Zebra Mussel Monitoring in Lake Arlington
Trinity River Authority
2019

Contents

PREPARED IN COOPERATION WITH THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

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Introduction

The zebra mussel *Dreissena polymorpha* is an invasive species that was first discovered to be present in Texas waters in 2009. The species has rapidly populated in different parts of the United States and is known to infest commercial and recreational infrastructure, such as water intakes or transfer pipes causing clogs, as well as infesting watercrafts (Mackie, 1991). Public areas can also be affected by the establishment of zebra mussel colonies as groups can form jagged clusters in walking and swimming areas. Zebra mussels establish themselves by clinging to stationary objects with strong fibers they excrete called byssal threads. Unlike the zebra mussel, commonly occurring native mussel species do not cling to objects in adulthood, and typically burrow themselves partially or completely in the stream bed or reservoir substrate. Adult zebra mussels are typically smaller than adult native mussels, and can be identified by a pronounced triangular shape. As the name implies their external shell color is typically black and white striped, thought the contrast between the stripes can sometimes appear muted or not at all.

Expansion of zebra mussels also may cause harm to other animals, such as native Texas mussels for example. Mussels are filter feeder bivalves: the mussel brings water in through an inhalant siphon, passes it through the gills where particulates are filtered out, then the water exits the excurrent siphon as the gills funnel the trapped particulates to the mouth, beginning digestion. As mussels share the same food source, large populations of invasive zebra mussels can reduce food sources and threaten the viability of native mussels and other Mollusca (Schloesser and others, 1997). Similarly, these infestations can change the trophic structure of a waterbody and impact all levels of aquatic life from algae to fish populations to surrounding life that depends of the reservoir for sustenance. Zebra mussels also preferential reject certain algal species which could lead to harmful algal blooms. Because of these challenges and others which zebra mussels bring with infestation, early detection and monitoring are critical. Since 2010 the U.S. Geological Survey (USGS) Zebra Mussel Monitoring Program for Texas (ZMMP) has grown with the spread of zebra mussel throughout the State.

Lake Arlington is a major water supply reservoir which provides drinking water for more than half a million people. This includes residents in Arlington, Bedford, Grapevine, Euless, Colleyville, North Richland Hills and other municipalities. Yields of the reservoir are currently supplemented by water pumped in from the Cedar Creek and Richland Chambers reservoirs (TRA, 2015). In addition to these reservoirs, Integrated Pipeline Project (IPL) which is being constructed by Tarrant Regional Water District and partners is set to add Lake Palestine to the network of contributing reservoirs by 2021 (TRWD, 2018). Of particular concern is that Richland Chambers Reservoir has a confirmed presence of adult zebra mussels from as early as October 2017 (TPWD, 2017).

Early detection of zebra mussels in Lake Arlington could help slow the spread of zebra mussels to other reservoirs. Additionally, early detection could increase the potential success of eradication measures taken before the reservoir becomes fully infested thereby protecting the public water supply and contact recreation designated uses of this reservoir.

Field Data Collection

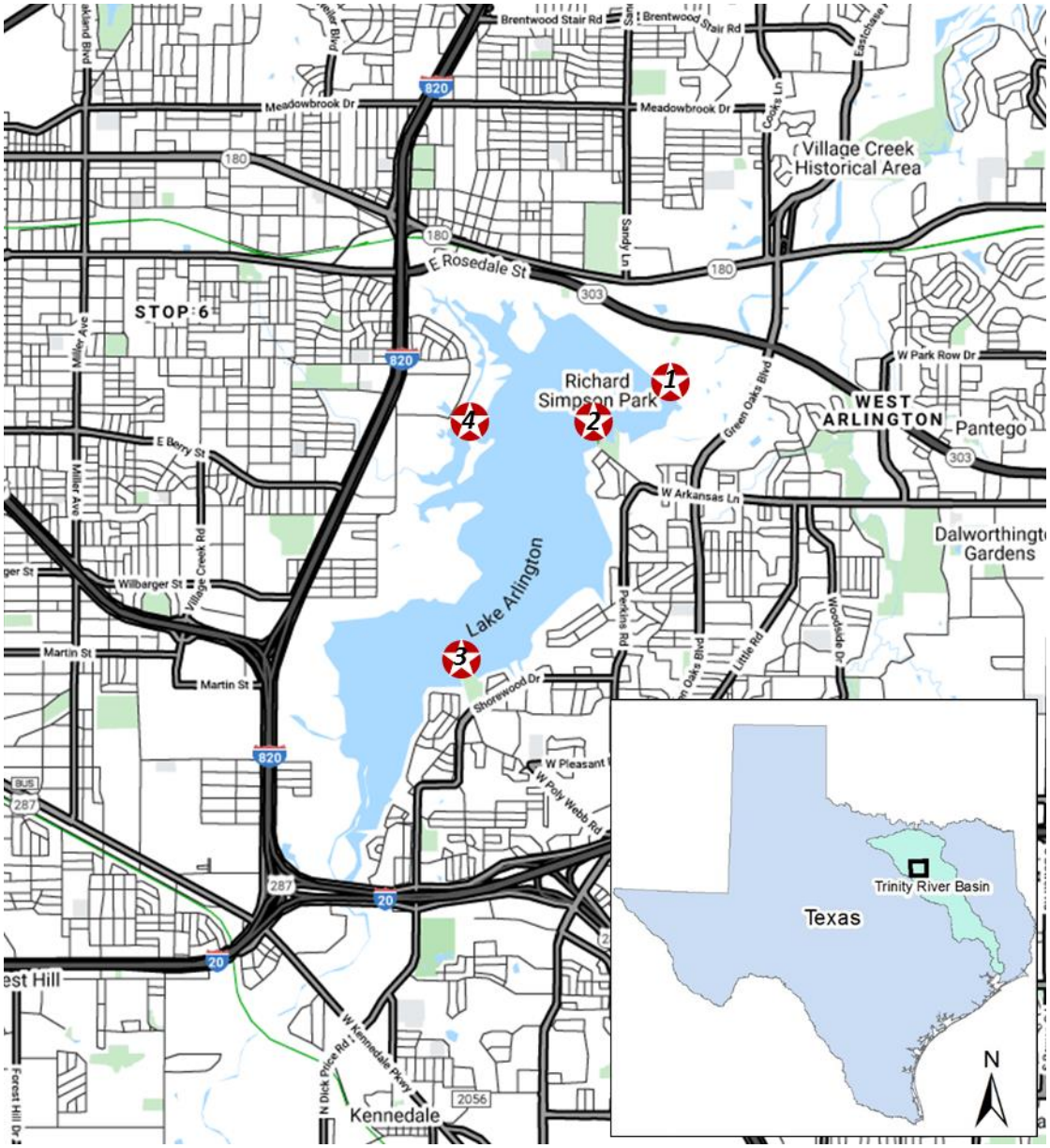

Figure 1: Lake Arlington Sample Locations

Starting in June of 2019, the USGS has performed five sampling efforts at four monitoring stations in Lake Arlington to determine the presence or absence of environmental DNA, zebra mussel young (or veligers), or adult/juvenile zebra mussels (see Figure 1). The study was designed to provide early detection and monitoring of invasive mussels in Lake Arlington and other Texas lakes and waterways using several methods. Refer to Churchill et al., 2012 for full a description of methods.

Collecting and analyzing water samples for juveniles (veligers)

Fine mesh plankton tow nets were used to monitor for the presence of zebra mussel veligers. Targeted sites include popular contact recreation areas where introduction was most likely to occur, such as docks, boat ramps and/or marinas, as well as water infrastructures. Water samples collected at that time were also tested for the presence of environmental DNA (Churchill et al., 2012). eDNA can be any cellular material shed by organisms in the water column deposited by the organism itself or imported by other means: for example, by way of boat bilge water from another infested water body.

Monitoring mussel collection and growth on artificial substrates

Artificial substrate samplers were used to monitor zebra mussel infestation and growth. The samplers are constructed of stacked pressed hardboard tiles with spacers which separate the tiles by approximately 0.25 inches. As with the water samples, deployment of samplers was concentrated on locations where introduction was most likely to occur and areas of vulnerable water infrastructure. The samplers are suspended in the water column and attached to a structure above the sample site. Routine observations of the samplers was performed by USGS staff at routine intervals following a period of at least 3 weeks, which allowed for colonization to occur. Colonization typically takes place after naturally occurring algae forms on the sampler. Upon the presence of zebra mussels, the density in mussels per square meter would have been calculated and a subset of the shells observed measured. Staff utilize a handheld digital microscope to determine shell lengths of mussels present in the subset (Churchill et al., 2012).

Results

Table 1: Lake Arlington Zebra Mussel Sample Results

Event	Date	Juveniles/Adults	Veligers	eDNA
1	6/6/2018	Negative	Negative	Positive
2	6/28/2018	Negative	Negative	Negative
3	10/22/2018	Negative	Negative	Positive
4	5/6/2019	<unable to sample>*	Negative	Negative
5	10/8/2019	Negative	Pending	Pending

*Unsafe weather conditions prevented sample collection

Current results indicate the presence of environmental DNA (eDNA) in Lake Arlington from two sampling efforts in 2018. Though eDNA does not confirm the existence of a reproducing live colony, it may be an effective tool for the early detection of aquatic invasive species such as the zebra mussel (Pilliod et al., 2013). Results from the most recent sampling event in October 2019 are pending.

Conclusions

Lake Arlington is a valued water supply reservoir and warrants particular vigilance to detect potential aquatic invasives. The ZMMP conducted by USGS is a robust sampling program that provides this

vigilance. Through this sampling program, the presence of eDNA has been confirmed within Lake Arlington. Additionally, the reservoir's yield is being supplemented by raw water transfers from Richland Chambers Reservoir, which is positive for zebra mussels. Therefore, Lake Arlington is considered to be at high risk for zebra mussel recruitment. Impaired operations due to zebra mussel infestation would likely prove to be costly and could potentially degrade the water supply itself. Zebra mussels have been known to disrupt the trophic structure and degrade water quality of infested waterbodies; including the likelihood of harmful algal blooms and displacement of native mussels.

Recommendations

The Trinity River Authority of Texas recommends that the TCEQ, and other appropriate agencies, ensure that Lake Arlington is monitored for zebra mussels. Future monitoring may prove to be critical in planning for maintenance and/or the eradication of the invasive should live zebra mussels be observed. Further, continued monitoring for zebra mussels supports several of the objectives of Title 30 Texas Administrative Code (30 TAC) Chapter 220 Subchapter A:

§220.4(a)(2) Develop and maintain a basin-wide water quality monitoring program that eliminates duplicative monitoring, facilitates the assessment process to identify problem areas and support long-term trend analyses, and targets monitoring to support the wastewater discharge permitting and standards process.

§220.4(a)(4) Identify water quality problems and known pollution sources and set priorities for taking appropriate actions to eliminate those problems and sources.

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