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To: Charlie Ciecko
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Subject: Fish die-off at Smith and Bybee Lakes

A substantial die-off of carp and other fishes has occurred in Smith and Bybee lakes. More than half of each lake is completely dry now, and remaining water is generally less than 6 inches deep. There are shallow ponded areas on the northeast side of Bybee Lake and the south side of Smith Lake; both are isolated from any other water. The deepest water is in the channel between the lakes and near the dam. Fish congregated in these "deep" areas, which may be nearly a foot deep. When the hot spell hit about a couple of weeks ago, the water must have been too warm for even carp to endure. The die-off started late in the week of the 6th, and numbered in the thousands by the week of the 13th. Nearly all of the fish are carp, with a smattering of bullheads, crappie and smallmouth bass. (Curiously enough, all but one of the bass I saw were young-of-year.) The largest concentration of dead fish is near the dam and in the channel. There are scattered dead fish throughout the lakes. Incredibly enough, there are still live fish out there.

My seasonal employees and I spent several days last week pitchforking fish out of the water by the dam and channel, onto the bank. The fish are rapidly decomposing on the shore. The water quality was obviously much better after we did this. We also cleared obstructions around the one grate at the dam that was low enough to be below the water level on the lake side. So there is very modest water flow, going into the slough with ebb tides (the flap gate closes as the tide comes in). We have removed all of the fish that we can; remaining fish are in areas that are too muddy to navigate (the mud in the channel is like quicksand).

My primary concern has been avian botulism. The bacteria (*Clostridium botulinum*) thrives in warm sediments, low DO, decaying organic matter (especially high-protein) and shallow water. These bacteria are probably present at the lakes, and in all wetlands in this area, all of the time. But conditions like those at the lakes provide the optimum environment for an outbreak. Invertebrates (e.g., maggots) breaking down the carcasses provide the toxin transfer - birds won't eat the dead fish directly, but they will eat the maggots. Waterfowl and shorebirds are at greatest risk, although many birds can be affected. Vultures appear to be the only birds that are very resistant to botulism. By getting the fish out of the water and as high on shore as we can, I hope to break any botulism cycle that may start. I'm also hoping that we don't get any rainfall for another couple of weeks, which might re-flood the carcasses.

Since we have done all we can to get the fish out of the water, we are now shifting to watching the birds. I am surveying the lakes pretty thoroughly a couple of times a week, looking for birds that show signs of infection. So far I have not seen any symptoms.

Sorry I haven't updated you before now, I've just been scrambling to get as much damage control done as I can. What an ironic situation - the dam was put there to prevent botulism outbreaks, and it created the ripest conditions for an outbreak that we've seen in many years. It caused the carp population to explode, and there was no way for me to let them out of there. It kept a little water in the lakes, when I would have drawn them completely down by now. On the up side, there's no longer a justification for keeping that dam to control avian botulism!

-Elaine

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