



Excessive Duckweed Causes Problems for Wastewater Treatment in Lagoons

That green stuff all over some wastewater lagoons is not algae like most people think of algae. It's duckweed.

Duckweed is a floating, flowering plant without stems. Duckweed grows at a phenomenal rate. Under good conditions duckweed can double its biomass in less than 24 hours. This means it can cover an acre of water in less than 45 days. Too much duckweed can adversely affect the treatment of wastewater stabilization ponds.

Because it floats on the surface, duckweed blocks the sunlight, which reduces the bacterial activity and results in lower dissolved oxygen levels in the lagoon. Maintaining good wind action will help control duckweed. I have had systems contact me, as well as referrals from the Kansas Department of Health and Environment (KDHE) to assist systems that have failed permit limits on a regular basis. Those systems (and KDHE) are anxious to meet the limits before the agency has to issue a "Letter of Compliance". The permit failures were possibly caused by duckweed.

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Duckweed is usually brought into the lagoons by waterfowl or other animals. It is high in protein and is eaten by waterfowl. Some studies are even being conducted by the Department of Energy to use duckweed as a bio-fuel source; duckweed has five to six times as much starch as corn. It is also considered a carbon-neutral energy source, because it removes carbon dioxide from the atmosphere and it also

uptakes nitrogen and phosphates.

Concerning the cases of wastewater permit failures, my first visit to the lagoons often reveals what the problem is. In some cases, the lagoons are covered with duckweed. And by "covered" I don't mean just a little bit of duckweed in the corners or around the edges of the lagoon cells; the lagoons were completely covered with duckweed.

In most cases, some duckweed can be tolerated. This is particularly so for the final cell as it can assist in reduction of Total Suspended Solids (TSS) caused by algae. The duckweed cover reduces sunlight which in turn reduces algae growth, which can sometimes be a cause of TSS in the effluent.

Complete coverage of the primary and secondary cells with duckweed can have an adverse effect on the BOD because algae are needed to produce oxygen to properly treat the waste. Excessive duckweed can also result in issues of odors; extreme coverage can cause anaerobic conditions. The table by Kansas State University “Aquatic Plants and Their Control” provides the names of the aquatic herbicide and trade name and effectiveness of control for the various aquatic weeds that are being targeted.

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spraying the herbicide will initially require two or three applications per week to control it. Later the frequency of spraying can be reduced to keep it under control. Remember, duckweed reproduces quite rapidly so controlling it may be time consuming in the first few weeks.

I was recently at a city that had excess duckweed on the lagoons; that city was also having issues meeting permit limits. They began using a herbicide after receiving permission from their KDHE district office. Within

Wastewater operators should remember to check with the respective KDHE district office prior to using any herbicides in or near the wastewater stabilization ponds. Several wastewater systems have resorted to using nets and other types of home-made mechanical devices to remove duckweed. That method is extremely labor intensive. Even

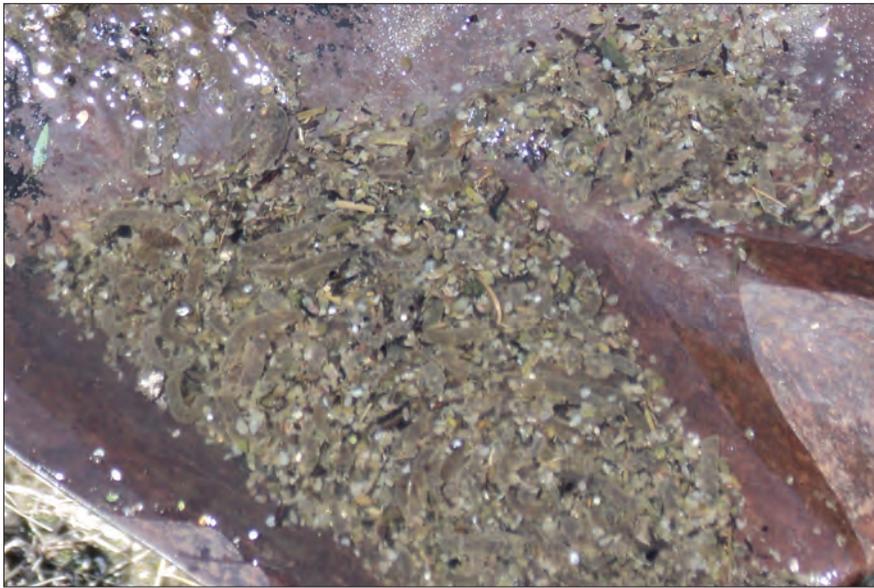
two weeks there was a noticeable reduction of the duckweed. The photo on the next page shows duckweed after the city applied herbicide. Prior to treatment, the duckweed covered a large portion of the cells; in 2013 the final two cells were almost completely covered with duckweed.

Response of aquatic weeds to selected herbicides and approximate costs.

– from *Aquatic Plants and Their Control* by Kansas State University Agricultural Experiment Station and Cooperative Extension Service

Aquatic Weed Classification	Aquatic Weed	Aquatic Herbicide (Trade name)							
		Copper Algaecides (Severol)	2,4-D (Severol)	Diquat (Reward & WeedtrineD)	Endothall (Aquathol & Hydrothol)	Fluridone (Sonar & Avast)	Glyphosate (Rodeo & Others)	Imazapyr (Habitat)	Triclopyr (Renovate)
Algae	Chara	E	P	G	G ²	P	P	P	P
	Filamentous	E	P	G	G ¹	P	P	P	P
	Planktonic	E	P	P	P	P	P	P	P
Floating Plants	Duckweed	P	G	G	P	E ¹	F	G	P
	Watermeal	P	P	F	P	G ³	F		P
Rooted Floating Plants	Waterlilies	P	E	P	P	E	E	E	E
Submersed Plants	Bladderwort	P	F	E	P	E	P	P	P
	Coontail	P	G	E	E	E	P	P	P
	Elodea	P		E	F ²	E	P	P	P
	Naiad	P	F	E	E	E	P	P	P
	Pondweeds	P	P	G	E	E	P	P	P
	Watermilfoil	P	G	G	G	E	P	P	E
Emerald Plants	Arrowhead	P	E	G	P	P	E	E	
	Water Primrose	P	E	F	P	F	E	G	E
Marginal Plants	Cattails	P	F	G	P	F	E	E	F
	Smartweeds	P	F	P	P	P	E	E	E
	Purple Loosestrife	P	F	P	P	P	E	E	G
	Willow	P	E	P	P	P	E	E	E
	Cottonwood	P	G	P	P	P	G	G	E
Approximate Cost ⁴		\$2.50-20/ Acre-ft	\$7-65/Acre-ft	\$250-700/ Surface acre	\$50-220/Acre-ft	\$60-150/Acre-ft	\$15-30/ Surface acre	\$33-133/ Surface acre	\$80-320/ Surface acre

¹ E = Excellent, G = Good, F = Fair, and P = Poor or none. Refer to product labels for specific recommendations.
² Hydrothol formulation only.
³ AS formulation only.
⁴ Herbicide cost varies with application rate, water depth, formulation, geography, and market fluctuations. Contact local supplier for current retail prices.



After several chemical treatments, the duckweed will die as shown in this shovel.

lagoons if not owned by the system. Duckweed usually will not grow in moving water; wind will assist in reducing the growth of duckweed.

With this in mind, just controlling the duckweed can mean the difference between passing or failing of discharge permit limits!

The Kansas Rural Water Association provides assistance to both water and wastewater systems. Funding support for this service is through contracts with the National Rural Water Association and USDA Rural Development, and another referral-only program funded through the Kansas Department of Health and Environment. I encourage any wastewater system having any issues to contact KRWA for no-cost assistance.

Improve wind action

Most systems that have issues with duckweed causing discharge permit violations are those that also have trees around the lagoons, either on one or two sides or all the way around. I realize that systems don't always own the land around the lagoons and may not be able to control trees growing there. I suggest talking to the property owners to see if they might allow the trees to be cut down around the

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