By Jeff Lamfers, KRWA Consultant

Control of Aquatic Plants Around Sewage Lagoons

The photo above shows a lagoon cell with a thick duckweed blanket covering most of the surface. Notice the plants actually supported by and sprouting in the duckweed blanket. Also notice the color of the wastewater in the open area. It is very anaerobic and actually has a dark, purple color with floating solids. It does not exhibit the typical green color found in well operated lagoons.

For most wastewater system operators with lagoons, controlling the growth of unwanted aquatic plants around lagoons is both challenging and a time-consuming proposition. While some plants such as algae are needed for treating sewage as they are the primary source of oxygen for facultative bacteria, other plants only cause problems. Such plants can adversely affect flow, oxygen concentrations and settling, resulting in effluent violations. For example, trees located too close to the lagoon can block prevailing winds which provide both mixing and oxygen transfer. Cattails can cause several problems including excessive seepage due to their extensive root system. And duckweed can cause a lagoon cell to turn anaerobic if the blanket is thick enough and covers sufficient surface area. The purpose of this article is to review some of the more common aquatic plants found around lagoons and how to control them.

One of the best ways to control aquatic plants is to prevent their growth in the first place. That is why mowing grass on the dikes and especially at the waters edge is critical. KDHE recommends using either a sickle-bar mower or a string trimmer for controlling plants near the waters edge. If routinely mowed, such plants should never become established or present problems. Allowing such plants to become established can result in several problems including blocking wind and creating still areas that promote both mosquito breeding and odors. Cattails are a very common problem around lagoons and present a classic example of how prevention can eliminate bigger problems in the future.

Preventing cattails on pond bottoms

Most of the time when lagoons have a cattail problem it is because the cell does not have sufficient water depth. At a minimum, any cell placed in service should have at least two feet of water depth. More is better. An optimum water depth is four to five feet. If the water is too shallow, sunlight can penetrate to the pond

bottom and promote the germination of rooted plants.

Just because a lagoon system has three or four cells, does not mean that all cells must be placed in service. Occasionally, lagoon systems are over-designed and not all cells are needed for treatment. In such cases, only use those cells needed to attain an optimum four to five feet of depth. However, those cells not placed in service cannot be ignored. They need to be routinely mowed to ensure excessive plant growth does not occur and that they are available for service if needed. Contact the respective Kansas Department of Health & Environment (KDHE) district office or KRWA for assistance if you believe your lagoon system is not able to maintain minimum water depths due to too many cells in service Just because there may be more cells than needed from a hydraulic standpoint does not mean all cells must be used.

Notice duckweed on all three lagoon cells and very little open water on the surface. Even solar mixers are not able to breakup the duckweed blanket.

This photo shows the same lagoon four months later after treatment with Diquat to control duckweed. This discharging lagoon was not meeting effluent limits while covered with duckweed. Once the duckweed blanket was controlled, the lagoon returned to compliance with all parameters.

Options for control of cattails

Unfortunately, even with optimum water depths, cattails can still appear in lagoons, especially at the edge of the water. Operators have two options for control. First, pull them immediately once identified or control the cattails using chemical means. If pulling or digging them out, be careful not to damage the clay seal used to control seepage. Usually that is not a major problem around the periphery of the lagoon. If using chemicals such as herbicides to control cattails, consult your KDHE district office for approval. In most cases approval will be given, but it is important to keep KDHE informed as some herbicides may have restrictions for use around lagoons, especially those lagoons that discharge.

Two of the more effective herbicides for controlling cattails are Glyphosate (Rodeo) and Imazapyr (Habitat). Glyphosate is also effective at controlling most marginal weeds and woody brush such as willow trees. When using any herbicide, directions on the manufacturer's product label must be followed closely. Make sure that the appropriate herbicide is used for the plant to be controlled. Application should be made at the recommended application rate. Avoid spraying herbicides on windy days or immediately before a rainstorm. Rainfall can result in runoff of the herbicide into the lagoon itself, possibly causing problems. Most herbicide manufacturers also recommend applying their products during the early plant growth phase in the spring. In short, it is more effective to treat before any unwanted plant, including cattails, become mature plants.

Glyphosate (Rodeo) is a great product for controlling cattail growth as it is effective if used as directed and it has no water use restrictions. This is especially critical for lagoons that discharge. Operators always need to consider other water users downstream. Some herbicides have restrictions on use of water after treatment for such uses as drinking, swimming, livestock watering and irrigation. For example, water treated with Imazapyr (Habitat) has a 120-day restriction on use for irrigating. Again, check labels carefully.

Problems caused by duckweed

Another common aquatic plant that can cause major problems on lagoons is duckweed. Duckweed is a floating plant whose root system absorbs nutrients directly from the water as opposed to being rooted in soil. In some lagoons duckweed can develop into a thick blanket that totally covers the water surface. When this happens, the blanket acts as a barrier and almost totally blocks all sunlight. Since sunlight is needed by algae to produce oxygen, wastewater

in such lagoons can turn anaerobic with offensive odors. Without sufficient oxygen present, the facultative bacteria cannot thrive, reproduce or breakdown incoming raw sewage. Such a situation is not desirable. It cannot only result in odor problem, but also problems meeting permit effluent limits.

I want to stress that just because duckweed is visible on the surface of one of the lagoon cells, it does not always mean immediate action is needed or that problems will automatically result. Most lagoons do not have duckweed problems. If a lagoon has been operated for several years with duckweed usually appearing in the spring, but never developing into a thick blanket, then no action may be necessary. If most of the duckweed is blown into one corner of the lagoon on a windy day, then it's not usually a problem. If however the duckweed has developed into a thick blanket during the course of prior summers or prevailing winds are unable to move it to a corner and clear a large area of open water, then control is probably needed. New operators may want to consult with the previous operator(s) to learn if duckweed had been a problem in the past. Otherwise, I recommend taking a conservative approach the first summer to see what happens. After one summer an operator should have a pretty good idea if duckweed is going to be a problem in the future.

This lagoon has a serious cattail problem because sufficient water depths are not being maintained. Note cattails are even growing out in the middle of the cell, not just around the edge. Cattails have an extensive root system that can damage the clay seal on the bottom of the lagoon, resulting in excessive seepage and the inability to hold water.

Duckweed control

There are several options for controlling duckweed. Unfortunately duckweed growth is so prolific, that whatever control option is chosen, frequent inspection and action are needed throughout the growing season. One option is to use grass carp (white amur) to control duckweed. They are a long-lived member of the minnow family and do not reproduce in lagoons as they require flowing bodies of water for reproduction. Once mature, they are herbivorous and will consume most species of floating plants such as duckweed. It is recommended using twenty fish per acre if half the pond area is covered with duckweed. It may take several years to adequately control the duckweed. I have worked with several systems trying to control duckweed using grass carp, but with less than acceptable results. There is also the issue of hoping adequate dissolved oxygen levels are maintained at all times so the fish survive.

Another option is to use dip nets or seines to skim duckweed off the surface of the pond. While I realize many reference manuals recommend this option for effective duckweed control, I do not find it to be very effective. First, it is very labor intensive. And second, even if seined daily, the operator may never gain on removing the entire duckweed blanket as it is constantly growing, covering more surface area with a thicker blanket. There is also the issue of how to dispose of the removed duckweed.

In my opinion, the best option for controlling duckweed is chemical application. There are several very effective herbicides available for controlling duckweed. These include Fluridone (Sonar and Avast), Diquat (Reward and Weedtrine D), Imazapyr (Habitat) and 2,4-D. Those most commonly used are Sonar and Diquat. Both are very effective if applied according to manufacturer's label instructions. Sonar is the more expensive of the two herbicides, but seems to have a longer-lasting effect at controlling duckweed. It does not have to be applied (sprayed) on individual plants, but simply disbursed in the water where it will be absorbed by the individual duckweed plants. It may take several applications over a period of thirty to ninety days for control. Also, if the duckweed blanket covers most of the surface area of a lagoon, it is recommended to only treat part of the blanket at a time, waiting five to seven days between treatments. If the entire blanket is treated at once and dies off, the duckweed blanket itself will create an oxygen demand on the pond that could make anaerobic conditions and odors considerably worse.

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Another advantage to Sonar is that it has few water use restrictions. It has no restrictions on swimming, fishing or consumption of treated water by humans, pets or livestock. There is a thirty-day restriction on using the water for irrigation purposes. Diquat has more water use restrictions including restrictions on using treated water for animal consumption, spraying or irrigation for fourteen days after treatment.

Finally, I recommend referring to a Kansas State University Extension Service publication for additional information. The manual is entitled "Aquatic Plants and Their Control" written by Dallas Peterson and Charles Lee. It is available online at www.oznet.ksu.edu. While the publication is already somewhat dated, it is still very timely and helpful. Also, I encourage anyone having specific questions related to plant control around lagoons to contact me through KRWA or email me at jeff@krwa.net.

Wastewater sessions at 2016 Conference

The 2016 Annual KRWA Conference & Exhibition will provide numerous sessions for wastewater operators and owners. Mark your calendars for the following:

- "Best Practices for Lift Stations", Tuesday, 3/29 beginning at 10 a.m.
- "Nutrient Monitoring and Wastewater Permits", 3/30, 1:30 p.m.
- "Water and Wastewater Funding Through KDHE", 3/30, 1:30 p.m.
- "Wastewater Collection System Evaluation", 3/30, 2:45 p.m.
- "Rehabilitating the Lateral and Lateral to Main Connection", 3/30, 4 p.m.
- "Wastewater Operator Refresher Course", 3/31, 9:30 a.m.

And don't miss the scores of exhibitors who will be displaying products and services. The EXPO Hall during the KRWA conference is one of the best places anyone can be to meet manufacturer representatives.

Jeff Lamfers began work for KRWA in November 2008. Jeff has more than thirty years of regulatory experience in the oversight and operation of water and wastewater systems with the Kansas Department of Health and Environment. He is a graduate of the University of Kansas with a degree in Environmental Studies with an emphasis in aquatic biology.