

Reduction of Pesticide Applications Using New Microsponge™ Technology

By

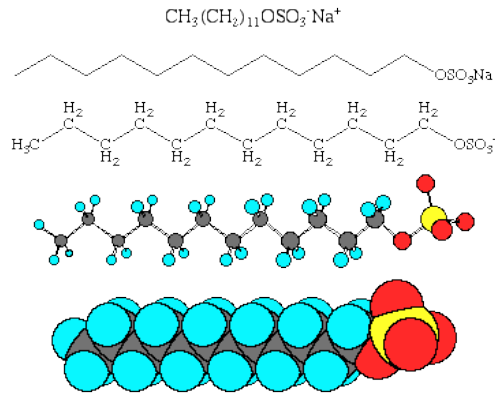
Biosorb, Inc. and Charlotte County Mosquito and Aquatic Control

L. Marshall, Ph.D., R. Lowe

S. Schermerhorn, J. Knezevic, R. Renick, B. Bailey

Current Technology

Surfactant = Molecule



30 Angstroms

Or

30×10^{-10} Meters

Microsponge™ Technology

Microsponge™ = Matrix



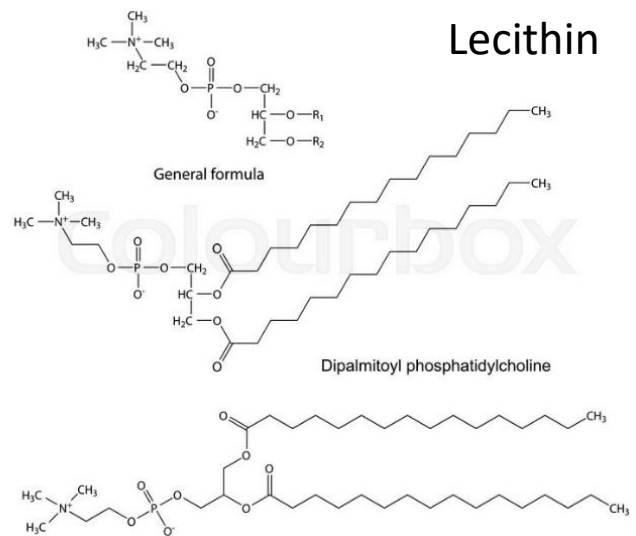
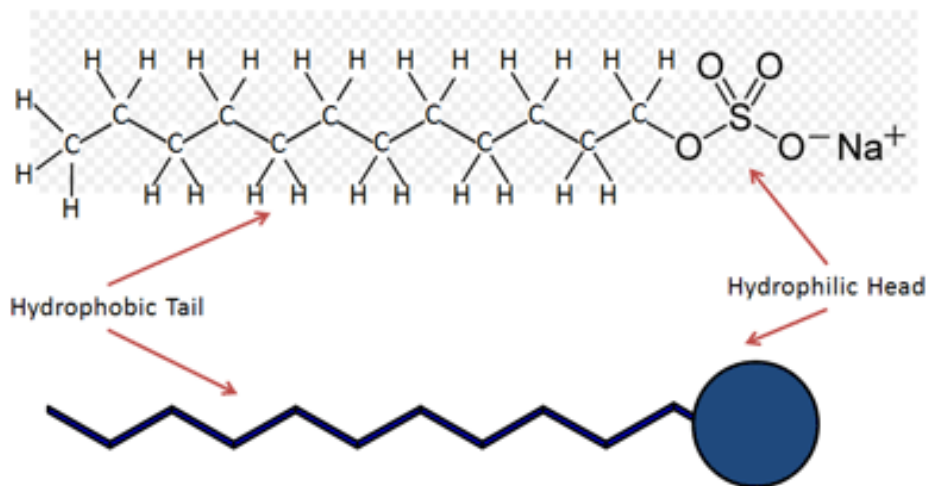
100 Microns

or

100×10^{-6} Meters

10,000 Times Bigger

$\text{NaC}_{12}\text{H}_{25}\text{SO}_4$ = Sodium dodecyl sulfate



10,000 Times Bigger

Microsponge™ Technology



Dry Form
Biocar®

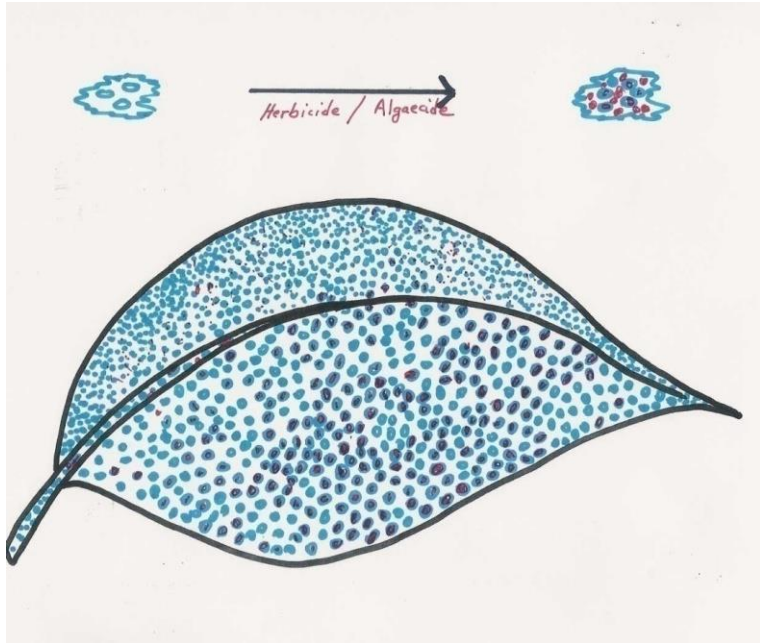


Liquid Form
TopFilm™

Microsponges™ Stick on Waxy Leaf Surfaces

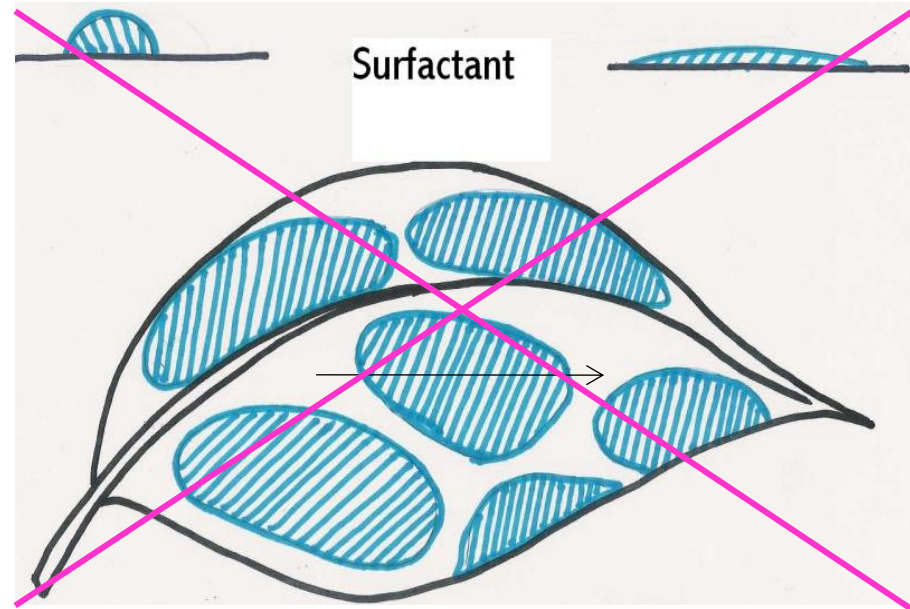


Differences: Microsponge™ vs Surfactants



Microsponge™ Results:

- 1- Increase Contact Time
- 2- Reduce Wash-off
- 3- Maximizes Herbicidal Effect



Surfactant Results:

- 1- Increase surface area
- 2- Increase evaporation surface
- 3- Increase wash-off (water soluble soaps)

Microsponge™ Results: Keeps Herbicide from Washing-off



Herbicide with Microsponge™ Technology



Toxicity of Surfactants to Bluegill

Ref: Haller, W.T. and R.K Stocker,
2003 Environ. Toxicology 22(3):
615-619

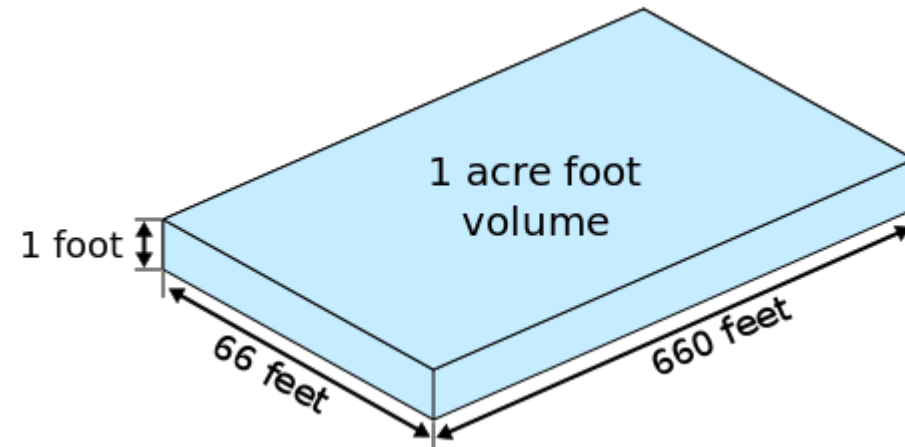
Surfactant Class	LC50 (mg/L)
Tallow Amine	1.6
Alcohol ethoxylates	8.6
Alcohol ethoxylates; Fatty	
Acids	9.0
Crop Oil; ethoxylate	9.6
d-Limonene	10.2
Silicone	19.8
Silicone	26.9
Silicone	29.7
MSO	53.1

How much product in an Acre-foot?

Adding 2.5 gallons
of PRODUCT

= 7.67 ppm

1 Acre-foot = 325,853 gallons
= 1,233,354 liters



325,853 gallons

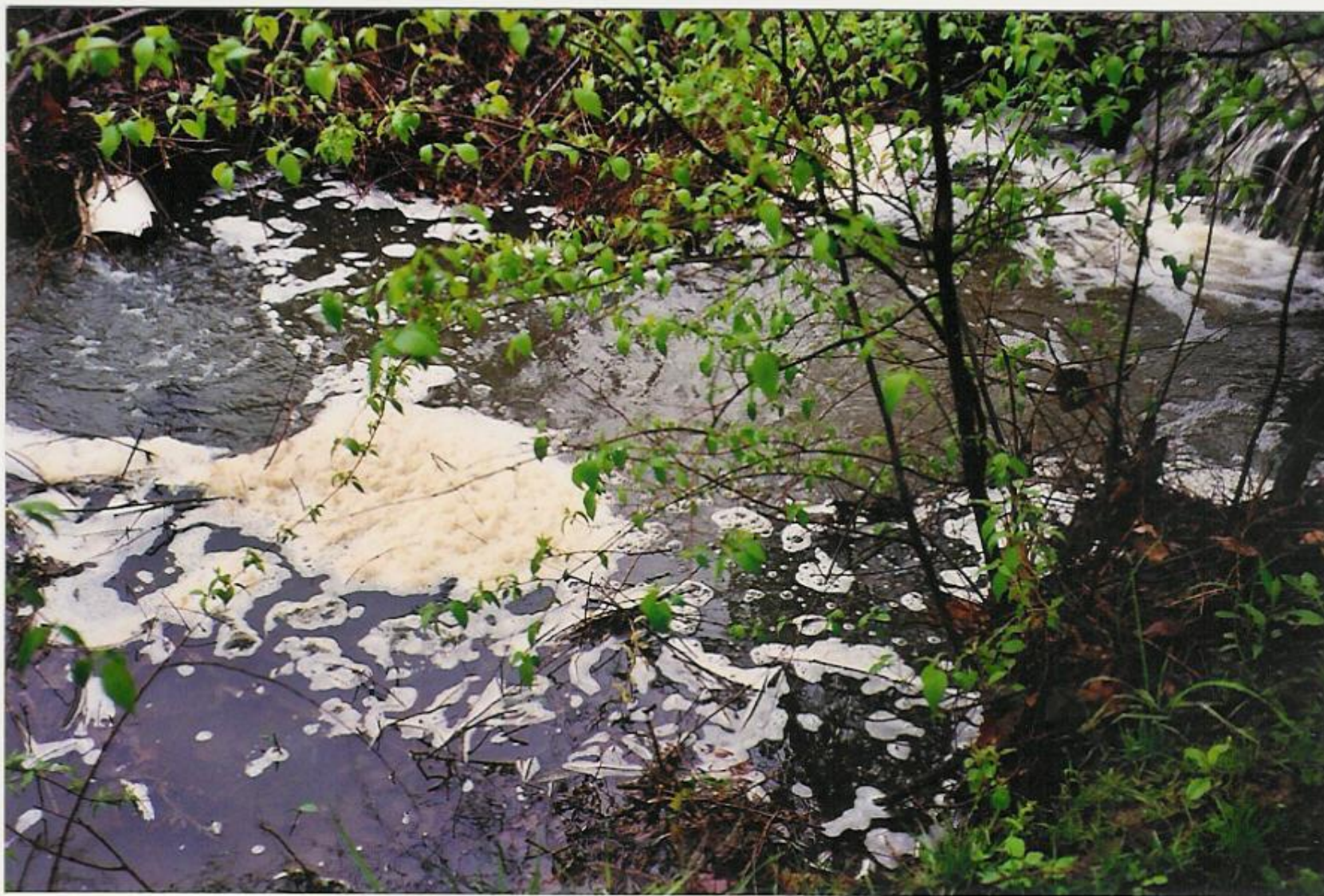
At 8 ppm in a pond :

Class	LC50 (mg/L)
Tallow Amine	1.6
Alcohol ethoxylates	8.6
Alcohol ethoxylates; Fatty Acids	9.0
Crop Oil; ethoxylate	9.6
d-Limonene	10.2



These surfactants will kill fish.

Surfactant Persistence



Stays in waterways

Does not biodegrade readily

Advantage of Microsponges™ over Surfactants

Microsponges™	Surfactant
Lower adjuvant use rate = 1.2 liters/hectare	Higher use rate = 5-6 liters/hectare
“Rainfastness” provided by Microsponge™ suspoemulsion	Soaps wash-off readily ; run-off
“Weatherability” of Microsponge™ endures high heat & UV degradation	Surfactants (soaps) & oils evaporate faster
Less Toxic	More Toxic to Environment

Bioefficacy

Comparison of Surfactant
to Microsponge Treatments
in Field Conditions

Charlotte County Division of Aquatic Weed Control

- * Charlotte County Florida was founded April 23, 1921 and named for Charlotte Harbor.
- * Charlotte County is bordered by Sarasota County on the North and Lee County on the South. The west coast is the Gulf of Mexico.
- * Approx. 26.8946° N by 81.9098° W
- * The County is 858 mi^2 of which 680 mi^2 is land and 178 mi^2 , or 20.7% is water.
- * Two units, Mosquito and Aquatic Weed Control are a Division within the Department of Public works and employs 26 individuals.
- * The Division oversees 1,890 surface acres of Fresh water canals, and over 800 acres of Mitigation sites, Right of way and misc. county parks.



Invasive Aquatic Weeds Managed By Charlotte County Florida Using Biosorb Microsponge Products - TopFilm™

Emergent weeds

Primrose (*Ludwigia hexapetala*)
Cattails (*Typha latifolia*)
Alligator weed (*Alternanthera philoxeroides*)
Spatterdock (*Nuphar advena*)

Submerged

Hydrilla (*Hydrilla verticillata*)
Ambulia (*Limnophila sessiliflora*)
East Indian Hygrophila (*hygrophila polysperma*)
Bladderwort (*Utricularia aurea*)

Floating

Water Lettuce (*Pistia stratiotes*)
Duckweed (*Lemna minor*)
Water Hyacinth (*Eichhoria crassipes*)
Salvinia (*Salvinia minima*)

Upland Vegetation

Brazilian Pepper (*Schinus terebinthifolius*)
Melaleuca (*M. quinquenervia*)
Australian Pine (*Casuarina equisetifolia*)
Rose Myrtle (*Rhodomyrtus tomentosa*)

Algae

Musk grass (*Chara*) Blue-green (*Cyanobacteria*) Filamentous Species





Glyphosate 96 oz, Top Film 16 oz, 100 gal Water



6 Days post treatment



12 Days Post Treatment



15 Days Post Treatment

Advantages of using TopFilm™

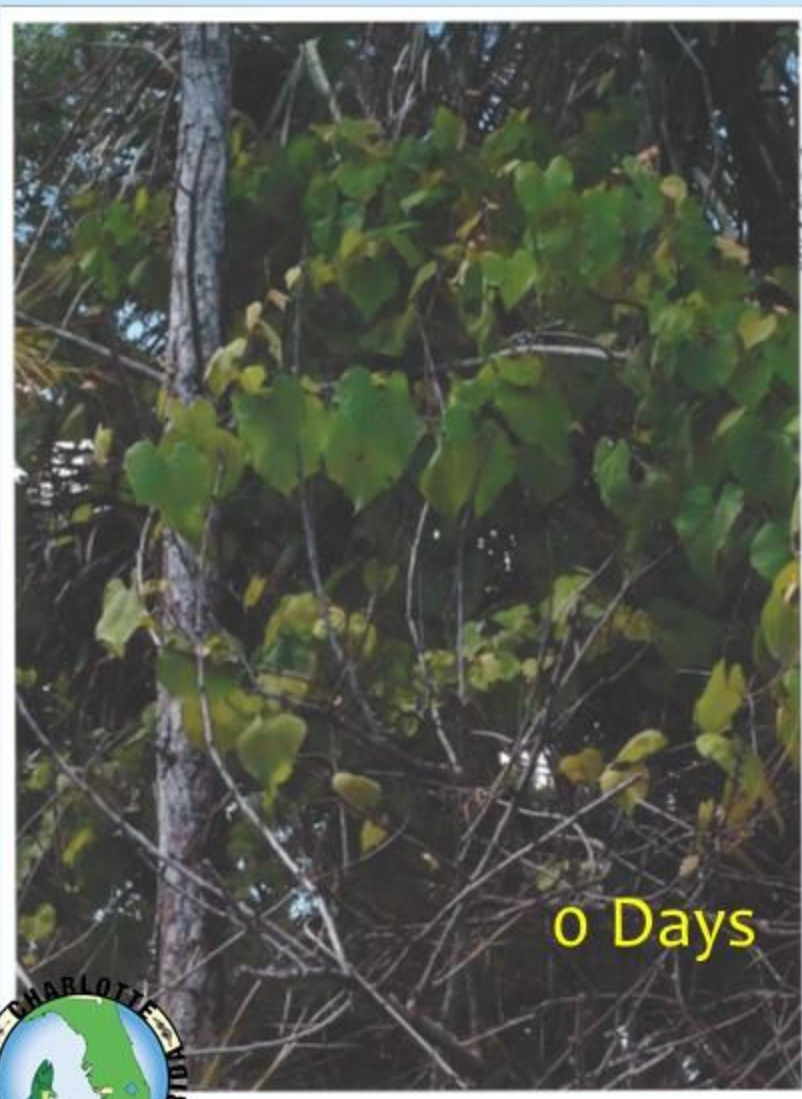
It is a micro sponge that keeps the herbicide active ingredient in contact with plants longer. This makes the herbicide more effective and reduces our need to retreat at a later date. It creates a faster kill, with less herbicide therefore our costs are less

It is all natural

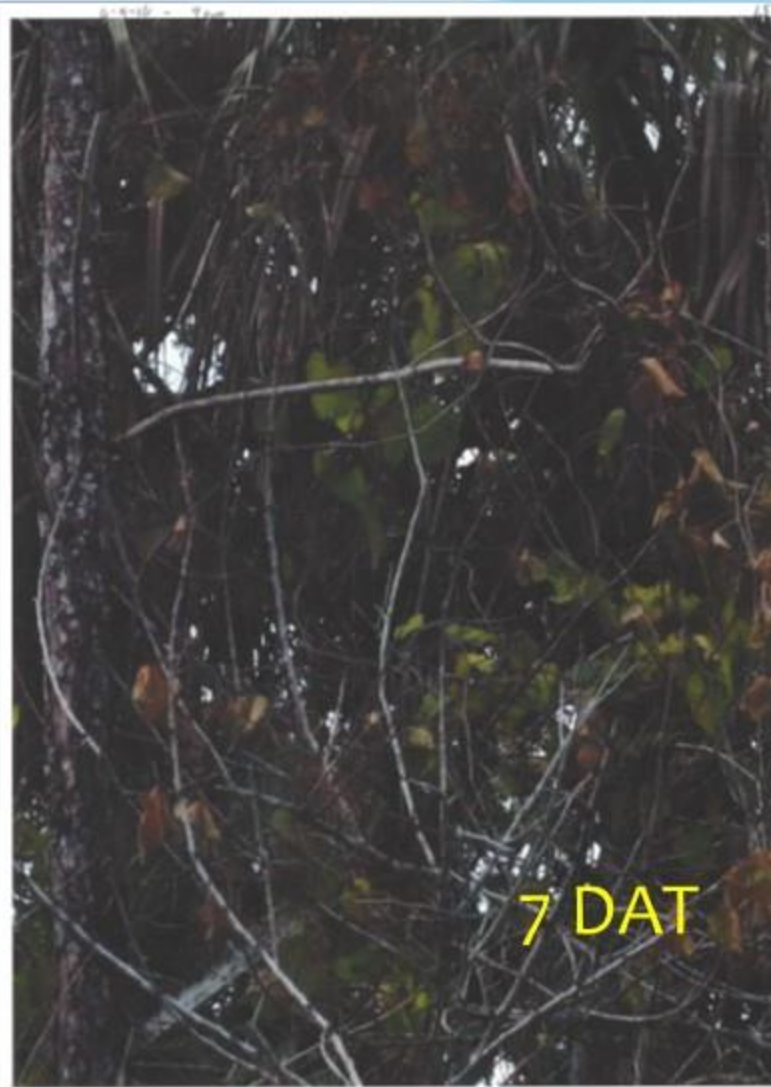


Vines – Herbicide Treatment Progression

Pre-Treatment 6/2/2016



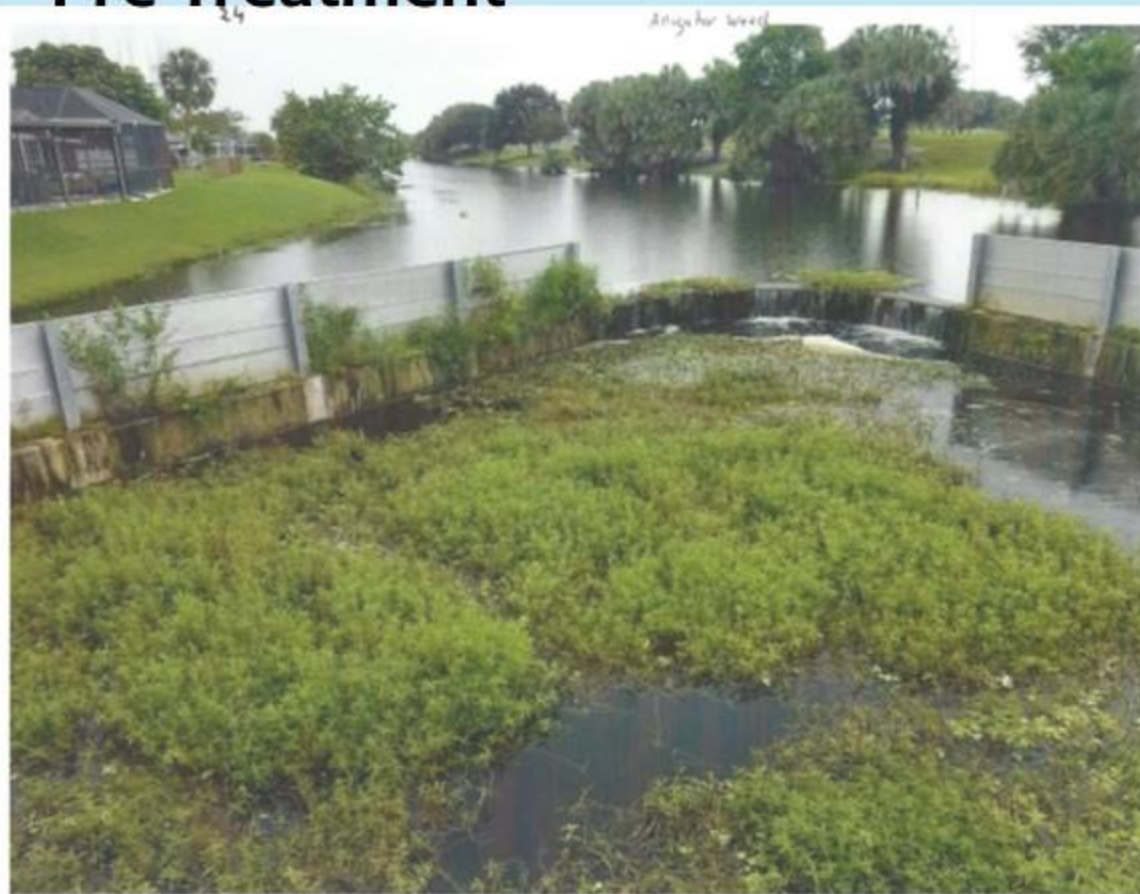
Glyphosate with TopFilm™ 6/17/2016 – 15 DAT



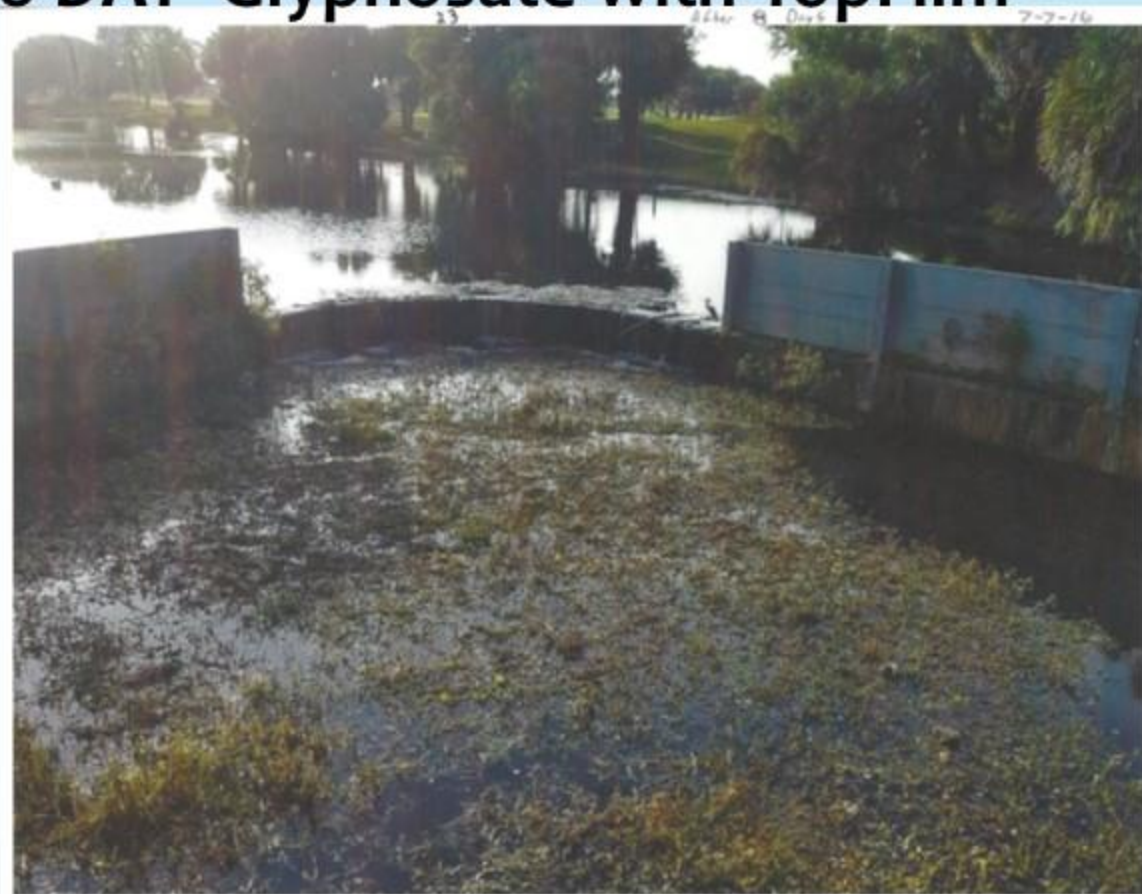


Alligator Weed

Pre-Treatment



8 DAT Glyphosate with TopFilm™





Cattails Treated with Glyphosate & TopFilm™

Pre-treatment 6/2/2016



6/17/2016 - 15 DAT -Glyphosate with TopFilm™





Water Primrose

Triclopyr with TopFilm™ - 9 DAT



Triclopyr with TopFilm™ - 9 DAT



Charlotte County TopFilm™ Usage and Results

Charlotte County Aquatic Weed Control examined the usefulness of microsphere technology, specifically TopFilm™ on several common invasive weeds. Further a pond in a park area was transected and treatments were performed with glyphosate alone, glyphosate and a nonionic surfactant, and Glyphosate with TopFilm™ at two concentrations. Kill dates were monitored for each transect and repeated in two other area ponds.



Oyster Park Charlotte County Pre-treatment



August 2017

Oyster Park Charlotte County 9 DAT Glyphosate with non-ionic surfactant 64oz

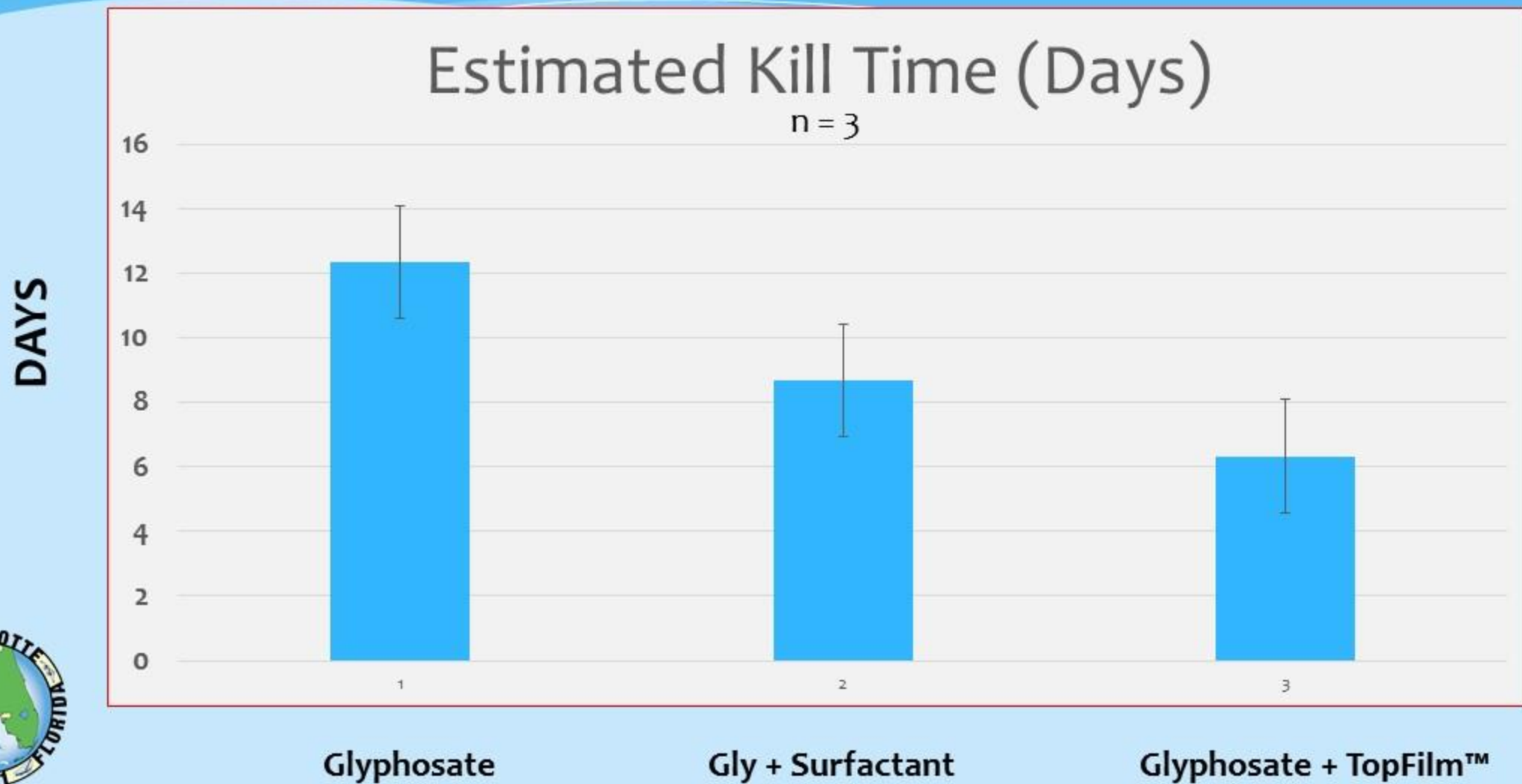




Oyster Park Charlotte County 7 DAT Glyphosate With TopFilm™ 8 oz



Comparison of Kill Time Using Three Formulations on Aquatic Weed Assemblages in Oyster Park





Price Comparison for 100 Gallons of 0.75% Glyphosate with Various Adjuvants



Results / Conclusions

- **TopFilm™** is very useful on hard to control aquatic weeds: Water Primrose and Alligator Weed.
- **TopFilm™** sticks to reeds, maximizing the herbicide active ingredients effect on cattails.
- **TopFilm™**'s adherence properties makes herbicides stick on hard to kill vines, i.e Kudzu.
- **TopFilm™** decreases kill times and reduces retreatment applications.
- **TopFilm™** reduces the spray tank volume. For example, standard surfactant is used at 32 oz per 50 gallon tank mix; whereas, **TopFilm™** was used at 8 oz per 50 gallon tank mix.
- **TopFilm™** is very effective when used at half recommended volume. 8oz/100g vs 16oz/100g
- **TopFilm™** is out-performing current surfactants, keeping treatments from washing-off.
- **TopFilm™** use may cut the required concentration of herbicides, increasing cost effectiveness.

