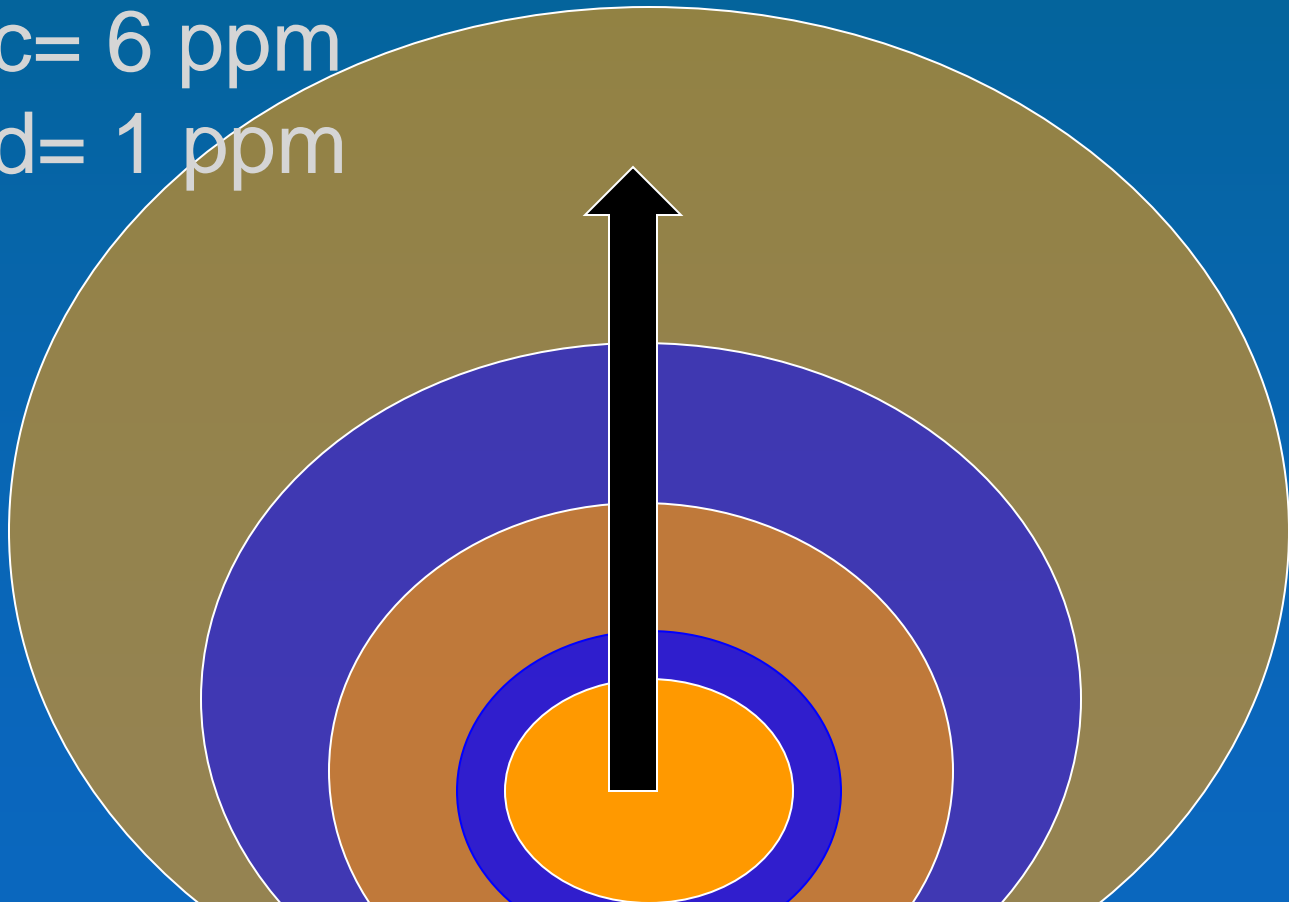
10% Granule= 100,000 ppm; solubility= 10ppm

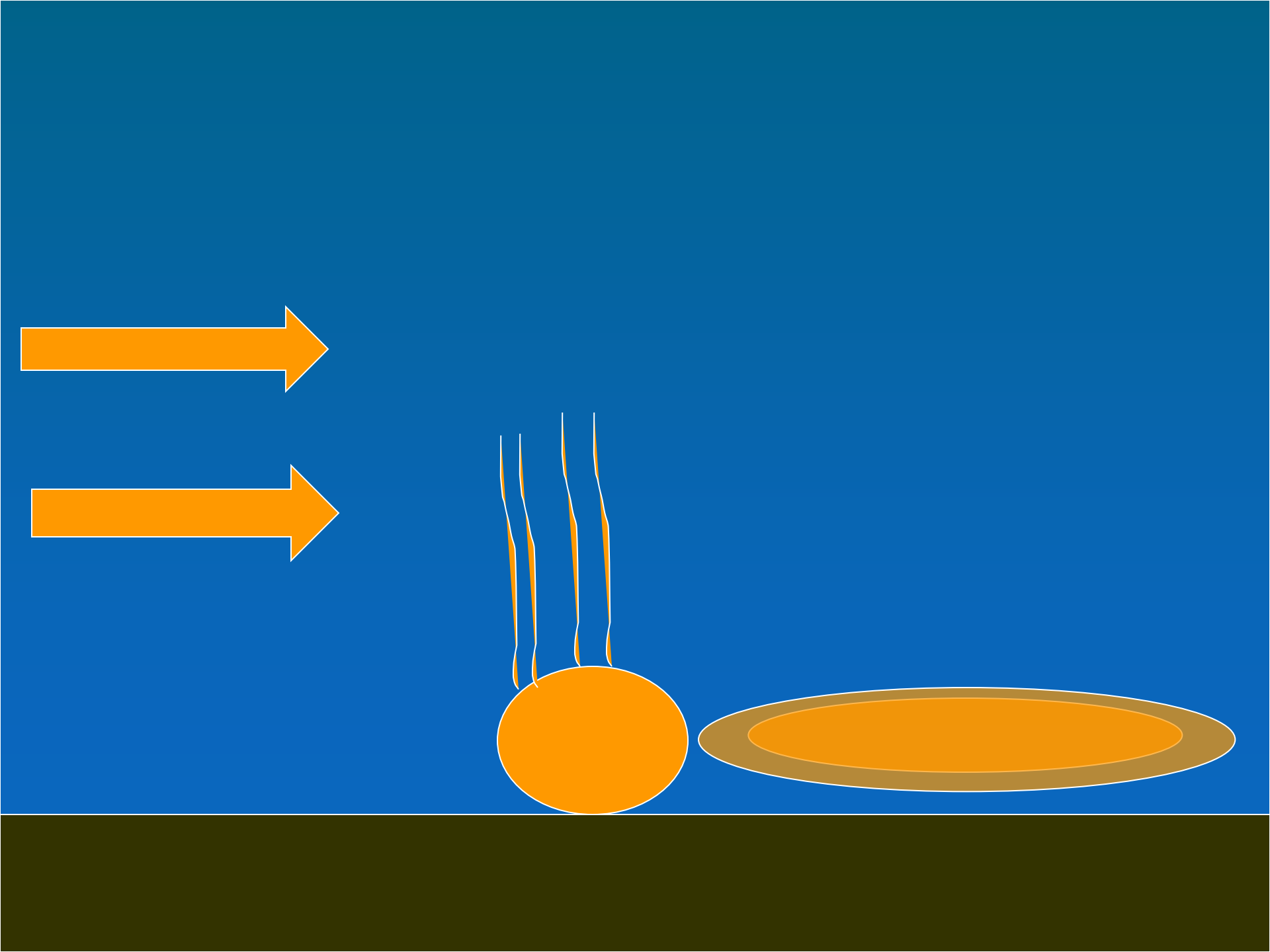
Zone a= 10 ppm

Zone b= 9 ppm

Zone c= 6 ppm

Zone d= 1 ppm





Water Movement

- Water movement speeds up release of herbicide
- Boundary Layer?
- Further flow rates necessary

Sediment Experiments



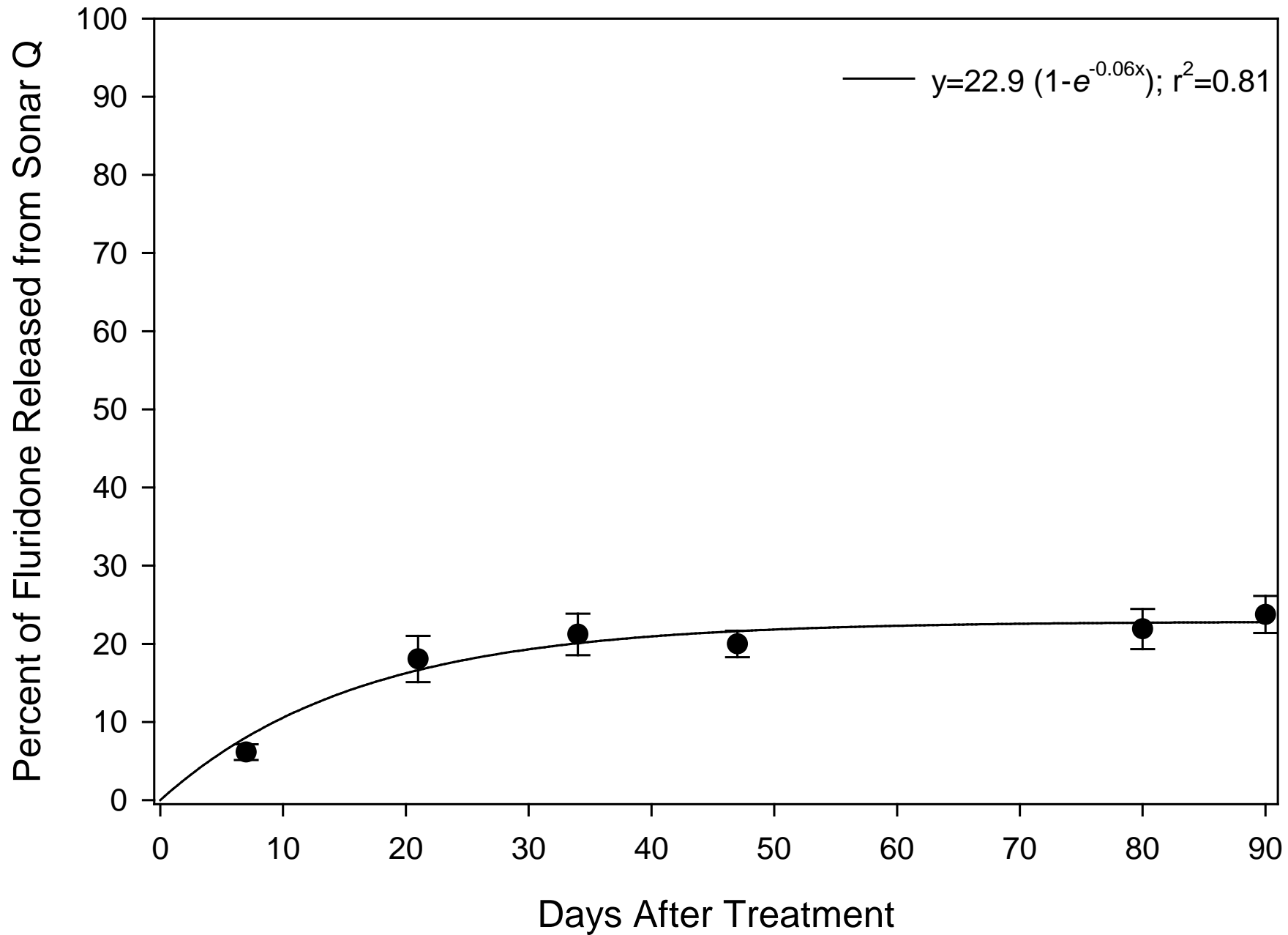


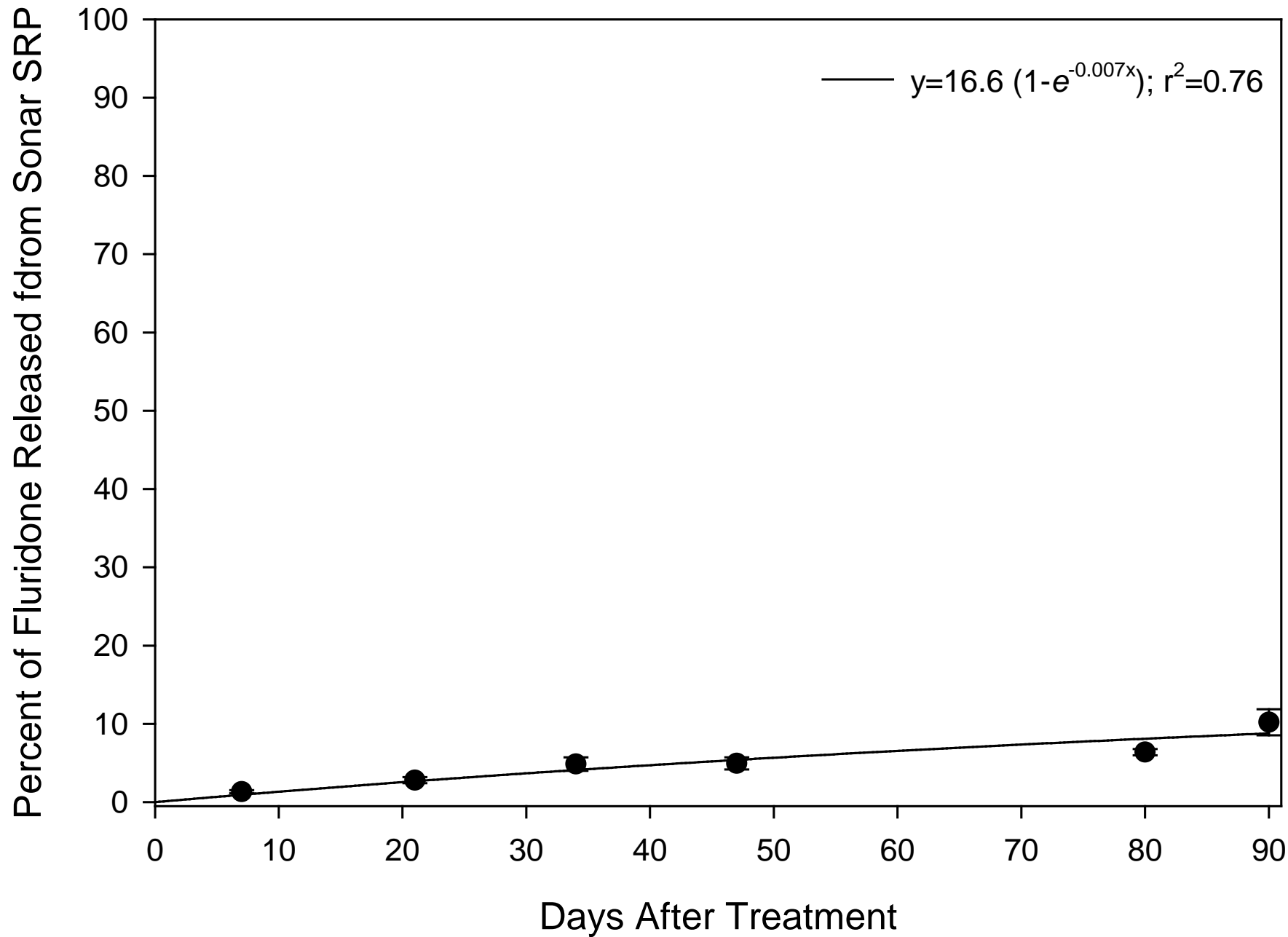


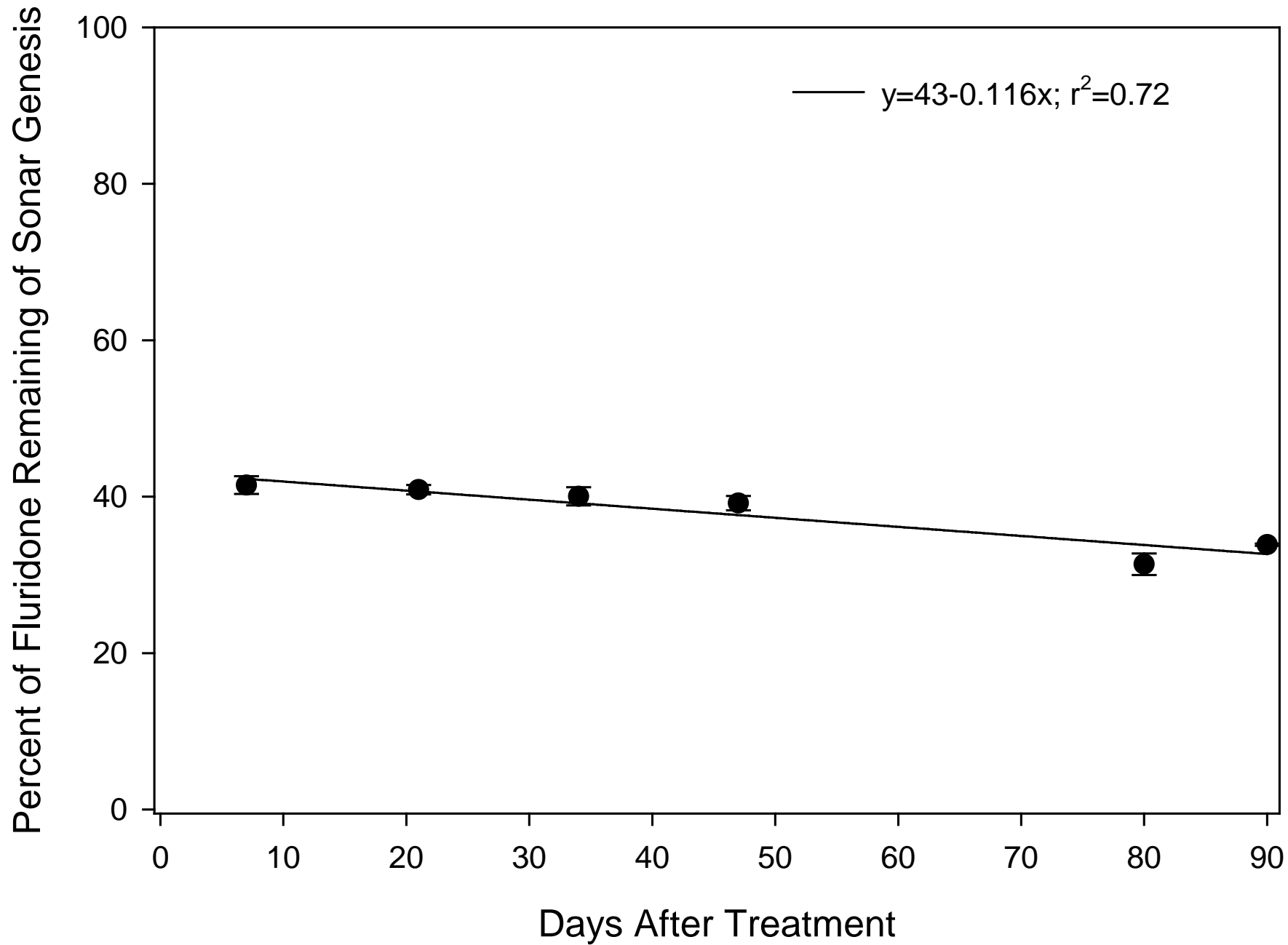
Results

Triclopyr

Herbicide	Treatment	50%	95%
Sonar Q	Static	27 days	68 days
	Sediment	N/A	N/A
Sonar SRP	Static	72 days	N/A
	Sediment	N/A	N/A
Endothall	Static	3.5 days	10 days
	Sediment	8 days	N/A
Triclopyr	Static	0.5 days	1.5 days
	Sediment	2.5 days	11 days



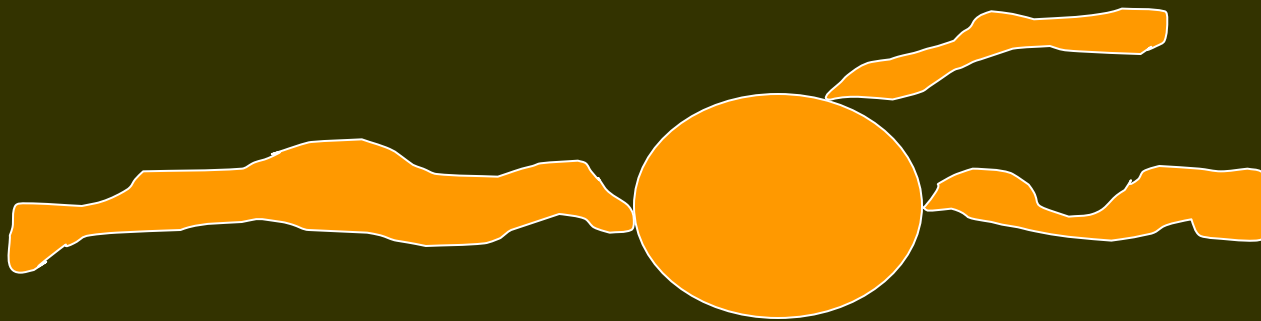




- Liquid
 - >95% of applied remained after 11d (no degradation or binding)
- Even without binding release slowed
 - Triclopyr has a lower Koc
 - What about high Koc products
 - Loss to binding?
- Physical barrier?

Do plant roots absorb herbicide?

Bound to sediment?



Conclusions

- Not all granules created equal
 - Some fast some slow
- Water movement increases speed of release
 - >10x difference at 0.001 MPH
- Sediment at the very least slows release
- 95% release of triclopyr as quick as 17 hrs or as long as 14 days!!!

Accurately predicting CET with granule hard

Why does all this matter?

- Granules have been used for years, they must work
 - Have they always been utilized as efficiently as possible
 - Do liquids and granules cost the same???
- Hard to predict CET

Efficient and cost effective treatments are the goal so you need to know how products work to achieve that goal



Thank you again for your time.

QUESTIONS?