

To: Distribution

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Subject: Offutt Base Lake Zebra Mussel Eradication Project – First Application Summary

1.0 TREATMENT SUMMARY

Application of copper sulfate pentahydrate to the Base Lake was completed on September 17 and 18, 2008 to eradicate the zebra mussel population from the lake. Lake elevation was surveyed on September 15, 2008, and the volume of water in the lake was determined based on survey data obtained from the Nebraska Game and Parks Commission. Based on the volume of water in the lake, approximately 26,890 pounds of copper sulfate pentahydrate was required to obtain an overall concentration of 1 part per million (ppm) of elemental copper. The main portion of the base lake received 26,900 pounds of copper sulfate pentahydrate and the upstream drainage received another 100 pounds of copper sulfate, for a total of 27,000 pounds.

The copper sulfate was applied via vortex spreaders mounted on a pontoon boat. Hand application was completed in drainageways and other areas that could not be reached with the boat due to obstructions (docks, trees, rocks, etc.). The full quantity of chemical was applied within a 30 hour timeframe. A global positioning system (GPS) unit loaded with ArcView geographic information system (GIS) software was used to assist in navigation of the lake to ensure full coverage was achieved. This information will be reported in the final report that will be prepared upon project completion.

2.0 POST-APPLICATION EFFICACY MONITORING

Post-application monitoring was performed in three categories, 1) residual copper concentration, 2) adult zebra mussel mortality, and 3) veliger (larval) monitoring. These categories are described in the following sections.

2.1 Residual Copper Concentration

Copper concentration in the lake was informally monitored from the shore during the copper sulfate application. The maximum measured concentration during application was 1.5 ppm, with an average concentration of approximately 0.7 ppm. A full lakewide delineation was completed on September 19, 2008, approximately 24 hours following the completion of the treatment. Copper analysis was performed at seven locations throughout the lake, at the top, middle and bottom depths. Copper concentrations varied from 0.00 to 0.73 ppm, with a mean concentration of 0.25 ppm. The copper concentrations varied widely and copper was not uniformly mixed

throughout the lake. However, since no measured concentrations exceeded 1.3 ppm, no usage restrictions were required as part of the Special Local Needs Label.

A second copper characterization was performed on October 17, 2008 at the same seven locations as the 24-hour characterization. Results of this characterization indicated that copper concentrations of the lake have become fairly uniform and much of the copper has precipitated out. Concentrations ranged from 0.04 to 0.20 ppm, with a mean concentration of 0.10 ppm.

2.2 Adult Zebra Mussel Mortality

Six live colonies (substrate with 40+ adult mussels) were placed in minnow buckets at six locations throughout the lake prior to treatment. These colonies were monitored at 24 hours, 72 hours, and 7 days after treatment to determine mortality. Mortality was based on the number of shells that have opened, although it should be noted that zebra mussels may be recently dead and have closed shells. At 24 hours, approximately 30 percent of the observed zebra mussels were considered dead. At 72 hours, that percentage increased to approximately 70 percent, and at 7 days, 100 percent of the observed zebra mussels were dead.

Coupon samples were also installed at the six locations throughout the lake. Each coupon was comprised of a combination of either a brick or concrete block base and a suspended piece of lumber or PVC. The coupons were checked at 30 days after treatment and no zebra mussels were present.

Additionally, over 100 rocks and other pieces of substrate were examined during the post-application fish pickup and no live zebra mussels were observed after 96 hours after treatment.

2.3 Veliger Analysis

Veliger samples were collected from three locations in the lake and analyzed for the presence of veligers. One sample was collected from the northeast cove, one sample from the main lake, and one sample from the southeast cove. Samples were collected with an 80 micrometer net with a 20 centimeter opening. The net was pulled for 50 meters in a horizontal tow, with the net being pulled from the bottom of the lake to the surface along the 50 meter run. Approximately 1,570 liters of water were sampled in each tow. The samples were preserved and sent to Water Systems Analysts for analysis. No veligers (live or shells) were found in the samples.

3.0 FISH MORTALITY

Dead fish began showing up on the second day of application. Gizzard shad were the first species to appear on September 18, 2008. Fish mortality by species became an interesting subplot to the treatment. Table 1 highlights the estimated amount of dead fish by species, as well as the period after the treatment that the fish were present. Assessing fish mortality by species, weight, and time was not a part of the scope of the project; therefore, all weights are approximate and based on the general observations of the field team. As is shown in Table 1, non-game fish were primarily impacted by the treatment, and there seems to be a correlation indicating that filter feeders may be more susceptible to the copper sulfate than predatory fish.

Table 1 – Estimated Fish Mortality by Species

Species	Weight (pounds)	Duration (days after treatment)	Fish Type
Gizzard Shad	200	1 to 3	Non-game
Common Carp	3,000	2 to 20	Non-game
Freshwater Drum	600	2 to 10	Game
Bighead (Asian) Carp	6,000	3 to 25	Non-game/invasive
Buffalo (bigmouth and smallmouth)	28,000	2 to 40	Non-game
Largemouth Bass	10	3 to 7	Game
White Perch	300	3 to 7	Game (Undesirable)
Walleye/Saugeye	50	5 to 10	Game
Catfish (channel and flathead)	5	15 to 20	Game
Bullhead	10	15 to 20	Non-game
Gar (shortnose and longnose)	5	Sporadic	Non-game
Crappie	3	Sporadic	Game
Paddlefish	100	Sporadic	Game
Grass Carp	200	Sporadic	Non-game
Total (Approximate)	39,000		