

FINDING OF NO SIGNIFICANT IMPACT

1.0 NAME OF ACTION: Eradication of Zebra Mussels from the base lake at Offutt Air Force Base (Offutt AFB).

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVE(S)

Offutt AFB has prepared an Environmental Assessment (EA) to identify and evaluate the potential environmental effects associated with the chemical eradication of zebra mussels from the base lake. The Environmental Assessment on the Eradication of Zebra Mussels from the base lake at Offutt Air Force Base (Offutt AFB) is hereby incorporated into this Finding of No Significant Impact.

2.1 Proposed Action

The Proposed Action would involve treating the base lake with copper sulfate under a Special-Use Label. The label expires in expires on May 31, 2009. This action includes an initial application in September 2008 and a second application in May of 2009. It is anticipated that approximately 26,000 pounds of copper sulfate would be applied to the lake during each application. The exact amount of chemical will depend on the water volume of the lake at the time of application.

2.2 Alternative Actions

Offutt AFB considered a wide range of alternatives to using copper sulfate. These alternatives included confinement by restricting boat access to the lake and plugging the drainage tubes from the lake, filling in the lake, introducing predators to control the zebra mussels, thermal removal by heating the lake water, and the use of other chemicals to eradicate the zebra mussels. Many of these alternatives were not carried forward for further analysis because they failed to satisfactorily restore the recreational function of the lake and/or reduce/eliminate the risk of zebra mussels being spread to other water bodies, especially the Missouri River. Some chemicals such as Clam-Trol and Endothal were not carried forward for analysis because they were highly toxic to the zebra mussels and also the fish in lake. These chemicals would have had an adverse impact on the recreational quality of the base lake.

Potash (Potassium chloride) was also considered by the zebra mussel working group. Executive Order 13112 directs Federal Agencies to detect and respond rapidly to and control populations of invasive species in a cost-effective manner. The zebra mussels are thought to have been in the lake since at least 2005; therefore, the working group wanted the initial treatment of the lake to occur during this calendar year. During 2007, the cost of Potash increased 300 percent. This increase in the cost of potash, coupled with the cost of transporting and applying 240 tons of potash to the lake was projected to be in excess of 1 million dollars. In addition to the costs associated with transporting 240 tons of Potash, the logistics of transporting, storing, and applying that amount of chemical in a timely manner posed further concerns about the use of Potash. Finally, Potash is not listed as an active ingredient in any Federally-registered pesticide. Therefore, additional time would be required to apply for and obtain a Special-Use label from the Nebraska Department of Agriculture and the U.S. Environmental Protection Agency. Based on

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14. ABSTRACT

In early 2006, zebra mussel shells were observed on the shoreline of the Base Lake and closer examination of rocks and other hard surfaces in shallow water of the Lake documented the presence of live zebra mussels. This is the only verified population of zebra mussels in Nebraska. They are believed to have entered the Base Lake in 2005 (or earlier) via a boat or boat trailer that came from infested waters. In 2007, the abundance of mussels in the Lake increased dramatically. Most hard surfaces in the Lake are now covered with multiple layers of zebra mussels that in many areas are 2 to 3 inches thick. Based on the presence of the zebra mussel in the Base Lake, a working group was formed that included Offutt AFB, federal and state regulatory and resource agencies, local electrical power companies, city municipal utility districts, and natural resource districts to discuss steps that could and should be taken to prevent the introduction of zebra mussels to other water bodies in Nebraska and surrounding states. The Base Lake zebra mussel working group, in response to their concern regarding the spread of the mussel to the Missouri River and other bodies of water, identified temporary and long-term actions that if implemented would reduce the potential for spread of the mussel. Short-term actions included restricting boat access to the Base Lake and temporarily sealing the outlet to prevent infested water from being discharged from the Lake. These two actions were implemented by Offutt AFB in 2007. The long-term action being considered in this EA is the total eradication of the zebra mussel from the Base Lake. The purpose of this EA is to explore this action and alternatives and identify the potential environmental impacts associated with implementation of the long-term action. Offutt AFB agrees that the proposed action would be an effective means to control the spread of zebra mussels from the Base Lake. In evaluating various eradication procedures, Offutt AFB, in concert with the working group, has determined that chemical application is the most practical method for eradication of the mussel. The eradication of the undesirable aquatic species would restore the recreational function of the Lake and reduce the potential for spread to other water bodies in the general vicinity of the Base Lake. This EA summarizes the alternatives considered by the working group, including confinement, physical removal, thermal removal, biological removal, and chemical removal and provides the reasoning behind their dismissal from further consideration. This EA provides a detailed analysis for the application of copper sulfate to the Base Lake and the No Action alternative. There are no significant adverse impacts associated with the Proposed Action. Therefore, a Finding of No Significant Impact (FONSI) is concluded for the proposed action.

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the requirements in Executive Order 13112 and the facts discussed above, the zebra mussel working group determined that Offutt AFB would not be able to respond in a timely and cost-effective manner using potash as the chemical of choice to eradicate the zebra mussels and prevent their spread to the Missouri and other nearby bodies of water. The zebra mussel working group was also concerned about whether there would be a sufficient supply of potash available to eradicate the zebra mussels because it is also used for agricultural purposes as a fertilizer. Therefore, no other alternatives other than the proposed action and the no-action alternatives were examined in the EA.

2.3 No-Action Alternative

The No Action Alternative is defined as maintaining the status quo with no actions being funded or completed to remove the zebra mussels from the base lake. Under this alternative, Offutt AFB would continue to restrict the use of private boats on the lake and the outlet pipes, which drain to the Bellevue drainage ditch and eventually to the Missouri River, would remain plugged. Consequently, maintaining status quo conditions would adversely impact the environment because during times of heavy precipitation, Offutt AFB would be unable to release water from the lake impacting its surface water drainage. As the lake level rises, recreational facilities surrounding the lake and land upstream from the lake would flood. Additionally, given the aggressive colonizing ability of zebra mussels, if the zebra mussels were to gain access to surface waters outside the lake, the potential exists for adverse economic impacts to the Bellevue metro area and beyond. The zebra mussels could plug intakes for municipal water and power companies along the Missouri River. The infestation of power and utility companies would result in increased operation and maintenance costs. These costs could be significant and would result in higher fees for end users.

3.0 SUMMARY OF ENVIRONMENTAL IMPACTS

3.1 Proposed Action

3.1.1 Land Use

There would be a temporary adverse impact on the recreational use of the lake during and immediately following the application of the copper sulfate, as access to and use of the lake would be restricted until all areas of the lake have elemental copper concentrations less than 1.3 ppm which is the maximum contaminant level (MCL) for copper. The Proposed Action would have a long-term positive impact on the use of the lake. Eradication of the zebra mussels would allow Offutt AFB to restock and maintain a larger variety and quantity of fish for fishermen.

3.1.2 Public Health and Safety

Public access to the lake area during application of the copper sulfate would be restricted to the lake perimeter roadway and landward. Access to the FAMCAMP, pavilion, and boathouse would be allowed during the application. Warning signs restricting use and informing lake users about the lake treatment would be placed at the entrance to the lake and at all boat ramps during the application and until monitoring indicates that adequate mixing has occurred and that no portion of the lake has water copper concentrations above 1.3 ppm. Additionally, public information sheets would be prepared and distributed to base personnel and users of the base

stables. Offutt AFB would also increase security patrols in the lake area. During and after application of the copper sulfate, the lake would be monitored for dead fish. Dead fish would be collected and disposed of at a local rendering plant until no dead fish are found for a 48-hour period. With the precautions presented above, the proposed action would have no significant impact on public health and safety.

3.1.3 Socioeconomics and Environmental Justice

A trailer park is located near the base lake. The impacts associated with the Proposed Action Alternative on low-income or minority populations in the trailer park would be related to noise and air quality. However, these impacts are expected to be minor and would be localized in the immediate vicinity of the base lake. This alternative would not result in a negative economic impact within the general project area. Economic activity associated with the lake would continue post-project as recreational fishing would be maintained as part of this alternative.

3.1.4 Noise

There would be a temporary increase in noise levels near the lake area during application of the copper sulfate (approximately 2 days). However, because Offutt AFB is an active military base with daily airfield operations (landings and takeoffs), a temporary and localized increase in noise would not result in a significant adverse impact to the base or adjacent communities.

3.1.5 Air Quality

Short-term, localized impacts to air quality may occur immediately downwind of the application activities. Copper sulfate would be applied in a crystal form limiting to the extent possible the production of dust. Any impacts would be considered minor and would be limited to the immediate vicinity of the base lake. Once application has been completed (2 days), air quality at the lake would return to pre-project conditions.

3.1.6. Water Resources

With the proposed action, copper sulfate would be applied to the lake resulting in the death of adult and larval zebra mussels. This activity would have a short-term negative impact on the water quality in the lake. However, with adequate mixing, copper levels would equalize below 1.3 ppm, which is the MCL for copper. In the long-term, the proposed action would have a positive impact on the aquatic resources at Offutt AFB. By removing the zebra mussels from the food chain, the lake ecosystem would return to its pre-zebra mussel state and provide acceptable habitat for a wide variety of fish species. This would allow the fish and wildlife management personnel on base to meet their mission.

3.1.7. Biological Resources

The proposed action would have a short-term negative impact on wetland vegetation within the project area. The copper sulfate may kill most of the wetland vegetation exposed to the chemical. However, the wetland vegetation would return to pre-project levels by the next growing season. Therefore, no long-term impacts would occur to wetland vegetation. No federal-listed or state-listed species are permanent residents at Offutt AFB. The bald eagle (a state-listed species) has the potential to fly over the lake and take fish. However, with the collection and disposal of fish killed by the copper sulfate, potential impacts to the bald eagle would be minimized. Therefore, the proposed action would not impact any threatened,

endangered, or state sensitive species. It is also unlikely that the proposed project would have a negative impact on any terrestrial species. Most wildlife roam across a home range and have more than one source of water. The lowest estimated acceptable concentration of copper was 4.6 ppm for white-tailed deer. Although during application and immediately following application some locations in the lake may have copper concentrations greater than 4.6 ppm, wave-action and mixing would quickly lower the concentrations. It is anticipated that the concentration of copper throughout the lake would be 1 ppm or less within 7 to 10 days.

3.1.8. Cumulative Impacts

No other activities were identified in the project and surrounding area which would have additional impacts on the natural resources in the lake area. Therefore, cumulative impacts would not be expected to be greater in scope or magnitude than those described for each individual environmental resource.

3.2 No Action Alternative

3.2.1 Land Use

The No Action Alternative will have a long-term adverse impact on the recreational use of the lake. The use restriction on privately-owned boats to minimize the potential spread of the mussels to other water bodies would continue with this alternative. Additionally, the mussels would reduce the level of phytoplankton and zooplankton within the lake, which would adversely affect reproduction and growth of fish species in the lake. The mussels would filter the water and make it clearer, which would encourage the growth of rooted aquatic macrophytes. These macrophytes could create additional problems for people wanting to fish the lake. This would be considered a significant long-term negative impact. With this alternative, the base lake outlets to the Bellevue Drain would remain plugged increasing the risk of flooding on base land.

3.2.2 Public Health and Safety

The No Action Alternative would not have a significant impact on public health and safety. The presence of the sharp zebra mussel shells along the shoreline area would represent a minor, insignificant hazard to lake users.

3.2.3 Socioeconomics and Environmental Justice

The No Action Alternative would not have a disproportional adverse impact on low-income or minority populations. This alternative could result in negative economic impacts within the general project area. The current restrictions on the base lake could result in decreased use of the recreation area by military personnel over time due to the decreased quality of recreational fishing. This would have a negative economic impact on the businesses that derive their income from the lake. Additionally, given the aggressive colonizing ability of zebra mussels, if the zebra mussels were to gain access to surface waters outside the base lake, the potential exists for economic impacts to the Bellevue metro area and beyond because the zebra mussels could plug intakes for municipal water and power companies along the Missouri River. The colonization of the municipal utilities would result in increased operation and maintenance costs which could be significant and could result in increase utilities fees for end users.

3.2.4 Noise

The No Action Alternative would not impact local noise levels.

3.2.5 Air Quality

The No Action Alternative would not impact local air quality.

3.2.6 Water Resources

The No Action Alternative would have a long-term negative impact on the quality of water in the base lake. Without intervention, the zebra mussels would continue to rapidly multiply within the lake. The presence of the zebra mussel would change the nutrient balance in the lake resulting in clearer water due to filter feeding and the removal of phytoplankton and zooplankton. Additionally, the potential would remain for the mussels to gain access to other local water bodies, where they could adversely impact the quality of water in those nearby resources and interfere with their use and enjoyment by the public.

3.2.7 Biological Resources

The No Action Alternative would not impact any wetlands at Offutt AFB. Although zebra mussels may gain access to wetlands from loss of containment in the base lake, this would not be considered a significant impact to wetlands. Zebra mussels like to colonize on hard surfaces. Cattails and reeds would be the predominant hard surface in a wetlands and it is not likely that zebra mussels would colonize on plants to the extent that they colonize on other hard surfaces. Additionally, the cattails and reeds derive their nutrients from the soil and not from other organisms in the water. Therefore, wetland quality and function would not be impacted by zebra mussel colonization. The No Action Alternative has the potential to impact any federal-listed and state-listed species if the zebra mussel gains access to the Missouri River. Overtime, the zebra mussel population would continue to grow and the Missouri River ecosystem would be negatively affected. Therefore, the potential exists for the pallid sturgeon, interior least tern, and piping plover to be negatively impacted by the No Action alternative. The No Action Alternative would not impact wildlife at Offutt AFB.

3.2.8 Cumulative Impacts

The No Action Alternative would not produce any cumulative impacts greater in scope or magnitude than those described for each individual environmental resource.

4.0 PUBLIC COMMENTS

The public was offered an opportunity to comment on this EA and the unsigned FONSI and FONPA. This public comment ran from August 13, 2008 to September 12, 2008. No public comments were received on the Draft EA.

5.0 CONCLUSION

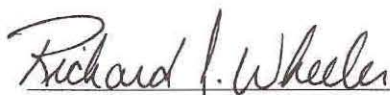
FINDING OF NO SIGNIFICANT IMPACT (FONSI)

The Environmental Assessment noted only minor, temporary, and short-term impacts that were expected to result from the proposed action to several different environmental disciplines to include Land Use, Socioeconomics/Environmental Justice, Air Quality, Water Quality, and Biological Resources. After review of the Environmental Assessment, I have concluded that these impacts are not significant and the proposed action will not have a significant adverse impact of a long-term nature to the quality of the human or natural environment. A Finding of No Significant Impact is appropriate. Therefore, no Environmental Impact Statement will be prepared. This analysis fulfills the requirements of the National Environmental Policy Act, The President's Council on Environmental quality, and 32 CFR 989.

FINDING OF NO PRACTICABLE ALTERNATIVE (FONPA)

After review of the Environmental Assessment, I have also concluded that the proposed action is the only practical alternative for the eradication of the zebra mussels and controlling their spread to the Missouri River and other nearby bodies of water. Of the five types of alternatives considered by the zebra mussel working group, chemical treatment was determined to be the most practical and effective alternative. Of the four chemicals considered by the working group and discussed in the Environmental Assessment, the proposed action (the application of copper sulfate) was determined to be the only practicable alternative. This determination was based on cost, availability of the chemical, logistics of transporting, storing, and applying the product, and the existence of a Special-Use label for the product.

The proposed action would have a short-term negative impact on wetland vegetation within the project area. The copper sulfate would kill most of the wetland vegetation exposed to the chemical. However, the wetland vegetation would return to pre-project levels by the next growing season. Therefore, no long-term impacts would occur to wetland vegetation. All the chemicals considered would have killed some or most of the wetland vegetation exposed to the chemical. No action would also be unacceptable. If the zebra mussels were to gain access to the Missouri River, then adverse economic impacts to the Bellevue metro area and beyond would be substantial because the zebra mussels could plug intakes for municipal water and power companies along the river causing increased costs for the companies and their customers.



RICHARD J. WHEELER

Colonel, USAF

Deputy Director of Installation and Mission Support (A7)

19 Sep 08

Date

F I N A L

ENVIRONMENTAL ASSESSMENT

ZEBRA MUSSEL ERADICATION PROJECT LAKE OFFUTT OFFUTT AIR FORCE BASE

SEPTEMBER 11, 2008

Prepared for
55CES/CEV
Offutt Air Force Base, Nebraska



Final Environmental Assessment

Zebra Mussel Eradication from the Base Lake at Offutt Air Force Base

Responsible Agency: United States (U.S.) Air Force, Air Combat Command

Proposed Action: Eradicate the non-native zebra mussel colonies from the Base Lake at Offutt Air Force Base (AFB) by applying copper sulfate to the Lake.

Designation: Final Environmental Assessment (EA)

Abstract: In early 2006, zebra mussel shells were observed on the shoreline of the Base Lake and closer examination of rocks and other hard surfaces in shallow water of the Lake documented the presence of live zebra mussels. This is the only verified population of zebra mussels in Nebraska. They are believed to have entered the Base Lake in 2005 (or earlier) via a boat or boat trailer that came from infested waters. In 2007, the abundance of mussels in the Lake increased dramatically. Most hard surfaces in the Lake are now covered with multiple layers of zebra mussels that in many areas are 2 to 3 inches thick.

Based on the presence of the zebra mussel in the Base Lake, a working group was formed that included Offutt AFB, federal and state regulatory and resource agencies, local electrical power companies, city municipal utility districts, and natural resource districts to discuss steps that could and should be taken to prevent the introduction of zebra mussels to other water bodies in Nebraska and surrounding states. The Base Lake zebra mussel working group, in response to their concern regarding the spread of the mussel to the Missouri River and other bodies of water, identified temporary and long-term actions that if implemented would reduce the potential for spread of the mussel. Short-term actions included restricting boat access to the Base Lake and temporarily sealing the outlet to prevent infested water from being discharged from the Lake. These two actions were implemented by Offutt AFB in 2007.

The long-term action being considered in this EA is the total eradication of the zebra mussel from the Base Lake. The purpose of this EA is to explore this action and alternatives and identify the potential environmental impacts associated with implementation of the long-term action. Offutt AFB agrees that the proposed action would be an effective means to control the spread of zebra mussels from the Base Lake. In evaluating various eradication procedures, Offutt AFB, in concert with the working group, has determined that chemical application is the most practical method for eradication of the mussel. The eradication of the undesirable aquatic species would restore the recreational function of the Lake and reduce the potential for spread to other water bodies in the general vicinity of the Base Lake.

This EA summarizes the alternatives considered by the working group, including confinement, physical removal, thermal removal, biological removal, and chemical removal and provides the reasoning behind their dismissal from further consideration. This

EA provides a detailed analysis for the application of copper sulfate to the Base Lake and the No Action alternative. There are no significant adverse impacts associated with the Proposed Action. Therefore, a Finding of No Significant Impact (FONSI) is concluded for the proposed action.

EXECUTIVE SUMMARY

Introduction

Offutt Air Force Base (AFB) proposed to eradicate zebra mussels from the Base Lake by applying copper sulfate directly to the lake.

This Environmental Assessment (EA) has been prepared in accordance with the National Environmental Policy Act of 1969 (NEPA), the Council on Environmental Quality (CEQ) regulations implementing NEPA [40 Code of Federal Regulations (CFR) Parts 1500 through 1508], and the Air Force regulations for NEPA compliance (32 CFR Part 989; Air Force Instruction [AFI] 32-7061) to assess the potential environmental impacts associated with the application of the chemical to the Base Lake.

Proposed Action and No Action Alternatives

In early 2006, zebra mussel shells were observed on the shoreline of the Base Lake and closer examination of rocks and other hard surfaces in shallow water of the Lake documented the presence of live zebra mussels. This is the only verified population of zebra mussels in Nebraska. They are believed to have entered the Base Lake in 2005 (or earlier) via a boat or boat trailer that came from infested waters. In 2007, the abundance of mussels in the Lake increased dramatically. Most hard surfaces in the Lake are now covered with multiple layers of zebra mussels that in many areas are 2 to 3 inches thick.

Based on the presence of the zebra mussel in the Base Lake, a working group was formed that included Offutt AFB, federal and state regulatory and resource agencies, local electrical power companies, city municipal utility districts, and natural resource districts to discuss steps that could and should be taken to prevent the introduction of zebra mussels to other water bodies in Nebraska and surrounding states. The Base Lake zebra mussel working group, in response to their concern regarding the potential for spread of the mussel to the Missouri River and other bodies of water, identified temporary and long-term actions that if implemented would reduce the spread of the mussel. Short-term actions included restricting boat access to the Base Lake and temporarily sealing the outlet to prevent infested water from being discharged from the Lake. These two actions were implemented by Offutt AFB in 2007.

The long-term action being considered in this EA is the total eradication of the zebra mussel from the Base Lake. The purpose of this EA is to explore this action and alternatives and identify the potential environmental impacts associated with implementation of the long-term action. Offutt AFB agrees that the proposed action would be an effective means to control the spread of zebra mussels from the Base Lake. In evaluating various eradication procedures, Offutt AFB, in concert with the working group, has determined that chemical application is the most practical method for eradication of the mussel. The eradication of the undesirable aquatic species would restore the recreational function of the Lake and reduce the potential for spread to other water bodies in the general vicinity of the Base Lake.

Summary of Potential Environmental Impacts

The proposed action and no action alternatives were analyzed for potential impacts on environmental resources including land use, public health and safety, socioeconomics/environmental justice, noise, air quality, water resources, and biological resources. Findings indicate that, under the preferred alternative, potential consequences would result in no significant adverse effects on resources in the area. Additionally, no significant cumulative effects would be expected from the action. Based on this, implementation of the proposed action would have no significant adverse environmental or socioeconomic effects. Because no significant adverse effects would result from implementation of the proposed action, preparation of an Environmental Impact Statement is not required and preparation of a Finding of No Significant Impact (FONSI) is appropriate.

Table ES-1 provides a summary of the impacts that would be expected for the proposed action and the no action.

TABLE ES-1
ENVIRONMENTAL EFFECTS OF ALTERNATIVES EVALUATED
ZEBRA MUSSEL ERADICATION PROJECT

Discipline	Alternative 1 No Action	Alternative 2 Proposed Action
Land Use	Long-term negative impact on recreational use of the lake.	Land use classification would not change with this alternative. Short-term negative impact due to use restrictions during and immediately following chemical application. Long-term positive impact on recreational use of the lake.
Public Health and Safety	No impact	Potential short-term impacts during chemical application.
Socioeconomics/Environmental Justice	Potential long-term negative economic impact to Base Lake businesses. Potential long-term negative economic impact if zebra mussels gained access to other water bodies and utility intakes.	No impact.
Noise	No impact.	Short-term increase in project area noise levels during application of the chemical.
Air Quality	No impact.	Short-term, localized adverse impacts to air quality during application of the chemical.
Water Resources	No impact on groundwater. Long-term negative impact on the quality of water in the Base Lake. Potential long-term impacts to other surface water bodies if the mussel gains access to them.	No impact on groundwater. Short-term negative impact on Base Lake water quality due to the addition of chemical. Long-term positive impact on water quality in the lake.
Biological Resources	No impact on wetlands. No impact on federal or state-listed species. No impact on terrestrial wildlife. Long-term negative impact on aquatic resources.	Short-term impact on wetland vegetation. Vegetation would return to normal by next growing season. No impact on federal or state-listed species. No impact on terrestrial wildlife Short-term adverse impact on aquatic resources. Long-term positive impact on aquatic resources in the Base Lake.
Cultural Resources	No impact.	No impact
Geology and Soils	No impact.	No impact
Climate and Meteorology	No impact.	No impact
Topography	No impact.	No impact
Hydrology	No impact.	No impact
Floodplains	No impact.	No impact
Hazardous Materials and Waste	No impact.	No impact

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List of Acronyms and Abbreviations

°F	degrees Fahrenheit
AF	Air Force
AFB	Air Force Base
AFI	Air Force Instructions
AICUZ	Air Installation Compatible Use Zone
BASH	Bird Aircraft Strike Hazard
bgs	below ground surface
Census	U.S. Census Bureau
CEQ	Council on Environmental Quality
CES	Civil Engineering Squadron
CEV	Environmental Flight
CFR	Code of Federal Regulations
CMPs	Corrugated metal pipes
dB	decibel
DNL	Day-Night Average A-Weighted Sound Level
EA	Environmental Assessment
EO	Executive Order
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FONSI	Finding of No Significant Impact
MCL	Maximum Contaminant Level
mg/kgBW/day	milligram per kilogram of body weight per day
mg/L	milligrams per liter
NAAQS	National Ambient Air Quality Standards
NDA	Nebraska Department of Agriculture
NDEQ	Nebraska Department of Environmental Quality
NEPA	National Environmental Policy Act
NGPC	Nebraska Game and Park Commission
NHU	Natural Habitats Unlimited
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
PM ₁₀	Particulate matter 10 microns or smaller
PM _{2.5}	Particulate matter 2.5 microns or smaller
ppm	parts per million
SGNIS	Sea Grant Non-indigenous Species Site
T&E	Threatened and Endangered
TEC	The Environmental Company
U.S.	United States
U.S.C.	United States Administrative Code

List of Acronyms and Abbreviations

URS	URS Group, Inc.
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

1.1 INTRODUCTION

Offutt Air Force Base (AFB) is located in Sarpy County, Nebraska immediately south of the City of Bellevue (Figure 1). The Base Lake at Offutt AFB was created by the removal of fill (sand and gravel) during the construction of the main runway at the Base. Generally, the Base Lake is between 117 and 113 acres in size and has an average depth of 15 feet (URS 2006). Currently, the Lake has a surface area greater than 123 acres and contains more than 2,600 acre-feet of water. The Base Lake and the area surrounding the Lake is used by Base personnel and their families for numerous recreational activities including boating, fishing, horseback riding, camping, picnicking, hiking, bicycling, and softball. Figure 1 shows the location of the Base Lake within Offutt AFB. Figure 2 shows the location of recreational facilities at the Lake.

In early 2006, zebra mussel shells were observed on the shoreline of the Base Lake and closer examination of rocks and other hard surfaces in shallow water of the Lake documented the presence of live zebra mussels. This is the only verified population of zebra mussels in Nebraska.

Zebra mussels, *Dreissena polymorpha*, (shown at right, photograph courtesy of the U.S. Geological Survey[USGS]) are small, fingernail-sized, freshwater mollusks accidentally introduced to North America via ballast water from a transoceanic vessel. Since their introduction in the mid 1980s, they have spread rapidly to all of the Great Lakes, the Mississippi River from St. Paul, Minnesota to Louisiana, and most of the major Mississippi River tributaries, including the Ohio, Tennessee, Cumberland, and Arkansas Rivers. By the end of 1995, zebra mussels had invaded waters in 20 of the 38 states east of the Rocky Mountains, as well as the Canadian provinces of Ontario and Quebec. Its rapid dispersal is due to the passive drifting of the larval stage (the free-floating or “pelagic” veliger), its ability to disperse during all life stages, and its ability to attach to boats navigating infested waters. (USGS 2008) They are believed to have entered the Base Lake in 2005 (or earlier) via a boat or boat trailer that came from infested waters. In 2007, the abundance of mussels in the Lake increased dramatically. Most hard surfaces in the Lake are now covered with multiple layers of zebra mussels that in many areas are 2 to 3 inches thick.



Unlike most North American freshwater bivalves, which brood their eggs within specialized gill brood pouches, the zebra mussels release sperm and eggs directly to the surrounding water for external fertilization. The fertilized egg develops into a free-swimming trocophore veliger (larva) with a ciliated velum, which is used for swimming and filtering food from the water. Generally, within 30 days, these immature forms begin to settle and attach themselves to a solid substrate (SGNIS 2008). Temperature is one of the limiting factors for the growth and reproduction of zebra mussels. When temperatures are below approximately 36 degrees Fahrenheit (°F) or above 104 °F, zebra mussels cannot survive. Poor to moderate growth (without reproduction) occurs at temperatures up to approximately 55 °F or above 84 °F, while reproduction and good growth occur at temperatures of between 55 °F to 84 °F. At the Base Lake, reproduction generally occurs from May through September, although that may vary slightly based on annual weather conditions.

Zebra mussels colonize on hard surfaces, such as docks, boat hulls, commercial fishing nets, water intake pipes and valves, native mollusks, and other zebra mussels. Known predators are limited to, some diving ducks, freshwater drum, carp, and sturgeon. In North America, these predators are not numerous enough to have a significant effect on zebra mussel populations. (USGS 2008)

The tendency of zebra mussels to form dense aggregates on hard surfaces (shown below, photograph courtesy of the National Oceanic and Atmospheric Administration [NOAA]) has led to serious economic impact in municipal, industrial, and private water systems. When large numbers of larvae settle in man-made raw water systems they accumulate in great numbers forming thick mats which can restrict water flow even in large diameter piping, increase sedimentation rates, and promote surface corrosion. Natural populations of 5,000 to 30,000 individuals per square meter are not uncommon. However, in waters with adequate water flow, abundant nutrients, and suitable substrates for attachment, densities have been documented as high as 700,000 individuals per square meter. (SGNIS 2008)



Additionally, zebra mussels can have profound effects on the ecosystems they invade. They primarily consume phytoplankton, but other suspended material is filtered from the water column including bacteria, protozoans, zebra mussel veligers, other microzooplankton and silt. Large populations of zebra mussels can reduce the biomass of phytoplankton by 80 to 90 percent and increase the transparency of the water by similar amounts. Increased water clarity allows light to penetrate further, potentially promoting macrophyte populations. (USGS 2008)

Effects continue through the food web to fish. Reductions in zooplankton biomass increase competition and decrease survival, which decreases the biomass of planktivorous fish. Because microzooplankton are more heavily impacted by zebra mussels, larval fish are more affected than later life stages. This may be especially important to inland lakes with population of pelagic larval fish such as bluegills. Benthic feeding fish may benefit as opposed to planktivorous fish, or behavioral shifts from pelagic to benthic-feeding may occur. In addition, proliferation of aquatic macrophytes may alter fish habitat. (USGS 2008)

Based on the presence of the zebra mussel in the Base Lake, a working group was formed that included Offutt AFB, federal and state regulatory and resource agencies, local electrical power companies, city municipal utility districts, and natural resource districts to discuss steps that could and should be taken to prevent the introduction of zebra mussels to other water bodies in Nebraska. The actions identified by the working group included closing the Lake to all boats except the rental boats that would not be removed from the Lake, the installation of concrete plugs in the two 48-inch corrugated metal pipes (CMPs) that serve as an outlet structure to the

Lake, and the removal of the zebra mussels from the Base Lake. The outlet discharges to a local drainage (Bellevue Drain) that flows approximately one mile before discharging to the Missouri River. Colonization of zebra mussels in this reach of the Missouri River is of major concern due to the presence of water intake structures for several power plants and municipal water systems.

1.2 PURPOSE AND SCOPE OF DOCUMENT

This Environmental Assessment (EA) identifies alternatives for controlling the spread of zebra mussels from the Base Lake and the major environmental resources within the study area. The EA also discusses potential environmental impacts to these resources associated with the implementation of the proposed action. This EA provides the public and decision-makers with the information required to understand and evaluate these potential impacts.

1.3 PURPOSE AND NEED

The Base Lake zebra mussel working group, in response to their concern regarding the spread of the mussel to the Missouri River and other bodies of water, identified temporary and long-term actions that if implemented would reduce the potential for spread of the mussel. Short-term actions included restricting boat access to the Base Lake and temporarily sealing the outlet to prevent infested water from being discharged from the Lake. These two actions were implemented by Offutt AFB in 2007.

The long-term action identified was the total removal of the zebra mussel from the Base Lake. The purpose of the proposed project would be to prevent the spread of zebra mussels from the Base Lake and return recreational functions to the Lake.

Offutt AFB recognizes the need to control the spread of the zebra mussel from the Base Lake. Offutt AFB has identified the need to control the undesirable non-native aquatic species in a manner that would restore the recreational function of the Lake and reduce the potential for spread to other water bodies including the Missouri River and numerous small gravel pit lakes located in the general vicinity of the Base Lake. The spread of zebra mussels to the Missouri River is a major concern to municipalities and power companies who have water intake structures located on the river. In evaluating various control procedures, Offutt AFB, in concert with the working group, has determined that chemical application is the most practical method for removal of the mussel.

1.4 APPLICABLE REGULATORY REQUIREMENTS AND COORDINATION

The National Environmental Policy Act of 1969 (NEPA), the Council on Environmental Quality (CEQ) regulations implementing NEPA [40 Code of Federal Regulations (CFR) Parts 1500 through 1508], and the Air Force regulations for NEPA compliance (32 CFR Part 989; Air Force Instruction [AFI] 32-7061) direct the Air Force (AF) and other federal agencies to fully understand, and take into consideration during decision-making, the environmental consequences of proposed federal actions. Thereby, Offutt AFB must comply with NEPA on all major federal actions. The removal of zebra mussels from the Base Lake would be considered a major action.

Executive Order (EO) 11514, Protection and Enhancement of Environmental Quality, as amended by EO 11991, sets policy for directing the federal government in providing leadership in protecting and enhancing the quality of the nation's environment. The CEQ Regulations (40 CFR - 1500 to 1508) implement the procedural provisions of NEPA. AFI 32-7061 and 32 CFR Part 989 establishes the specific AF procedural requirements for implementation of NEPA.

EO 13112, Invasive Species, addresses the prevention of the introduction of invasive species and provides for their control and minimization of the economic, ecological, and human health impacts the invasive species cause.

EO 12088, Federal Compliance with Pollution Control Standards, requires all Federal agencies to be in compliance with environmental laws and fully cooperate with the United States Environmental Protection Agency (USEPA), State, interstate, and local agencies to prevent, control, and abate environmental pollution.

CEQ has developed regulations for the preparation of environmental impact documents in compliance with NEPA. The regulations require an investigation and evaluation of all reasonable alternatives as part of the EA process. In addition, NEPA requires that the No Action Alternative be retained and evaluated in the EA.

Offutt AFB evaluated measures that could be used to remove or control the spread of the zebra mussel from the Lake. This evaluation was done in concert with the working group. The following two goals need to be satisfied for an action alternative to be determined to be satisfactory and retained for further evaluation.

- Restoration of the recreational function of the Base Lake
- Reduction/elimination of the risk of zebra mussels being spread to other water bodies, especially the Missouri River

2.1 ALTERNATIVES INITIALLY CONSIDERED

The working group discussed a wide variety of potential alternatives to remove the mussel from the Base Lake. During these initial discussions, many of the discussed alternatives were eliminated because they could not be implemented, were not feasible, would not satisfy one or both of the identified goals, were cost prohibitive, or would not achieve the desired level of removal. Potential alternatives generally fell into one of the following five categories:

- Confinement
- Physical Removal
- Thermal Removal
- Biological Removal
- Chemical Removal

2.1.1 Confinement

2.1.1.1 *Restrict Boat Usage on Base Lake*

With this alternative, private boats would not be allowed on the Base Lake. Boat usage would be limited to rental boats that would not be removed from the Lake.

Although this alternative would remove one of the pathways for zebra mussels to be spread to other bodies of water, it does not remove the threat of infestation in other water bodies. As long as zebra mussels remain in the Base Lake, the threat of them being spread would remain. In addition, this alternative would have no affect on the restoration of the recreational function of the Lake.

This alternative was eliminated as an alternative because it would not satisfy the two identified goals. However, it has short-term benefits as it would reduce the risk of the spread of the zebra mussel until an alternative could be implemented that would satisfy the identified needs. In

response to this identified short-term benefit, Offutt AFB restricted boat access to the Base Lake in 2007. Therefore, this action is included as part of the No Action Alternative.

2.1.1.2 Plug Outlet Structure

This alternative involves installing a plug in the Base Lake's outlet structure (2 corrugated metal pipes) to prevent water from the Lake flowing into Bellevue Drain, which in turn flows into the Missouri River.

Although this alternative would remove one of the pathways for zebra mussels to be spread to other bodies of water, it does not remove the threat of infestation in other water bodies. As long as zebra mussels remain in the Base Lake, the potential for them to spread to other water bodies would remain. In addition, this alternative would have no effect on the restoration of the recreational function of the Lake.

This alternative was eliminated as an alternative because it would not satisfy the two identified goals. However, it has short-term benefits as it would reduce the risk of the spread of the zebra mussel until a long-term alternative could be implemented. In response to this identified short-term benefit, Offutt AFB plugged both outlet culverts with concrete in 2007. This action is included as part of the No Action Alternative.

2.1.2 Physical Removal

This alternative would involve the placement of fill into the Base Lake until the entire volume of water in the Lake has been replaced with fill and the lake and associated habitat for the zebra mussel would no longer exist. The placement of the fill would need to occur over an extended period of time to prevent the water level from rising to a level where it would flow into existing drainages, which would discharge into the Missouri River and/or its tributaries. Rough calculations indicate that in excess of 35 million cubic yards of fill would be needed to fill in the Lake. Additionally, the East Gate drainage system would need to be modified. Obtaining and transporting the volume of fill that would be needed would make the alternative cost prohibitive, would dramatically impact the stormwater management at Offutt AFB, and would prevent the recreational function of the Base Lake from being restored. For these reasons the alternative was removed from consideration.

2.1.3 Thermal Removal

Depending on acclimation levels and rate of temperature change, 100 percent mortality of zebra mussels have been reported at temperatures ranging from 95 to 104 °F. Thermal treatment has been used to remove zebra mussels from targeted surfaces associated with raw water supply systems. However, this technique has not been used to remove zebra mussels from an entire body of water. No feasible way was identified to add the amount of heat that would be required to rapidly increase the water temperature to over 95 °F. This alternative was determined to be unproven and not feasible, and was removed from consideration.

2.1.4 Biological Removal

In North America, certain diving ducks and a limited number of fish species (sturgeon, carp, and freshwater drum) have been identified as animals that will readily feed on zebra mussels. However, none of these potential predators would be expected to completely eliminate the zebra mussel from the Base Lake.. In addition, the high reproductive rate of the zebra mussels would be able to replace all individuals lost due to predation. Since this alternative would not be expected to achieve either of the identified goals, the alternative was not retained.

2.1.5 Chemical Removal

The evaluation of chemicals that could be used to remove zebra mussels involved four criteria:

- The chemical had to be toxic to zebra mussels.
- The chemical had to be permitted or capable of being permitted in a short period of time for use against zebra mussels.
- The chemical had to be less toxic to other aquatic species than it was to zebra mussels.
- The chemical has to be licensed for use in an open water system.

Chemicals considered included Clam-Trol, Endothall, potash (potassium chloride), and copper sulfate

2.1.5.1 Chemicals Not Meeting Screening Criteria

Clam-Trol

Clam-Trol is a chemical that is labeled for the application into aquatic environments for the control of clams in open water systems. Toxicity information available for Clam-Trol indicated that it is moderately toxic to zebra mussels while being highly toxic to sensitive species such as channel catfish, which are an important game fish species in the Base Lake. Since the application rate that would be required to eradicate the zebra mussels would be expected to also result in high fish mortality, Clam-Trol was not retained as a chemical to be considered for eradication of zebra mussels from the Base Lake.

Endothall

Endothall is a chemical that is presently labeled for use in the aquatic environments for the control of aquatic vegetation and algae. Various formulations (salts) of endothall are used in aquatic pest control. Although the parent compound (endothall) is the same, characteristics of the different salt formations differ greatly. Some formulations (e.g., Hydrothol 191) are labeled for aquatic weed control in open water systems. Other formulations (e.g., EVAC) are labeled for zebra mussel use but restricted to closed water systems. While endothall is moderately toxic to mussels, in some formulations it can be moderately to highly toxic to some fish species. The open water system formulation (Hydrothol 191) is extremely toxic to fish. In addition, it has not

been labeled for control of organisms such as zebra mussel. Under the authority of 24(c) of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), states may register an additional use of a federally registered pesticide product, or a new end-use product to meet special local needs. The USEPA reviews these registrations, and may disapprove the state registration if, among other things, the use is not covered by necessary tolerances, or the use has been previously denied, disapproved, suspended or canceled by the USEPA Administrator, or voluntarily canceled subsequent to a notice concerning health or environmental concerns (Romary 2008). Based on this approval process, the working group believed it would be quite difficult to obtain a label for it to be used to eradicate zebra mussels from the Base Lake. Therefore, it was not retained for further evaluation.

2.1.5.2 Chemicals Meeting Screening Criteria

Potash

Potash (potassium chloride) has been reported to have been used successfully to eradicate zebra mussels from Millbrook Quarry in Virginia. There has been no report of zebra mussels in this 12-acre lake since the eradication action in 2006. Initially in the evaluation, Offutt AFB and the working group believed that potash should be the chemical considered for the eradication of the zebra mussel from the Base Lake. However, a very high concentration (approximately 240 tons) of potash would be required to obtain the desired zebra mussel mortality. During 2007, there was in excess of a 300 percent increase in the cost of the chemical, resulting in the cost of the chemical alone for two applications would have been in excess of \$330,000. This increase in the cost of potash, coupled with the cost of transporting 240 tons of potash to the base lake and the cost of applying the potash to the base lake was projected to be in excess of 1 million dollars. Subject to the availability of appropriations, and within Administration budgetary limits, Executive Order 13112 directs Federal Agencies to detect and respond rapidly to and control populations of invasive species in a cost-effective and environmentally sound manner. Based on the directive in Executive Order 13112, the zebra mussel working group determined that Offutt AFB could not respond quickly and in a cost-effective manner using potash as the chemical of choice to eradicate the zebra mussels and prevent their spread to the Missouri and other nearby bodies of water. The zebra mussel working group was also concerned about whether there would be a sufficient supply of potash available to eradicate the zebra mussels because it is also used for agricultural purposes as a fertilizer.

Even though potash was used to eradicate zebra mussels in Virginia, potash is not listed as an active ingredient in any Federally-registered pesticide. Section 18 of FIFRA authorizes the USEPA to allow states to use pesticides for an unregistered use for a limited time if USEPA determines that an emergency condition exists. The Nebraska Department of Agriculture (NDA) or a Federal agency is usually the entity that makes the Section 18 application to USEPA. Upon receipt of the application, USEPA attempts to make decisions on the request within a 50 day time frame from date of receipt. During this 50 day period, USEPA performs an evaluation of the request including an assessment of the validity of the emergency claim and economic loss, human dietary risk assessments, occupational risk assessment, ecological and environmental risk assessments, and an assessment of the progress toward registration for the use for specific or public health exemption requests (Romary 2008). The Base Lake working group concluded that

the probability of potash being approved for this exemption was low because of the unknown environmental effects.

Although potash meets the screening criteria, the high cost of the alternative coupled with the uncertainty of obtaining an exemption to eradicate zebra mussels from the Base Lake resulted in the alternative being removed from consideration.

Copper Sulfate

Copper sulfate has been used for many years as a chemical tool in freshwater farm ponds and aquaculture operations, including open water systems. It is both an effective algaecide and a parasite treatment. There are no restrictions on the use of the water following treatment; however, it is desirable to wait 24 hours to let the metallic smell in the water to dissipate. Copper sulfate is also toxic to invertebrates, such as snails and recently has shown effectiveness against zebra mussels. Copper sulfate can be toxic to fish, especially to copper sensitive species such as trout and especially in more acidic waters. Based on the label toxicity, copper sulfate can kill goldfish at a concentration of 0.1 parts per million (ppm) for 48 hours and rainbow trout at a concentration of 0.1 ppm for 96 hours. However, most fish kills following copper sulfate treatment appear to result from heavy algae kill and accompanying oxygen depletion rather than from the chemical itself.

Copper sulfate has a fairly short period of activity. It is quickly adsorbed to soil and sediment and inorganic ions such as carbonates, and organic materials suspended in the water. These particles then fall to the bottom sediments, rendering the copper inactive.

The product Copper Sulfate Crystals, USEPA registration number 56576-1, was chosen because it is an already-registered product with USPEA and the NDA. Also, a similar species/site, “schistosome-infected freshwater snails” is listed on the label. In order to legally apply this product for zebra mussels, a section 24 (c) label would be required. The U.S. Air Force would apply for this approved use through the NDA and USEPA.

2.2 ALTERNATIVES EVALUATED IN THE EA

This section describes the No Action Alternative and the Proposed Action, which involves the application of copper sulfate to the Base Lake. Inclusion of the No Action Alternative is required under NEPA.

2.2.1 No Action Alternative

The No Action Alternative is defined as maintaining the status quo with no actions being funded or completed to remove the zebra mussels from the Base Lake. Under this alternative, Offutt AFB would continue to restrict the use of private boats on the Base Lake and the outlet pipes would remain plugged.

2.2.2 Application of Copper Sulfate

The Proposed Action would involve the treatment of the Base Lake using copper sulfate. The Proposed Action includes an initial application in September 2008 and a second application in the spring of 2009. Each application would be completed in 2 phases.

2.2.1.1 Initial Application – Treatment Methods

Copper sulfate would be applied to the Base Lake at a rate of 10.8 pounds per acre foot of water, in accordance with the Special Local Need Label (Appendix B). The surface area and volume of the Base Lake during the treatment period would determine the precise amount of copper sulfate that would need to be applied to the Base Lake. Therefore, the elevation of the Base Lake would be surveyed prior to application to determine the correct volume of water and appropriate amount of copper sulfate to be applied. The amount of copper sulfate that would need to be applied to the Base Lake is expected to be between 22,000 and 26,000 pounds based on the estimated acre-feet of water that will be in the Lake in September 2008.

The application of copper sulfate would occur so the average concentration of the Lake would be 1 ppm over a 48 hour period, in accordance with the Special Local Need Label. Medium sized (5 to 8 millimeter diameter) copper sulfate crystals (shown at right) would be applied using a barge and vortex-type aquatic herbicide spreaders (or equivalent). It is anticipated that the copper sulfate would be spread evenly at a rate of between 1,000 to 1,500 pounds per hour. If necessary, additional watercraft would be employed to achieve the required rate of application so the appropriate amount of copper sulfate would be applied within the required 48 hour period.



In addition to treating the main portion of the Base Lake, copper sulfate would be applied to the inlet channel and ponded areas immediately upstream of the Lake on base property (Figure 3). The potential for zebra mussel migration into these areas warrants their treatment. Application of these areas would be done manually using handheld spreaders. All mixing and application would be completed by individuals that have been certified by NDA as a commercial/noncommercial pesticide applicator in the Aquatic Pest Controls Category in the State of Nebraska.

2.2.1.2 Initial Application - Post-Treatment Activities

Following the completion of the copper sulfate application, the Lake would be monitored for water quality, fish mortality, and zebra mussel mortality. The Lake would also be periodically monitored for copper concentration to evaluate when the concentration is less than 1.3 ppm in all areas of the Lake. The Lake would have usage restrictions (no fishing, swimming, or boating) in place until the highest detected concentration is less than 1.3 ppm.

Copper sulfate is toxic to some fish and fish kills may occur. Therefore, monitoring for fish mortality would also occur immediately following the application of the copper sulfate. If fish mortality is observed, all dead fish would be removed daily until no dead fish are observed for 48 consecutive hours. The dead fish would be buried on Offutt AFB or taken to an approved local landfill. The exact disposal would depend on the volume of dead fish.

Visual analysis and monitoring would occur to determine if the zebra mussel eradication effort was effective. These analyses would include substrate sampling and veliger (larval) sampling within the water column, as well as visual inspections.

2.2.1.3 Second Application

A second application of copper sulfate, if necessary, would occur in the spring of 2009.

Special Label Use Restrictions

- The Special Local Need Labeling for the use of copper sulfate at Offutt AFB includes the following restrictions:
 - The label only applies to the Offutt AFB Base Lake.
 - The label is only valid for two applications, and expires on May 31, 2009
 - The average lake concentrations of elemental copper cannot exceed 1 ppm based on the total lake volume.
 - The lake area must be monitored for dead fish during daylight hours. All dead fish must be collected and disposed of by burial or landfill.
 - Swimming in the lake, consumption of fish from the lake, and the use of the lake as direct or indirect source of drinking water are prohibited during and after lake treatment until the water concentration of copper is at or below 1.3 ppm.
 - Warning signs must be posted at the lake.

This chapter describes the human and natural environment at Offutt AFB, providing information to allow for the evaluation of potential environmental impacts that could result from the alternatives described in Section 2.

During the initial environmental review process, it was determined that several environmental disciplines would not be impacted by the proposed action. These include:

- Climate and Meteorology
- Topography
- Geology and Soils
- Hydrology
- Floodplains (FEMA 2005)
- Cultural Resources
- Hazardous Materials and Wastes

To facilitate the preparation and review of the EA, these disciplines will not be discussed further in this document.

3.1 LAND USE

The Base Lake provides multiple recreational opportunities to primarily Offutt AFB personnel. Recreational activities available at the Lake include horseback riding, camping, picnicking, hiking, softball, boating, and fishing. The Base Lake is posted as a no wading or swimming area and is not used as a potable water source.

Due to the presence of the zebra mussels, restrictions have been placed on boat access to the Lake. Only rental boats available at the lake are allowed.

3.2 PUBLIC HEALTH AND SAFETY

EO 12088, Federal Compliance with Pollution Control Standards, directs federal agencies to comply with federal, state, and local laws and regulations concerning air, water, and noise pollution, and hazardous materials and substances to the same extent as any private party.

The edges of zebra mussel shells are sharp and can cause lacerations to feet, legs, or arms that may come into contact with them. However, the Base Lake shorelines are steep and riprap has been placed to stabilize the steep shorelines.

The Base Lake is not enclosed within the perimeter fence of Offutt AFB. Therefore, the public can gain access to the Lake. However, the lake is patrolled by Offutt AFB security staff to minimize the use by non-military personnel.

3.3 SOCIOECONOMICS/ENVIRONMENTAL JUSTICE

EO 12898, enacted in 1993, requires that each federal agency make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.

Offutt AFB is an active military base with approximately 12,000 military and federal personnel assigned to the facility. Currently, there is no base-owned housing located in the vicinity of the Base Lake. Therefore, for purposes of environmental justice, there are no low-income or minority populations located on Base or within the project area.

The city of Bellevue, Nebraska which is located adjacent to Offutt AFB to the north and west, has a population of approximately 44,382 people. The population is comprised of approximately 86 percent whites, 6 percent African Americans, 6 percent Hispanic or Latino, and 2 percent Asian. Approximately 4 percent of the families and 6 percent of the individuals live below the poverty level. (Census 2008)

A civilian trailer park is located less than 0.2 mile northwest of the Base Lake. According the 2000 Census, this area is comprised of approximately 6 percent Hispanics or Latinos and 4 percent African Americans. Approximately 11 percent of the families and 15 percent of the individuals in the area live below the poverty line. (Census 2008)

Since their introduction into the Great Lakes region in 1988, zebra mussels have been causing problems for power companies, steel plants, city water suppliers, and other industries by clogging water-intake systems. The United States Fish and Wildlife Service (USFWS) has estimated that the potential economic impact at \$5 billion from 2000 to 2010 to United States (U.S.) and Canadian water users within the Great Lakes region alone.

Presently, electric power and potable water for Offutt AFB and surrounding municipalities is supplied by facilities that have water intake(s) on the Missouri River. Locally, these entities include Omaha Public Power District, Omaha Metropolitan Utilities District, and Mid America Energy. The Missouri River flows from Montana to south to its confluence with the Mississippi River, near St. Louis, Missouri. Therefore, many municipalities and industries obtain needed water from the Missouri River and its tributaries.

3.4 NOISE

Sounds disrupting normal activities or otherwise diminishing the quality of the environment are designated as noise. Noise events that occur during the night (10 p.m. to 7 a.m.) are more disruptive than those that occur during normal wake hours (7 a.m. to 10 p.m.). Man-made noise events within the project vicinity are primarily associated with aircraft operation.

The Offutt AFB's host unit is the 55th Wing. The Wing operates a variety of RC-135s, the EC-130, and the E-4B aircraft in support of its diverse missions, which include reconnaissance, command and control, communications, electronic attack, and international treaty verification.

An average day at Offutt AFB involves approximately 135 flying events. In addition, numerous transient aircraft from other military installations land and take-off from Offutt AFB on a daily basis. Noise levels within the southwest one-fourth of the Lake (closest to the active runways) are estimated to be approximately 65 to 70 decibels (dB) Day-Night Average A-weighted Sound Level (DNL). (URS 2006, Offutt AFB 2007)

The effects of aircraft and airfield operation noise on the surrounding community are of great concern to the Air Force, as is the potential danger to humans and property from aircraft accidents. To minimize the impact of noise and danger, the Air Force participates in cooperative planning with the cities of Bellevue, Papillion, La Vista, Ralston, Plattsmouth, and Omaha along with Sarpy and Douglas counties. All of these entities have land use plans that have benefited from the input of Offutt AFB data concerning flight operations and Air Installation Compatible Use Zone (AICUZ) Land Use Guidelines. (URS 2006)

The Base Lake is located approximately 0.25 mile northeast of the southeastern end of the runway. The closest residential structures (which are not on the Base) are located approximately 0.2 mile northwest of the Lake.

3.5 AIR QUALITY

The National Ambient Air Quality Standards (NAAQS) established by the USEPA define the allowable concentration of pollutants that may be reached but not exceeded in a given period to protect human health (primary standard) and welfare (secondary standard), with a reasonable margin of safety. These standards include maximum concentrations for ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, particulate matter with a diameter of 10 microns or less (PM₁₀) and smaller particulates 2.5-microns or smaller (PM_{2.5}). Exceeding a concentration level is a violation and constitutes a non-attainment of the standard. In addition to the pollutants previously identified, the State of Nebraska has established additional criteria for total reduced sulfur. Standards are not to be exceeded more than once per year except for ozone and particulate matter, which are not to be exceeded more than an average of one day per year.

Offutt AFB is located in a NAAQS Attainment Area (USEPA 2008).

3.6 WATER RESOURCES

3.6.1 Surface Water

Surface water at the Base consists of the Base Lake, the golf course pond, and five drainage basins. Overland flow on base is collected in storm sewers, drainage ditches, and collection basins. All the drainage basins flow into the Papillion Creek, Platte River, or Missouri River. (URS 2006) Surface water runoff from the runway area drains through the East Gate drain and into the Base Lake.

The Base Lake is between generally between 117 and 113 acres in size and holds approximately 2,000 acre-feet of water. Due to heavy precipitation in the spring and summer of 2008, the Lake

elevation had risen and the size has increased. As of July 25, 2008, the Lake size was approximately 123 acres and the lake contained more than 2,600 acre-feet of water. The Lake is fed by both surface drainages and groundwater. Because it is groundwater fed, variations in the elevation of the Missouri River can affect the water level in the lake. The Lake was formed as a result of dredging to supply materials for construction on base. Since its formation, concrete and riprap have been placed along the bank of the Lake to stabilize the shoreline. The soil composition of the banks coupled with high usage makes vegetative cover difficult to maintain. (URS 2006)

As stated in Section 1.1, concrete plugs were installed in the two 48-inch CMPs that serve as an outlet structure for the Lake. The outlet discharges to a local drainage (Bellevue Drain) that flows approximately 1 mile before discharging to the Missouri River.

The Missouri River is a major tributary to the Mississippi River and is approximately 1 mile downstream of the Base Lake. A portion of the Missouri River located along the northeastern section of Nebraska in Ponca State Park is a federally-designated “wild and scenic river.” The Missouri River is used for recreational boating, fishing, and swimming and the transport of goods via barge. As indicated in Section 3.3, the Missouri River provides water to the municipalities and industries via intake pipes along its course from Montana to Missouri.

3.6.1.1 Surface Water Quality

The basic water quality in the Base Lake is similar to water quality of other sandpit lakes in the Platte River Valley. Due to temperature stratification during the warmer months, water below the thermocline (hypolimnion) has low dissolved oxygen levels which prevents utilization by the fish in the lake. Current temperature profiles of the Base Lake will be collected prior to chemical application.

Monitoring of the water that flows into the Base Lake is necessary to ensure water quality does not degrade. Much of the water that flows into the Lake comes from areas on the base, and due to the proximity of the runway, run off may contain petroleum contaminants. Monitoring of the water that flows into the Base Lake is necessary to ensure water quality does not degrade. Other sources of pollution include the horse stables at the Base Lake. (URS 2006)

The Base Lake is not used as a potable water source; water use is limited to recreational activities.

3.6.2 Groundwater

Groundwater at Offutt AFB may be found at depths as shallow as 10 feet. At the higher elevations of the base, groundwater is located 70 or more feet below ground surface (bgs). Groundwater generally flows from uplands to lowlands. (URS 2006) As indicated earlier, the Missouri River impacts the Base Lake water levels via groundwater action.

3.7 BIOLOGICAL RESOURCES**3.7.1 Wetlands**

Wetlands are defined as those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands are areas that are covered by water or have waterlogged soils for long periods during the growing season. Plants growing in wetlands are capable of living in saturated soil conditions for at least part of the growing season. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds. (USACE 2008)

EO 11990, Protection of Wetlands, requires federal agencies to take action to avoid or minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands.

A Survey of the Waters of the U.S. on Offutt AFB was completed in January 2005 (TEC 2005). The survey detailed the jurisdictional and non-jurisdictional wetlands and open water bodies found at Offutt AFB. According to this survey, there are approximately 14 jurisdictional and 51 non-jurisdictional wetlands and water bodies located on Offutt AFB property. Jurisdictional wetlands are located around the perimeter of the Base Lake. Non-jurisdictional wetlands are located upstream and along the shores of the Base Lake. Figure 4 shows the wetlands located in and near the Base Lake project area.

3.7.2 Threatened and Endangered Species

The Endangered Species Act (16 U.S. Administrative Code [U.S.C.] --1531 to 1544) requires federal agencies to determine the effects of their actions on threatened and endangered (T&E) species of fish, wildlife, and plants, and their critical habitats, and take steps to conserve and protect these species.

Federally-listed threatened and endangered species for Sarpy County, Nebraska include the interior least tern, the pallid sturgeon, the piping plover, and the western prairie fringed orchid (USFWS 2008). In addition to these immediate project area species, threatened and endangered species occur all along the Missouri River's course. These species include mammals, fish, birds, mussels, amphibians, and plants.

Based on consultation with USFWS and Nebraska Game and Fish Commission (NGPC) during the preparation of the current Integrated Natural Resource Management Plan (URS 2006), there are no federal or state listed threatened or endangered species within Offutt AFB.

3.7.3 Terrestrial Wildlife

Offutt AFB provides habitat for wildlife that would be typical in an urban environment. Mammals that may frequent Offutt AFB include opossum, moles, shrews, raccoons, bats, rabbits,

rodents, coyotes, skunks, foxes, and deer. Reptiles and amphibians that frequent the base include various snakes, frogs, toads, lizards, and salamanders. (URS 2006)

Migratory birds are protected through International Treaties and the Migratory Bird Treaty Act. Federal regulations (50 CFR) and EO 13186 (Responsibilities for Federal Agencies to Protect Migratory Birds) provide the framework for regulation of migratory bird take and possession. Federal permits are required to take, possess, transport and dispose of migratory birds, bird parts, feathers, nests, or eggs.

Offutt AFB is located within a migratory bird corridor, and as such, several types of birds frequent the area. Songbirds (robins, swallows, sparrows, etc.) are prevalent throughout the base as both resident populations and migratory populations. Resident populations of waterfowl (ducks, geese, swans) are located around nearby grain fields and waterbodies. Migratory waterfowl travel in large flocks during spring and fall. Raptors (hawks, eagles, owls, kites, etc.) can be found at Offutt AFB and surrounding areas as migratory populations or as residents. Other bird species that may be found at Offutt AFB, as both migratory and resident populations, include pigeons, shorebirds, blackbirds, and starlings. (URS 2006)

To minimize impacts associated with birds near the runways, Offutt AFB maintains a Bird Aircraft Strike Hazard (BASH) plan. In general, birds are the primary BASH concern at Offutt AFB. It is important to note that the primary goal of natural resource management at Offutt AFB is to manage natural resources to sustain the military mission and maintain operational capability and flexibility. Therefore, management of potential BASH species is an important component of natural resources management and flight safety at Offutt AFB.

3.7.4 Aquatic Resources

The Base Lake is a relatively small lake that provides recreational fishing for Offutt AFB personnel. Prominent game fish species found in the Base Lake, including largemouth bass, smallmouth bass, walleye, saugeye, bluegill, catfish, and white and black crappie. Non-game fish species include gizzard shad, white perch, river carpsucker, bigmouth buffalo, smallmouth buffalo, common carp, drum, and longnose gar (NHU 2006).

The primary goals of fish and wildlife management at Offutt AFB are to maintain and enhance game fish populations and their desired habitat to provide successful recreational fishing opportunities.

Aquatic macrophytes are presently limited to areas along the inlet to the Lake. Willows have become established at the normal Lake elevation in areas that do not have steep banks.

3.8 CUMULATIVE IMPACTS

CEQ regulations implementing NEPA [40 CFR Part 1508.7] include the need to address potential cumulative impacts. A cumulative impact is defined as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonable foreseeable future actions.” Cumulative effects are not wholly different effects from

direct or indirect effects of an action. Cumulative effects are merely a way of placing seemingly isolated or insignificant direct and indirect effects in context with respect to overall impacts, both over time and in an area larger than that evaluated for direct and indirect effects. Cumulative effects are discussed as being additive, synergistic, or reductional.

This chapter discusses the potential for impacts to the environmental resources described in Section 3 as a result of implementing the project alternatives described in Section 2.

4.1 LAND USE

4.1.1 No Action Alternative

The No Action Alternative will have a long-term adverse impact on the recreational use of the Lake. The use restriction of privately-owned boats to minimize the potential for spread of the mussels to other water bodies would continue with this alternative. Additionally, the mussels would reduce the level of phytoplankton and zooplankton within the lake, which would adversely affect reproduction and growth of fish species in the lake. In addition, the clear water will encourage the growth of rooted aquatic macrophytes, which could create additional problems for people wanting to fish the Lake. This would be considered a significant long-term negative impact.

4.1.2 Eradication of Zebra Mussels – Offutt AFB (Proposed Action)

There would be a temporary adverse impact on the recreational use of the Lake during and immediately following the application of the copper sulfate, as access to and use of the lake would be restricted by signage and Offutt AFB security patrols until all areas of the lake have elemental copper concentrations less than 1.3 ppm which is the maximum contaminant level (MCL) for copper.

The Proposed Action would have a long-term positive impact on the use of the Lake. Eradication of the zebra mussel would allow Offutt AFB to restock and maintain a larger variety and quantity of fish for the recreational fishermen.

4.2 PUBLIC HEALTH AND SAFETY

4.2.1 No Action Alternative

The No Action Alternative would not have a significant impact on public health and safety. The presence of the sharp zebra mussel shells along the shoreline area would represent a minor, insignificant hazard to lake users.

4.2.2 Eradication of Zebra Mussels – Offutt AFB (Proposed Action)

Copper sulfate would be applied directly to the Base Lake according to label directions (See Appendix B). The average elemental copper concentrations will not exceed 1 ppm. Due to concerns for humans, direct contact with lake water and eating fish from the Lake would be prohibited during and after Lake treatment, until water concentrations of elemental copper at individual sampling locations is at or below 1.3 ppm. Public access to the Lake area during application of the copper sulfate would be restricted to the Lake perimeter roadway and landward. Access to the FAMCAMP, pavilion, and boathouse would be maintained during the application. Warning signs restricting use and informing Lake users about the Lake treatment

would be placed at the entrance to the Lake and at all boat ramps during the application and until monitoring indicates that adequate mixing has occurred and that no portion of the Lake has water copper concentrations above 1.3 ppm. Additionally, public information sheets would be prepared and distributed to base personnel and users of the Base stables. Offutt AFB would also increase security patrols of the Lake area.

All mixing and application would be completed by individuals that have been certified as a Pesticide Applicator #5 (Aquatics) in the State of Nebraska. The work crews would be required to wear dust masks, full eye protection, long-sleeve shirts, full-length pants, and boots.

During and after application of the copper sulfate, the lake would be monitored for dead fish. Dead fish would be collected and buried on Offutt AFB or disposed of at an approved local landfill until no dead fish are found for a 48-hour period.

With the precautions presented above, the proposed action would have no significant impact on public health and safety.

4.3 SOCIOECONOMICS/ENVIRONMENTAL JUSTICE

4.3.1 No Action Alternative

The No Action Alternative would not have a disproportional adverse impact on low-income or minority populations.

The No Action Alternative could result in negative economic impacts within the general project area. The current restrictions on the Base Lake could result in decreased use of the recreation area by military personnel over time due to the decreased quality of recreational fishing. This would have a negative economic impact on the businesses that derive their income from the Lake.

Additionally, given the aggressive colonizing ability of zebra mussels, if the zebra mussels were to gain access to surface waters outside the Base Lake, the potential exists for economic impacts to the Bellevue metro area and beyond because the zebra mussels could plug intakes for municipal water and power companies along the Missouri River. The colonization of the municipal utilities would result in increased operation and maintenance costs which could be significant and could result in increase utilities fees for end users.

4.3.2 Eradication of Zebra Mussels – Offutt AFB (Proposed Action)

Potential impacts to the trailer park and other surrounding areas would be related to noise and air quality, which are discussed in Sections 4.4 and 4.5, respectively. The impacts associated with these environmental resources would not be disproportionate to any low-income or minority populations.

The Proposed Action Alternative would not result in a negative economic impact within the general project area. Economic activity associated with the Base Lake would be expected to

continue post-project as recreational fishing would be maintained as part of this alternative. See also Sections 4.4 and 4.5.

4.4 NOISE

4.4.1 No Action Alternative

The No Action Alternative would not impact local noise levels.

4.4.2 Eradication of Zebra Mussels – Offutt AFB (Proposed Action)

There would be a temporary increase in noise levels in the immediate project area during application of the copper sulfate (approximately 2 days). However, since Offutt AFB is an active military base with daily airfield operations (landings and takeoffs), a temporary, localized increase in noise would not result in a significant adverse impact to the base or adjacent communities. The proposed project activities would not impact the Offutt AFB AICUZ guidelines.

4.5 AIR QUALITY

4.5.1 No Action Alternative

The No Action Alternative would not impact local air quality.

4.5.2 Eradication of Zebra Mussels – Offutt AFB (Proposed Action)

Short-term, localized impacts to air quality may occur immediately downwind of the application activities. Copper sulfate would be applied in a crystal form limiting to the extent possible the production of dust. Any impacts would be considered minor and would be limited to the immediate vicinity of the Base Lake. Once application has been completed (2 days), air quality at the Base Lake would return to pre-project conditions. See also Section 4.2 for Public Health and Safety.

4.6 WATER RESOURCES

4.6.1 No Action Alternative

The No Action Alternative would have no impact on groundwater.

The No Action Alternative would have a long-term negative impact on the quality of water in the Base Lake. Without intervention, the zebra mussels would continue to rapidly multiply within the Lake. The presence of the zebra mussel would change the nutrient balance in the Lake resulting in clearer water due to filter feeding and the remove of phytoplankton and zooplankton. The full ecosystem effects would pertain to the aquatic resources in the Lake and are discussed in Section 4.7.4. Additionally, potential would remain for the mussel to gain access to other local

water bodies, impacting intake and outlet structures and industries connected to those water bodies.

With this alternative, the Lake outlets to Bellevue Drain would remain plugged to control the spread of the zebra mussel. During times of heavy precipitation, Offutt AFB would be unable to release water from the Lake impacting Base surface water drainage. As the Lake level rises, recreational facilities surrounding the lake and land upstream from the Lake will flood.

4.6.2 Eradication of Zebra Mussels – Offutt AFB (Proposed Action)

The copper would bind to soil and other particles in the water column and fall to the bottom sediments, removing the copper from the water column. The copper would remain bound to the sediments and become immobile. Therefore, the copper would not impact surface or groundwater.

With the proposed action, copper sulfate would be applied to the Lake resulting in the death of adult and larval zebra mussels. This activity would have a short-term negative impact on the water quality in the Lake. However, with adequate mixing copper levels would equalize below 1.3 ppm, which is the MCL for copper. In the long-term, the proposed action would have a positive impact on the water quality in the Lake as it relates to the aquatic resources (see Section 4.7.4).

As indicated earlier, the copper would remain in the water for a few days, then precipitate to the bottom of the Lake where it would be bound and rendered biologically inert in the sediment (Haller 2007). Copper is a heavy metal and heavy metals are not highly mobile in soil/sediment or groundwater, especially under basic (alkaline) conditions. The Base Lake pH ranges from 7.2 to 8.5, which is a fairly neutral to slightly alkaline environment. Therefore, it is anticipated that the copper would be bound to bottom sediments and would not impact groundwater quality.

As part of the temporary measures in response to the identification of zebra mussel in the Base Lake, the outflow pipes from the Base Lake to the Bellevue Drain were plugged. The pipes remain plugged at this time; therefore, the Base Lake does not have any connection to other surface water bodies in the area. Therefore, no downstream water bodies, including the Bellevue Drain and the Missouri River would be impacted by the proposed action.

Copper sulfate would also be applied to the Lake inlet and upstream ponded areas. These areas are upstream of the Base Lake and since the Base Lake has no connection to other surface water bodies, application of the copper sulfate to these areas would not impact other surface water bodies downstream. Impact to wetlands are discussed in Section 4.7.

With this alternative, the Base Lake outlets to the Bellevue Drain would be reopened allowing surface water drainage on the Base to return to normal conditions. Therefore, the risk of flooding of upgradient land be reduced and recreational functions of the lake could return.

Offutt AFB has a current National Pollutant Discharge Elimination System (NPDES) permit from the Nebraska Department of Environmental Quality (NDEQ). Although this action does not involve a pollutant discharge, NDEQ was contacted regarding the project. NDEQ indicated

no NPDES permit would be required and there were no other concerns regarding the project (see Appendix A).

4.7 BIOLOGICAL RESOURCES

4.7.1 Wetlands

4.7.1.1 No Action Alternative

The No Action Alternative would not impact any wetlands at Offutt AFB. Although zebra mussels may gain access to wetlands from loss of containment in the Base Lake, this would not be considered a significant impact to wetlands. Zebra mussels like to colonize on hard surfaces. Cattails and reeds would be the predominant hard surface in a wetlands and it is not likely that zebra mussels would colonize on plants to the extent that they colonize on other hard surfaces. Additionally, the cattails and reeds derive their nutrients from the soil and not from other organisms in the water. Finally Nebraska is a temperate climate. All wetland within the general project area would freeze during the winter months, killing the zebra mussels. Therefore, wetland quality and function would not be impacted by zebra mussel colonization.

4.7.1.2 Eradication of Zebra Mussel - Offutt AFB (Proposed Action)

The proposed action would have a short-term negative impact on wetland vegetation within the project area. The copper sulfate may kill most of the wetland vegetation exposed to the chemical. However, the wetland vegetation would return to pre-project levels by the next growing season. Therefore, no long-term impacts would occur to wetland vegetation. Additionally, since the project requires no fill material be placed in a wetland, no Section 404 would be required from the U.S. Army Corps of Engineers (USACE). The USACE was contacted regarding the project and expressed no concerns about the project (USACE telephone memorandum 23 June 08, Appendix A).

4.7.2 Threatened, Endangered, and State Sensitive Species

4.7.2.1 No Action Alternative

The No Action Alternative has the potential to impact federal-listed and state-listed T&E species if the zebra mussel gains access to the Missouri River. Overtime, the zebra mussel population would continue to grow and the Missouri River ecosystem would be negatively affected. Therefore, the potential exists for the pallid sturgeon, interior least tern, and piping plover to be negatively impacted by the No Action alternative.

4.7.2.2 Eradication of Zebra Mussels - Offutt AFB (Proposed Action)

As indicated in Section 3.7.2, no federal-listed or state-listed species are permanent residents at Offutt AFB. The bald eagle (a state-listed species) has the potential to fly over the Lake and take fish. However, with the collection and disposal of fish killed by the copper sulfate, potential impacts to the bald eagle would be minimized. Therefore, the proposed action would not impact

any threatened, endangered, or state sensitive species. USFWS concurred with this determination in a telephone conservation on 12 June 2008 (Appendix A). NGPC, in telephone memorandums dated 23 June 2008 (Appendix A), also concurred that no state-listed or sensitive species would be impacted by the project. Both the USFWS and NGPC were part of the zebra mussel working group and both agencies support the project (USFWS and NGPC telephone memorandums, see Appendix A).

4.7.3 Terrestrial Wildlife

4.7.3.1 No Action Alternative

The No Action Alternative would not impact wildlife at Offutt AFB.

4.7.3.2 Eradication of Zebra Mussels – Offutt AFB (Proposed Action)

The Base Lake is used by a variety of terrestrial wildlife species as a source of water and food. Therefore, an acceptable surface water concentration of copper was estimated for representative species to show that the application of copper sulfate would not pose an unacceptable risk to terrestrial species. Table 4-1 shows the estimated acceptable surface water concentrations of copper. The calculations assumed that the Lake was the only source of drinking water for the species and used a 35 day exposure period. These are conservative assumptions because it is anticipated that the Lake concentration of copper would not exceed 1.3 ppm at any location by approximately 2 weeks post-application. Additionally, most wildlife have a home range in which they roam; therefore, they have more than one source of water. The lowest estimated acceptable concentration was 4.6 ppm for white-tailed deer. Although during application and immediately following application some locations in the Lake may have copper concentrations greater than 4.6 ppm, wave-action and mixing would quickly lower the concentrations. It is anticipated that the concentration of copper throughout the Lake would be 1.3 ppm or less within 7 to 10 days. Therefore, is unlikely that the proposed project would have a negative impact on any terrestrial species. The complete methodology for the calculation of the surface water concentrations is included in Appendix C.

4.8 AQUATIC RESOURCES

4.8.1.1 No Action Alternative

The No Action Alternative would have a long-term negative impact on aquatic resources at Offutt AFB. As the zebra mussels continue to multiply, they would change the nutrient balance of the water feeding on the microzooplankton, bacteria, and protozoans. The lower biomass would lead to clearer water. Clearer water would allow sunlight to penetrate deeper into the Lake. These impacts would change the aquatic ecosystem and fish habitat within the Lake, making the Lake less acceptable for many fish species.

Under the No Action alternative, the possibility exists that zebra mussels could gain access to other water bodies in the area via flooding, transportation on fishing equipment, or bait water. If this were to occur, there would be a negative impact on all infested aquatic ecosystems. For

some systems, this impact could be significant resulting in a change in the types and numbers of aquatic organisms present.

4.8.1.2 Eradication of Zebra Mussels –Offutt AFB (Proposed Action)

The proposed action would have a short-term adverse impact on the aquatic resources in the Base Lake. The purpose of the project is to eradicate the zebra mussels; however, a side affect of this action is the death of bottom dwelling organisms, invertebrates, snails, crawfish, vegetation, and potentially some fish.

As indicated earlier in the EA, rainbow trout is the most sensitive species to copper. No rainbow trout occur in the Lake. Other fish species, especially carp and catfish which are bottom dwellers are more tolerant of changes in their environments. Native invertebrate populations should return to pre-treatment levels within a few months (Haller 2007).

In the unlikely event of a significant die-off of aquatic organisms, a rapid decrease in the dissolved oxygen content of the Lake water could occur, particularly in areas where there is little circulation with the rest of the water body. This is a potential negative impact of the chemical application.

The proposed action would have a long-term beneficial impact on the aquatic resources at Offutt AFB. By removing the zebra mussels from the food chain, the Lake ecosystem would return to its pre-zebra mussel state and provide acceptable habitat for a wide variety of fish species. This would allow the fish and wildlife management personnel on base to meet their mission.

For purposes of this project, zebra mussels would be considered an un-named target pest; therefore, the Chem One Special Local Need Label (See Appendix B) for Offutt AFB allows for the treatment of the Base Lake without requiring any additional permits from USEPA (Haller 2007).

4.8.2 Cumulative Impacts

4.8.2.1 No Action Alternative

The No Action Alternative would not produce any cumulative impacts greater in scope or magnitude than those described for each individual environmental resource.

4.8.2.2 Eradication of Zebra Mussels – Offutt AFB (Proposed Action)

No other activities were identified in the project and surrounding area which would have additional impacts on the natural resources in the Lake area. Therefore, cumulative impacts would not be expected to be greater in scope or magnitude than those described for each individual environmental resource.

TABLE 4-1
ACCEPTABLE COPPER SURFACE WATER CONCENTRATIONS FOR
RECEPTORS OF CONCERN

Receptor	Body Weight (kg)	Water Ingestion Rate (L/day)	Copper Drinking Water NOAEL (mg/kgBW/day)	Acceptable Short-Term Copper Surface Water Concentration (mg/L or ppm)¹
Belted Kingfisher	0.148	0.02	10.2	75
Mink	0.8	0.099	17.2	139
Raccoon	6.67	0.554	17.2	207
White-tailed Deer ²	60.7	3.986	17.2	262
White-tailed Deer ³	60.7	3.986	0.3	4.6

NOAEL - No-observed-adversed-effects level

1 - Assumes entire daily water intake is from treated lakewater

2 - Using the rat as a surrogate test species

3 - Using sheep as a surrogate test species

kg = kilogram

L/day = liter per day

mg/kgBW/day = milligrams per kilogram of body weight per day

mg/L = milligrams per liter

mg/L = ppm

ppm = parts per million

5.1 COMPARISON OF THE ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

The Proposed Action would be expected to have a long-term positive effect on the Base Lake ecosystem and recreational use of the Lake. A more detailed comparison of the potential effects of the alternatives on environmental resources is presented in Table 5-1.

5.2 CONCLUSIONS

As indicated in the previous sections, potential impacts associated with the proposed action would be limited to the Base Lake and immediately surrounding wetland areas (area of application). Direct impacts from the copper sulfate are expected to be short-term, in that the Base Lake copper concentrations would be expected to drop below 1.3 ppm (the MCL for copper) within 2 weeks of application. The only long-term impacts associated with the proposed action would be the presence of non-mobile copper bound to lake sediments and wetland soils and the positive impact on the Base Lake ecosystem following removal of the zebra mussels.

Therefore, all of the potential adverse impacts associated with the proposed action were determined to be insignificant. These determinations support a Finding of No Significant Impact (FONSI) for the Proposed Action (Alternative 1).

TABLE 5-1

**ENVIRONMENTAL EFFECTS OF ALTERNATIVES EVALUATED
ZEBRA MUSSEL ERADICATION PROJECT**

Discipline	Alternative 1 No Action	Alternative 2 Proposed Action
Land Use	Long-term negative impact on recreational use of the lake.	Land use classification would not change with this alternative. Short-term negative impact due to use restrictions during and immediately following chemical application. Long-term positive impact on recreational use of the lake.
Public Health and Safety	No impact.	Potential short-term impacts during chemical application.
Socioeconomics/Environmental Justice	Potential long-term negative economic impact to Base Lake businesses. Potential long-term negative impact if zebra mussels gain access to other water bodies and utility intakes.	No impact.
Noise	No impact.	Short-term increase in project area noise levels during application of the chemical.
Air Quality	No impact.	Short-term, localized adverse impacts to air quality during application of the chemical.
Water Resources	No impact on groundwater. Long-term negative impact on the quality of water in the Base Lake. Potential long-term impacts to other surface water bodies if the mussel gains access to them.	No impact on groundwater. Short-term negative impact on Base Lake water quality due to the addition of the chemical. Long-term positive impact on water quality in the lake.
Biological Resources	No impact on wetlands. No impact on federal or state-listed species. No impact on terrestrial wildlife. Long-term negative impact on aquatic resources.	Short-term impact on vegetation. Vegetation would return to normal by next growing season. No impact on federal or state-listed species. No impact on terrestrial wildlife Short-term adverse impact on aquatic resources. Long-term positive impact on aquatic resources in the Base Lake.
Cultural Resources	No impact.	No impact
Geology and Soils	No impact.	No impact
Climate and Meteorology	No impact.	No impact
Topography	No impact.	No impact
Hydrology	No impact.	No impact
Floodplains	No impact.	No impact
Hazardous Materials and Waste	No impact.	No impact

Offutt AFB will publish a public notice in a local newspaper informing the public of the proposed project and allowing the public 14 days to comment on the action. Relevant comments received during this comment period will be addressed in this section prior to issuing the Final EA and FONSI.

SECTION SEVEN

Agencies and Individuals Contacted

Robert Harms U.S. Fish and Wildlife Service Grand Island Ecological Field Office 203 West Second Street Federal Building, Second Floor Grand Island, Nebraska 68801	Steven Schainost Nebraska Game and Parks Commission District 1 Office 299 Husker Road Alliance, Nebraska 69301
Ken Bazata Nebraska Department of Environmental Quality 1200 "N" Street, Suite 400 Lincoln, Nebraska 68509	Larry Shepard U.S. Environmental Protection Agency – Region 7 901 North Fifth Street Kansas City, Kansas 66101
Tim Creger Nebraska Department of Agriculture 301 Centennial Mall South Lincoln, Nebraska 68509	Justin King Nebraska Public Power District 1414 15 th Street Columbus, Nebraska 68602
Gerry Mackie 23 Avra Court Guelph, ON N1H 7B2	L. Robert Puschendorf Deputy SHPO P.O. Box 82554 1500 "R" Street Lincoln, NE 68501
Karl Morris Technical Project Manager 55 CEV/CES 106 Peacekeeper Drive Offutt AFB, Nebraska 68113-4019	Krystal Stoner Nebraska Game and Parks Commission 2200 N. 33 rd St. Lincoln, NE 68503
Mick Sandine U.S. Army Corps of Engineers 106 S. 15 th Street Omaha, NE 68102	

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This EA was prepared by URS Group, Inc., for Offutt AFB in Bellevue, NE.

URS Group staff includes:

Mr. Quentin Bliss, Senior Environmental Planner - Over 40 years of progressive experience in the environmental field and has been involved with NEPA since it was enacted in 1969. Has extensive experience with all aspects of NEPA, including: the scoping process, identification and evaluation of alternatives, identification of appropriate mitigation, and agency coordination. Project experience includes over 100 multidiscipline projects that involved NEPA compliance.

Ms. Susan Volkmer, Environmental Planner - Over 15 years of experience with environmental assessments involving human and ecological resources. Project experience includes over 85 multidiscipline projects that involved NEPA compliance.

Mr. Brian Osborn, Environmental Planner – Over 11 years of experience in the environmental field. Specialized expertise in environmental planning and NEPA compliance studies, including environmental document preparation. Project experience includes over 40 multidiscipline projects that involved NEPA compliance.

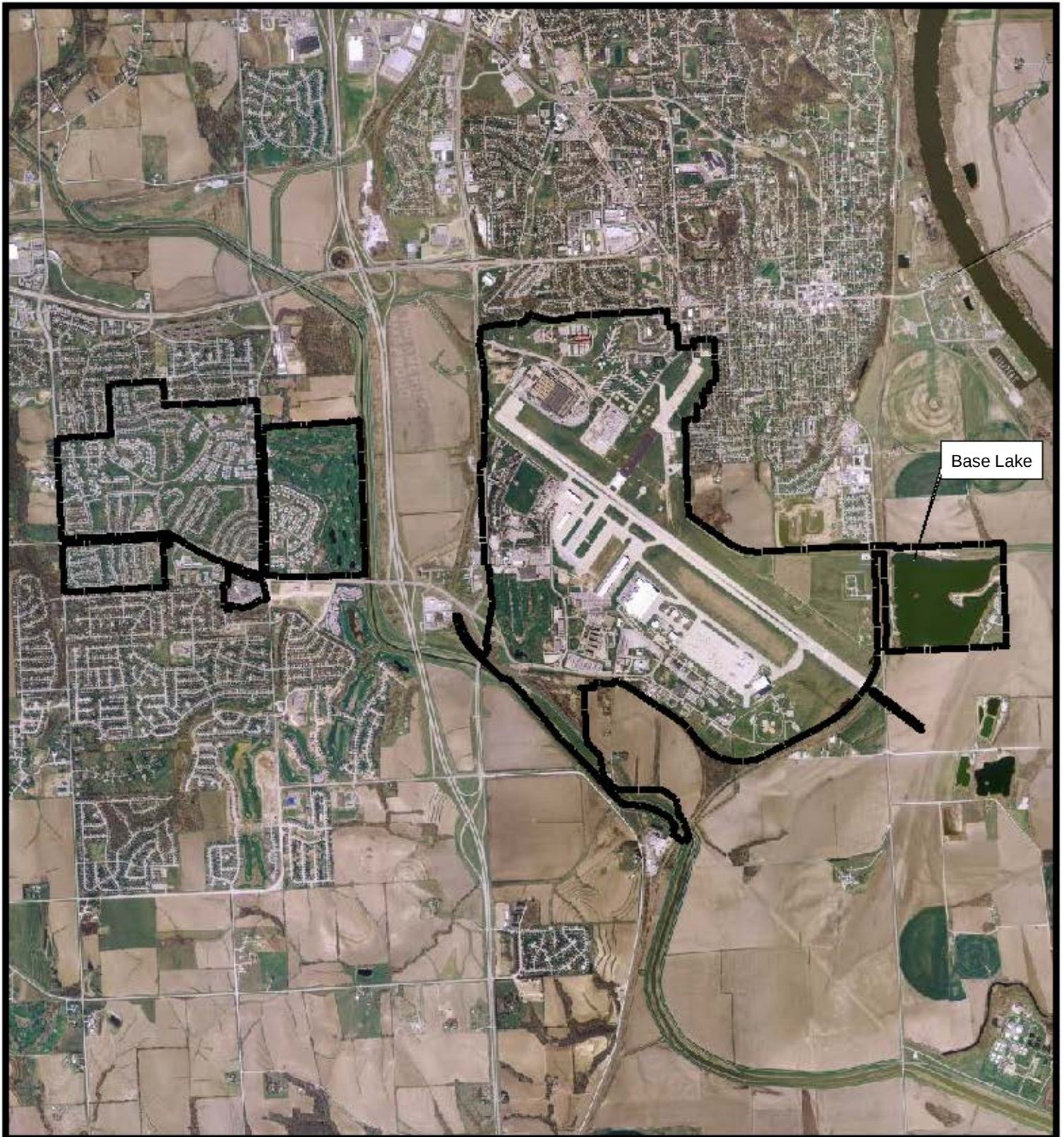


Figure 1
Location Map

Zebra Mussel Eradication Offutt AFB, Nebraska

Designed By:
SP
Drawn By:
SP
Checked By:
BO
Submitted By:
BO

Projection:
NAD83 HARN State Plane, Nebraska, Feet

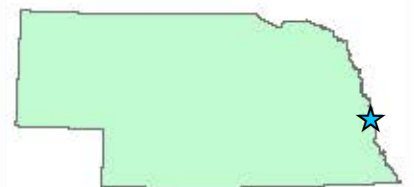
Legend

 Offutt AFB Boundary



0 3,500 7,000
Feet

Locator Map



Nebraska



Figure 2
Base Lake Recreational Facilities

Designed By: SP	Zebra Mussel Eradication Offutt AFB, Nebraska
Drawn By: SP	
Checked By: BO	
Submitted By: BO	
Projection: NAD83 HARN State Plane, Nebraska, Feet	

Legend

Lake Features



0 500 1,000 Feet

Locator Map

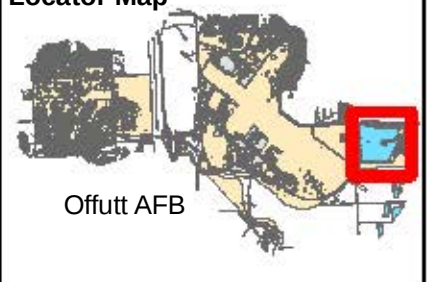




Figure 3
Inlet Channels and Ponded Areas

Designed By:	Zebra Mussel Eradication Offutt AFB, Nebraska
SP	
Drawn By:	
SP	
Checked By:	
BO	Submitted By:
BO	Projection:
	NAD83 HARN State Plane, Nebraska, Feet

Legend

Inlet Areas



0 500 1,000 Feet

Locator Map

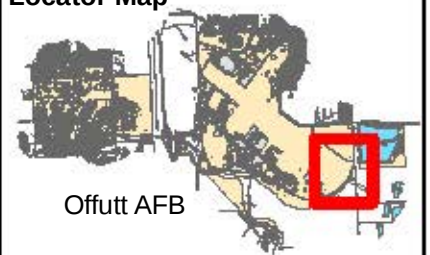




Figure 4
Base Lake Area Wetlands

Designed By: SP	Zebra Mussel Eradication Offutt AFB, Nebraska
Drawn By: SP	
Checked By: BO	
Submitted By:	
BO	
Projection: NAD83 HARN State Plane, Nebraska, Feet	

Legend

-  Non-Jurisdictional Wetlands
-  Jurisdictional Wetlands



0 1,000 2,000
Feet

Locator Map



TELEPHONE MEMORANDUM

Date June 12, 2008 Time (am / pm) 3:45

Project Number 16170345

To (Mr. / Ms.) _____

Project Offutt AFB

From Bob Harms

Zebra Mussel

Company USFWS

Eradication

Phone Number 308.382.6468

RE effect on T & E species

Recorded By JMV

Bob returned by my call from earlier in the day. Bob indicated that USFWS is supportive of this project. Bob also concurred that the project will have "No Effect" on threatened and endangered species.

Copy To _____

URS

TELEPHONE MEMORANDUM

Date 16 June 2008 Time (am/pm) 2:20

Project Number 16170345

To (Mr./Ms.) _____

Project Zebra Mussel

From Ken Bazata

Eradication

Company NDEQ

Phone Number 402.471.2186

RE Zebra Mussel Project

Recorded By SMV

Ken returned my call regarding the Zebra Mussel Eradication project at Offutt AFB. Ken stated that no NDEQ permits would be required and that NDEQ had no concerns about the project.

Copy To _____

URS

TELEPHONE MEMORANDUM

Date 18 June 08 Time (am/ pm) 10:45

Project Number 16170345

To (Mr./Ms.) Bob Puschendorf

Project Zebra Mussel

From _____

Eradication Project

Company SHPO

Phone Number 402.471.3270

RE Cultural Resource Impacts

Recorded By SMV

I spoke with Bob regarding the potential for the proposed project to impact any cultural resources. Bob stated that he had no concerns about the project impacting cultural resources.

Copy To _____

URS

TELEPHONE MEMORANDUM

Date <u>June 19, 2008</u>	Time (am / pm) _____	Project Number <u>16170345</u>
To (Mr. Ms.) <u>Larry Shepard</u>		Project <u>Zebra Mussel</u>
From _____		<u>Eradication</u>
Company <u>EPA - Region 7</u>		
Phone Number <u>(913) 551-7441</u>		
RE _____		Recorded By <u>SMV</u>

Larry indicated during our conversation that he wanted the EA to include the following:

- Alternatives Consider
- Farfield impacts
 - ↳ GW
 - ↳ Creek
 - ↳ Wetlands

Copy To _____

URS

TELEPHONE MEMORANDUM

Date	June 23, 2008	Time	(am) pm) 9:30	Project Number	16170345
To (Mr./ Ms.)	Steven Schainost	Project	Zebra Mussel		
From			Eradication		
Company	Nebraska Game & Parks Commission				
Phone Number	308.763.2940				
RE		Recorded By	SPM		

I called Steve to find out if the NGPC had any comments or concerns about the proposed project. Steve concurred that the NGPC supports the project.

Copy To _____

URS

TELEPHONE MEMORANDUM

Date	Jun 23, 2006	Time (am/pm)	10:15	Project Number	16170345
To (Mr./Ms.)	Krystal Stoner	Project	Zebra Mussel		
From				Eradication - Offutt AFB	
Company	Neb Game & Parks Comm				
Phone Number	402.471.0641				
RE		Recorded By	SPV		

I called Krystal to let her know that an EIT was in progress for the eradication of zebra mussels from the Base Lake at Offutt AFB in Omaha. I told Krystal that Steve Schainost had been part of the task force and that we had contacted him about the project. (Steve had no comments or concerns about the project - see Steve's phone memo). Krystal indicated that she was comfortable with where the project was and would defer to Steve. Krystal also indicated that if we were comfortable with no signed letter saying no impact to state-listed T & E, NGPC Commission was okay with no letter. Therefore, no formal letter from ~~NGPC~~ NGPC is included in this document.

Copy To _____

URS

TELEPHONE MEMORANDUM

Date 23 June 08 Time (am) pm 10:30

To (Mr. Ms.) Mick Sandine

From _____

Company USACE

Phone Number 402.996.3452

RE _____

Project Number 16170345

Project Zebra Mussel

Eradication - Offutt AFB

Recorded By SMV

I call Mick to discuss the project. Mick was part of the task force. Mick indicated that the USACE had no jurisdiction relative to the project. Mick also indicated - no permits would be needed from USACE to complete the project. Mick stated that the USACE had no concerns or comments. Mick inquired as to which chemical was selected and I told him copper sulfate had been selected.

Copy To _____

URS

TELEPHONE MEMORANDUM

Date	7/29/08	Time (am/ pm)	10:07	Project Number	16170345
To (Mr./ Ms.)				Project	Zebra Mussel
From	Ms Laura Banker			Eradication	—
Company	USACE - Wehrspan Wehrspan			Offutt AFB	
Phone Number	402.896.0723				
RE	404 permit			Recorded By	SPV

Laura returned my call from earlier this morning. Laura indicated she would need to check the 404 permit reqs about whether or not the wetland vegetation impacts associated with the project would require a permit. She will email her findings.

Copy To _____

URS

SPECIAL LOCAL NEED LABELING
FOR DISTRIBUTION AND USE ONLY IN THE STATE OF NEBRASKA

COPPER SULFATE CRYSTALS

EPA Reg. No. 56576-1

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Directions For Use:

Location: Offutt Air Force Base, Bellevue, NE.

Use Site: Offutt Air Force Base Lake and all inlets, shallows, and shorelines.

Target Pest: Zebra Mussels (*Dreissena polymorpha*).

Use Rate: Apply Copper Sulfate Crystals as a whole lake treatment by boat or aircraft so that the average elemental copper concentration does not exceed 1 ppm. At 25% elemental copper, Copper Sulfate Crystals requires 10.8 pounds of product to treat one acre foot of water to obtain 1 ppm elemental copper. No more than two whole lake treatments may be made prior to the label expiration date of May 31, 2009.

Method of Application: Application either by boat or by aircraft (helicopter), in order to treat the entire lake within a 24-48 hour period.

Additional Requirements: Due to the possibility of aircraft collisions with scavenging birds, applicator or other designated persons must monitor the lake during and after treatment for dead fish during daylight hours. All dead fish must be collected and disposed by burial or landfill until no dead fish are found over a 48-hour period.

Due to concerns for human contact, fish consumption, and drinking water standards, swimming in the lake and eating fish from the lake is prohibited during and after lake treatment until the water concentration of copper is at or below 1.3 ppm. Efficacy monitoring by SCUBA divers is allowed at all times after treatment. Treated lake water cannot be used as a direct or indirect source of human or animal drinking water until copper concentration is at or below the 1.3 ppm MCL. Warning signs informing the public or base personnel about the lake treatment are to be placed at the entrance to the lake and at all boat ramps and beaches, at least during the application and until water copper concentration is determined to be at or below 1.3 ppm.

This label expires May 31, 2009, or immediately upon completion of the second lake treatment, or sooner if suspended or cancelled by the EPA, the manufacturer, registrant or Nebraska Department of Agriculture. All applicable directions, restrictions, and precautions on the EPA registered label are to be followed.

This labeling must be in the possession of the user at the time of pesticide application.

Neither the manufacturer, registrant, nor the Nebraska Department of Agriculture makes any warranty of merchantability, fitness of purpose, or otherwise, expressed or implied, concerning the use of this pesticide in accordance with these provisions. The user acknowledges the preceding disclaimer and accepts liability for any possible damage resulting from this use.

This product manufactured for
CHEM ONE LTD
HOUSTON, TEXAS 77040-6519
TEL. (713) 896-9966



EPA SLN No. NE-080003
Expiration Date: 05/31/2009

Run Date: 4/10/2008
I/M Date: 4/10/2008

Chem One Ltd
8017 Pinemont Drive , #100
Houston, Texas 77040-6519

Page: 2
Time: 1:15:28PM

Sales Order: 0063928
Customer: Aqua-Chem, Inc.

Order Date: 4/10/2008

Reference: N/A

Proj Ship Date: 4/10/2008

Customer P/O: Sample Request

Quantity: 0.25

ITEM: CSMSA50L40 Copper Sulfate - Medium

REF: 10003-5C SA Certificate of Analysis

MFG BATCH OR LOT #: 10003-5c; 5080302, MFG date March 12-26 2--8

Certificate Date: 4/2/2008
Receipt Date: 4/10/2008
Expiration Date 3/12/2010
Shelf Life: 2 YEARS

SYNONYMS: Cupric Sulfate (Pentahydrate)

CHEMICAL FORMULA: $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

CAS NUMBER: 7758-99-8

APPEARANCE: Blue crystals

MOLECULAR WEIGHT: 249.68

COUNTRY OF ORIGIN: Mexico

PACKAGING : 50 lb bag

THE FOLLOWING VALUES HAVE BEEN PROVIDED TO CHEM ONE BY THE MANUFACTURER OF THIS PRODUCT. CALL CUSTOMER SERVICE IF YOU HAVE ANY QUESTIONS OR NEED ADDITIONAL INFO. 713-896-9966 M-F 8AM - 5PM CST.

	Specifications		Typical	Analysis
Assay	99.0%	min	99.0-99.12%	99.064%
Copper (Cu)	25.0%	min	25.20-25.22%	25.210%
Iron	0.1%	max	<0.1%	<0.1%
00			0.05%	

Moisture 30% at 100 deg C for 1 hr, residual moisture 0.5%; pH 4 in 0.1M soln (24.97 g copper sulfate in 1 liter) Specific gravity 2.284
Based on assay content of 99%, the calculated sulfur content is 12.71%

TYPICAL HEAVY METALS (IN PPM) :

As.....0.10- 1.80	Mo.....0.00- 4.00	Ba..... 0.0-1.66	Sn.....10.60
Cd.....0.11- 2.66	Ni..... 4.64-18.40	Fl..... 6.40	
Co.....0.52- 6.00	Se.....0.00- 3.20	Mg.....69.20	
Pb.....13.00-39.00	Zn.....4.80-60.00	Cl.....43.80	
Hg.....0.00- 2.00	Sb.....0.52-12.80	Si....174.00	
Fe...(28) 198- 652	Be..... 0.00	Cr..... 0.012	

THIS PRODUCT IS Certified to NSF/ANSI Standard 60 AND MEETS ANSI/AWWA STANDARDS.

CRYSTAL SIZE: 5-8 MM

BULK DENSITY 1.10G/CC

Typical particle size data:

%retained on No 3 US sieve	(5.66millimeters)	25%
% retained on No 10 Us sieve	(2.0 millimeters)	98%
% passing thru No 100 US sieve	(0.149 millimeters)	0.5%

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

*** Section 1 - Chemical Product and Company Identification ***

Chemical Name: Copper Sulfate Pentahydrate

Product Use: For Commercial Use

Synonyms: Copper Sulfate Crystals, Blue Copper, Blue Stone, Blue Vitriol, Copper (II) sulfate, Cupric Sulfate, Copper Sulfate Fine 200, Fine 100, Fine 30, 20, Small, Medium, Large, FCC IV, and Very High Purity

Supplier Information

Chem One Ltd.

8017 Pinemont Drive, Suite 100

Houston, Texas 77040-6519

Phone: (713) 896-9966

Fax: (713) 896-7540

Emergency # (800) 424-9300 or (703) 527-3887

General Comments

NOTE: Emergency telephone numbers are to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure, or accident involving chemicals. All non-emergency questions should be directed to customer service.

*** Section 2 - Composition / Information on Ingredients ***

CAS #	Component	Percent
7758-99-8	Copper (II) Sulfate Pentahydrate	> 99

Component Related Regulatory Information

This product may be regulated, have exposure limits or other information identified as the following: Copper (7440-50-8) and inorganic compounds, as Cu, Copper (7440-50-8) dusts and mists, as Cu and Copper fume, Cu.

Component Information/Information on Non-Hazardous Components

This product is considered hazardous under 29 CFR 1910.1200 (Hazard Communication).

*** Section 3 - Hazards Identification ***

Emergency Overview

Copper Sulfate Pentahydrate is a blue crystalline or powdered, odorless solid. Potentially fatal if swallowed. May cause irritation to the eyes, respiratory system and skin. Fire may produce irritating, corrosive and/or toxic fumes. Firefighters should use full protective equipment and clothing.

Hazard Statements

HARMFUL OR FATAL IF SWALLOWED. Can cause irritation of eyes, skin, respiratory tract and, in extreme cases, burns. Avoid contact with eyes and skin. Avoid breathing dusts. Wash thoroughly after handling. Keep container closed. Use with adequate ventilation. Keep from contact with clothing and other combustible materials.

Potential Health Effects: Eyes

Exposure to particulates or solution of this product may cause redness and pain. Prolonged contact may cause conjunctivitis, ulceration and corneal abnormalities.

Potential Health Effects: Skin

This product can cause irritation of the skin with pain, itching and redness. Severe overexposure can cause skin burns. Prolonged exposure may cause dermatitis and eczema.

Potential Health Effects: Ingestion

Harmful or fatal if swallowed. May cause gastrointestinal irritation with symptoms such as nausea, vomiting, and diarrhea. Ingestion may cause degeneration of liver, kidney, or renal failure. Persons who survive ingestion may develop granulomatous lesions of the kidney. Ingestion of large amounts may lead to convulsions, coma or death.

Potential Health Effects: Inhalation

May irritate the nose, throat and respiratory tract. Symptoms can include sore throat, coughing and shortness of breath. In severe cases, ulceration and perforation of the nasal septum can occur. If this material is heated, inhalation of fumes may lead to development of metal fume fever. This is a flu-like illness with symptoms of metallic taste, fever and chills, aches, chest tightness and cough. Repeated inhalation exposure can cause shrinking of the lining of the inner nose.

HMIS Ratings: Health Hazard: 2* Fire Hazard: 0 Physical Hazard: 1

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe * = Chronic hazard

*** Section 4 - First Aid Measures ***

First Aid: Eyes

Immediately flush eyes with large amounts of room temperature water, occasionally lifting the lower and upper lids, for at least 15 minutes. If symptoms persist after 15 minutes of irrigation, seek medical attention.

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

*** Section 4 - First Aid Measures (Continued) ***

First Aid: Skin

Remove all contaminated clothing. For skin contact, wash thoroughly with soap and water for at least 20 minutes. Seek immediate medical attention if irritation develops or persists.

First Aid: Ingestion

DO NOT INDUCE VOMITING. Have victim rinse mouth thoroughly with water, if conscious. Never give anything by mouth to a victim who is unconscious or having convulsions. Contact a physician or poison control center immediately.

First Aid: Inhalation

Remove source of contamination or move victim to fresh air. Apply artificial respiration if victim is not breathing. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Administer oxygen if breathing is difficult. Get immediate medical attention.

First Aid: Notes to Physician

Provide general supportive measures and treat symptomatically. Basic Treatment: Establish a patent airway. Suction if necessary. Watch for signs of respiratory insufficiency and assist ventilations if necessary. Administer oxygen by non-rebreather mask at 10 to 15 L/minutes. Monitor for shock and treat if necessary. For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with normal saline during transport. Do not use emetics. For ingestion, rinse mouth and administer 5 mL/kg up to 200 mL of water for dilution if the patient can swallow, has a strong gag reflex, and does not drool. Administer activated charcoal. Advanced Treatment: Consider orotracheal or nasotracheal intubation for airway control in the patient who is unconscious. Start an IV with lactated Ringer's SRP: "To keep open", minimal flow rate. Watch for signs of fluid overload. For hypotension with signs of hypovolemia, administer fluid cautiously. Consider vasopressors if hypotensive with a normal fluid volume. Watch for signs of fluid overload. Use proparacaine, hydrochloride to assist eye irrigation.

*** Section 5 - Fire Fighting Measures ***

Flash Point: Not flammable

Method Used: Not applicable

Upper Flammable Limit (UEL): Not applicable

Lower Flammable Limit (LEL): Not applicable

Auto Ignition: Not applicable

Flammability Classification: Not applicable

Rate of Burning: Not applicable

General Fire Hazards

Copper Sulfate Pentahydrate is not combustible, but may decompose in the heat of a fire to produce corrosive and/or toxic fumes.

Hazardous Combustion Products

Sulfur oxides and copper fumes.

Extinguishing Media

Use methods for surrounding fire.

Fire Fighting Equipment/Instructions

Firefighters should wear full protective clothing including self-contained breathing apparatus. Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution.

NFPA Ratings: Health: 2 Fire: 0 Reactivity: 1 Other:

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

*** Section 6 - Accidental Release Measures ***

Containment Procedures

Stop the flow of material, if this can be done without risk. Contain the discharged material. If sweeping of a contaminated area is necessary use a dust suppressant agent, which does not react with product (see Section 10 for incompatibility information).

Clean-Up Procedures

Wear appropriate protective equipment and clothing during clean-up. Shovel the material into waste container. Thoroughly wash the area after a spill or leak clean-up. Prevent spill rinsate from contamination of storm drains, sewers, soil or groundwater.

Evacuation Procedures

Evacuate the area promptly and keep upwind of the spilled material. Isolate the spill area to prevent people from entering. Keep materials which can burn away from spilled material. In case of large spills, follow all facility emergency response procedures.

Special Procedures

Remove soiled clothing and launder before reuse. Avoid all skin contact with the spilled material. Have emergency equipment readily available.

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

*** Section 7 - Handling and Storage ***

Handling Procedures

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling, when used as a pesticide. Do not breathe dust. Avoid all contact with skin and eyes. Use this product only with adequate ventilation. Wash thoroughly after handling.

Storage Procedures

Keep in original container in locked storage area. Keep container tightly closed when not in use. Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Material should be stored in secondary containers or in a diked area, as appropriate. Store containers away from incompatible chemicals (see Section 10, Stability and Reactivity). Storage areas should be made of fire-resistant materials. Post warning and "NO SMOKING" signs in storage and use areas, as appropriate. Use corrosion-resistant structural materials, lighting, and ventilation systems in the storage area. Floors should be sealed to prevent absorption of this material. Have appropriate extinguishing equipment in the storage area (i.e., sprinkler system, portable fire extinguishers). Empty containers may contain residual particulates; therefore, empty containers should be handled with care. Do not cut, grind, weld, or drill near this container. Never store food, feed, or drinking water in containers that held this product. Keep this material away from food, drink and animal feed. Inspect all incoming containers before storage, to ensure containers are properly labeled and not damaged. Do not store this material in open or unlabeled containers. Limit quantity of material stored. Store in suitable containers that are corrosion-resistant.

*** Section 8 - Exposure Controls / Personal Protection ***

Exposure Guidelines

A: General Product Information

Follow the applicable exposure limits.

B: Component Exposure Limits

The exposure limits given are for Copper & Inorganic Compounds, as Cu (7440-50-8), Copper fume as Cu or Copper dusts and mists, as Cu.

ACGIH: 1 mg/m³ TWA (dusts & mists)

0.2 mg/m³ TWA (fume)

OSHA: 1 mg/m³ TWA (dusts & mists)

0.1 mg/m³ TWA (fume)

NIOSH: 1 mg/m³ TWA (dusts & mists)

0.1 mg/m³ TWA (fume)

DFG MAKs 1 mg/m³ TWA Peak, 2•MAK 15 minutes, average value, 1-hr interval (copper and inorganic copper compounds)

0.1 mg/m³ TWA Peak, 2•MAK 15 minutes, average value, 1-hr interval (fume)

Engineering Controls

Use mechanical ventilation such as dilution and local exhaust. Use a corrosion-resistant ventilation system and exhaust directly to the outside. Supply ample air replacement. Provide dust collectors with explosion vents.

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132). Please reference applicable regulations and standards for relevant details.

PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment: Eyes/Face

Wear safety glasses with side shields (or goggles) and a face shield, if this material is made into solution. If necessary, refer to U.S. OSHA 29 CFR 1910.133.

Personal Protective Equipment: Skin

Wear chemically-impervious gloves, made of any waterproof material, boots and coveralls to avoid skin contact. If necessary, refer to U.S. OSHA 29 CFR 1910.138.

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

*** Section 8 - Exposure Controls / Personal Protection (Continued) ***

Personal Protective Equipment: Respiratory

If airborne concentrations are above the applicable exposure limits, use NIOSH-approved respiratory protection. If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998). The following NIOSH Guidelines for Copper dust and mists (as Cu) are presented for further information.

Up to 5 mg/m³: Dust and mist respirator.

Up to 10 mg/m³: Any dust and mist respirator except single-use and quarter mask respirators or any SAR.

Up to 25 mg/m³: SAR operated in a continuous-flow mode or powered air-purifying respirator with a dust and mist filter(s).

Up to 50 mg/m³: Air purifying, full-facepiece respirator with high-efficiency particulate filter(s), any powered air-purifying respirator with tight-fitting facepiece and high-efficiency particulate filter(s) or full-facepiece SCBA, or full-facepiece SAR.

Up to 100 mg/m³: Positive pressure, full-facepiece SAR.

Emergency or Planned Entry into Unknown Concentrations or IDLH Conditions: Positive pressure, full-facepiece SCBA, or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.

Escape: Full-facepiece respirator with high-efficiency particulate filter(s), or escape-type SCBA.

NOTE: The IDLH concentration for Copper dusts and mists (as Cu) is 100 mg/m³.

Personal Protective Equipment: General

Wash hands thoroughly after handling material. Do not eat, drink or smoke in work areas. Have a safety shower or eye-wash fountain available. Use good hygiene practices when handling this material including changing and laundering work clothing after use. Discard contaminated shoes and leather goods.

*** Section 9 - Physical & Chemical Properties ***

Physical Properties: Additional Information

The data provided in this section are to be used for product safety handling purposes. Please refer to Product Data Sheets, Certificates of Conformity or Certificates of Analysis for chemical and physical data for determinations of quality and for formulation purposes.

Appearance:	Blue crystals or powder	Odor:	Odorless
Physical State:	Solid	pH:	3.7-4.2 (10% soln.)
Vapor Pressure:	20 torr at 22.5 deg C	Vapor Density:	8.6
Boiling Point:	560 deg C (1040 deg F) [decomposes]	Freezing/Melting Point:	150 deg C (302 deg F)
Solubility (H2O):	31.6 g/100 cc (@ 0 deg C)	Specific Gravity:	2.28 @ 15.6 deg C (H2O = 1)
Softening Point:	Not available	Particle Size:	Various
Molecular Weight:	249.68	Bulk Density:	Not available
		Chemical Formula:	CuSO4*5H2O

*** Section 10 - Chemical Stability & Reactivity Information ***

Chemical Stability

Copper Sulfate Pentahydrate is hygroscopic, but stable when kept dry, under normal temperature and pressures.

Chemical Stability: Conditions to Avoid

Avoid high temperatures, exposure to air and incompatible materials.

Incompatibility

Copper Sulfate causes hydroxylamine to ignite and the hydrated salt is vigorously reduced. Solutions of sodium hypobromite are decomposed by powerful catalytic action of cupric ions, even as impurities. Copper salts, including Copper Sulfate may react to form explosive acetylides when in contact with acetylene or nitromethane. Contact with reducing agents, can cause a vigorous reaction, especially in solution. This product can corrode aluminum, steel and iron. Copper Sulfate Pentahydrate is incompatible with magnesium, strong bases, alkalines, phosphates, acetylene, hydrazine, and zirconium.

Hazardous Decomposition

Sulfur oxides and Copper oxides.

Hazardous Polymerization

Will not occur.

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

* * Section 11 - Toxicological Information * * *

Acute and Chronic Toxicity

A: General Product Information

Acute toxicity is largely due to the corrosive (acidic) properties of this material. Harmful or fatal if swallowed. Product is an eye and skin irritant, and may cause burns. Product is a respiratory tract irritant, and inhalation may cause nose irritation, sore throat, coughing, and chest tightness and possibly, ulceration and perforation of the nasal septum.

Chronic: Long term skin overexposure to this product may lead to dermatitis and eczema. Prolonged or repeated eye contact may cause conjunctivitis and possibly corneal abnormalities. Chronic overexposure to this product may cause liver and kidney damage, anemia and other blood cell abnormalities.

B: Component Analysis - LD₅₀/LC₅₀

Copper Sulfate Pentahydrate (7758-99-8)

Oral-rat LD₅₀ = 330 mg/kg (testing done June 2006, Consumer Product Testing Co., Inc.); Intraperitoneal-Rat LD₅₀: 18,700 mg/kg; Intraperitoneal-rat LD₅₀: 20 mg/kg; Subcutaneous-rat LD₅₀: 43 mg/kg; Intravenous-rat LD₅₀: 48900 µg/kg; Unreported-rat LD₅₀: 520 mg/kg; Oral-mouse LD₅₀: 369 mg/kg; Intraperitoneal-Mouse LD₅₀: 33 mg/kg; Intraperitoneal-mouse LD₅₀: 7182 µg/kg; Intravenous-mouse LD₅₀: 23300 µg/kg

B: Component Analysis - TDL₀/LDL₀

Copper Sulfate Pentahydrate (7758-99-8)

Oral-man LDL₀: 857 mg/kg; Oral-Human LDL₀: 50 mg/kg; Behavioral: somnolence (general depressed activity); Kidney, Urethra, Bladder: changes in tubules (including acute renal failure, acute tubular necrosis); Blood: hemorrhage; Oral-Human TDL₀: 11 mg/kg; Gastrointestinal: gastritis; Gastrointestinal: hypermotility, diarrhea, nausea or vomiting; Oral-Human TDL₀: 272 mg/kg; liver, kidney, Blood effects; Oral-Human LDL₀: 1088 mg/kg; Oral-child : 150 mg/kg; Kidney, Urethra, Bladder: changes in tubules (including acute renal failure, acute tubular ; necrosis); Blood: other hemolysis with or without anemia; unknown-Man LDL₀: 221 mg/kg; Oral-Woman TDL₀: 2400 mg/kg/day; Gastrointestinal tract effects; DNA Inhibition-Human: lymphocyte 76 mmol/L; Oral-woman LDL₀: 100 mg/kg; Vascular: Blood pressure lowering not characterized in autonomic section; Liver: hepatitis (hepatocellular necrosis), diffuse; Kidney, Urethra, Bladder: changes in tubules (including acute renal failure, acute tubular necrosis); Oral-Human LDL₀: 143 mg/kg; Pulmonary system effects, Gastrointestinal tract effects ;Oral-rat TDL₀: 915 mg/kg/1 year-intermittent: Cardiac: changes in coronary arteries; Blood: changes in serum composition (e.g. TP, bilirubin, cholesterol; Oral-rat TDL₀: 157 mg/kg/6 weeks-intermittent: Endocrine: changes in adrenal weight; Nutritional and Gross Metabolic: weight loss or decreased weight gain; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: dehydrogenases; Oral-rat TDL₀: 7530 mg/kg/30 days-intermittent: Blood: changes in serum composition (e.g. TP, bilirubin, cholesterol); Blood: changes in erythrocyte (RBC) count; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels:- multiple enzyme effect; Oral-rat TDL₀: 2 gm/kg/20 days-intermittent: Liver: other changes; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: phosphatases, Enzyme inhibition, induction, or change in blood or tissue levels; Intraperitoneal-rat TDL₀: 791 mg/kg/18 weeks-intermittent: Nutritional and Gross Metabolic: weight loss or decreased weight gain; Intraperitoneal-rat TDL₀: 7500 µg/kg; female 3 day(s) after conception: Reproductive: Fertility: other measures of fertility; Subcutaneous-rat TDL₀: 12768 µg/kg; male 1 day(s) pre-mating: Reproductive: Paternal Effects: testes, epididymis, sperm duct; Intratesticular-rat TDL₀: 3192 µg/kg; male 1 day(s) pre-mating: Reproductive: Paternal Effects: spermatogenesis (incl. genetic material, sperm morphology, motility, and count), testes, epididymis, sperm duct; Oral-mouse TDL₀: 3 gm/kg/8 weeks-continuous: Blood: changes in spleen; Immunological Including Allergic: decrease in cellular immune response, decrease in humoral immune response; Oral-mouse TDL₀: 2 gm/kg/3 weeks-continuous: Blood: changes in spleen; Immunological Including Allergic: decrease in cellular immune response, decrease in humoral immune response; Subcutaneous-mouse LDL₀: 500 µg/kg; Subcutaneous-mouse TDL₀: 12768 µg/kg; male 30 day(s) pre-mating: Reproductive: Paternal Effects: testes, epididymis, sperm duct; Intravenous-mouse TDL₀: 3200 µg/kg; female 8 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus), Specific Developmental Abnormalities: Central Nervous System, cardiovascular (circulatory) system; Intravenous-mouse TDL₀: 3200 µg/kg; female 7 day(s) after conception: Reproductive: Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants); Oral-Dog, adult LDL₀: 60 mg/kg; Intravenous-guinea pig TDL₀: 2 mg/kg; Subcutaneous-Guinea Pig, adult LDL₀: 62 mg/kg; Oral-Pigeon LDL₀: 1000 mg/kg; Oral-Domestic animals (Goat, Sheep) LDL₀: 5 mg/kg; Oral-Bird-wild species LDL₀: 300 mg/kg; Intravenous-frog LDL₀: 25 mg/kg; Parenteral-chicken TDL₀: 10 mg/kg; Tumorigenic: equivocal tumorigenic agent by RTECS criteria; Endocrine: tumors; Oral-pig TDL₀: 140 mg/kg; female 1-15 week(s) after conception, lactating female 4 week(s) post-birth: Reproductive: Effects on Newborn: biochemical and metabolic; Intravenous-hamster TDL₀: 2130 µg/kg; female 8 day(s) after conception: Reproductive: Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants), Specific Developmental Abnormalities: Central Nervous System, body wall

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

*** Section 11 - Toxicological Information (Continued) ***

Carcinogenicity

A: General Product Information

Copper Sulfate Pentahydrate (7758-99-8)

Cytogenetic Analysis-Rat/ast 300 mg/kg

B: Component Carcinogenicity

Copper dusts and mists, as Cu (7440-50-8)

EPA: EPA-D (Not Classifiable as to Human Carcinogenicity - inadequate human and animal evidence of carcinogenicity or no data available)

Epidemiology

No information available.

Neurotoxicity

Has not been identified.

Mutagenicity

Human and animal mutation data are available for Copper Sulfate Pentahydrate; these data were obtained during clinical studies on specific human and animal tissues exposed to high doses of this compound.

Teratogenicity

There are no reports of teratogenicity in humans. Animal studies indicate that a deficiency or excess of copper in the body can cause significant harm to developing embryos. The net absorption of copper is limited and toxic levels are unlikely from industrial exposure.

Other Toxicological Information

Individuals with Wilson's disease are unable to metabolize copper. Thus, persons with pre-existing Wilson's disease may be more susceptible to the effects of overexposure to this product.

*** Section 12 - Ecological Information ***

Ecotoxicity

A: General Product Information

Harmful to aquatic life in very low concentrations. Copper Sulfate Pentahydrate is toxic to fish and marine organisms when applied to streams, rivers, ponds or lakes.

B: Ecotoxicity

Copper Sulfate Pentahydrate (7758-99-8)

LC₅₀ (*Lepomis machochirus* bluegill) wt 1.5 g = 884 mg/L at 18°C, static bioassay (95% confidence limit 707-1,100 mg/L) (technical material, 100% (about 25% elemental copper); LC₅₀ (*Leopmis cyanellus*, Green Sunfish) = 1.1 g, 3,510 µg/L at °C; LC₅₀ (*Pimephales promelas*, Fat-head minnow) = 1.2 g, 838 µg/L at 18°C; LC₅₀ (*Crassius auratus*, Goldfish) = 0.9 g, 1380 µg/L at 18°C; LC₅₀ (*Crassius auratus*, Goldfish) = 0.1-2.5 mg/L; LC₅₀ (*EEL*) = 0.1-2.5 mg/L; LC₅₀ (*Salmo gairdneri*, Rainbow trout) = 1.6 g, 135 µg/L at 18°C; LC₅₀ (*Salmo gairdneri*, Rainbow trout) 48 hours = 0.14 ppm; LC₅₀ (*Daphnia magna*) no time specified = 0.182 mg/L; LC₅₀ (*Salmo gairdneri*, Rainbow trout) no time specified = 0.17 mg/L; LC₅₀ (*Lepomis machochirus*, Blue gill) no time specified = 1.5 g, 884 µg/L at 18°C; LC₅₀ (Stripped Bass) 96 hours = 1 ppm or lower; LC₅₀ (Prawn) 48 hours = 0.14; LC₅₀ (Shrimp) 96 hours = 17.0 ppm copper; LC₅₀ (Blue Crab) 96 hours = 28 ppm copper; LC₅₀ (Oyster) 96 hours = 5.8 ppm copper; LC₅₀ (*Viviparus bengalensis* snail) 96 hours = 0.060 ppm copper (at 32.5°C; 0.066 ppm copper static bioassay); LC₅₀ (*Viviparus bengalensis* snail) 96 hours = 0.09 ppm copper (at 27.3°C; 0.066 ppm copper static bioassay); LC₅₀ (*Viviparus bengalensis* snail) 96 hours = 0.39 ppm copper (at 20.3°C; 0.066 ppm copper static bioassay)

Environmental Fate

If released to soil, copper sulfate may leach to groundwater, be partly oxidized or bind to humic materials, clay or hydrous oxides of iron and manganese. In water, it will bind to carbonates as well as humic materials, clay and hydrous oxides of iron and manganese. Copper is accumulated by plants and animals, but it does not appear to biomagnify from plants to animals. In air, copper aerosols have a residence time of 2 to 10 days in an unpolluted atmosphere and 0.1 to greater than 4 days in polluted, urban areas.

*** Section 13 - Disposal Considerations ***

US EPA Waste Number & Descriptions

A: General Product Information

This product is a registered pesticide.

B: Component Waste Numbers

No EPA Waste Numbers are applicable for this product's components.

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

Disposal Instructions

All wastes must be handled in accordance with local, state and federal regulations or with regulations of Canada and its Provinces. This material can be converted to a less hazardous material by weak reducing agents followed by neutralization. Do not reuse empty containers. Do not rinse unless required for recycling. If partly filled, call local solid waste agency or (1-800-CLEANUP or equivalent organization) for disposal instructions. Never pour unused product down drains or on the ground.

Pesticide Disposal

Pesticide wastes are acutely hazardous. Improper disposal of excess pesticides, spray mixtures, or rinsate is a violation of U.S. Federal and Canadian Law. If these wastes cannot be disposed of by use, according to product label instruction, contact your U.S. State, or Canadian Province Pesticide or Environmental Control Agency, or the hazardous waste representative at the nearest U.S. EPA Regional Office, or the offices of Environment Canada for guidance.

* * * Section 14 - Transportation Information * * *

NOTE: The shipping classification information in this section (Section 14) is meant as a guide to the overall classification of the product. However, transportation classifications may be subject to change with changes in package size. Consult shipper requirements under I.M.O., I.C.A.O. (I.A.T.A.) and 49 CFR to assure regulatory compliance.

US DOT Information

UN/NA#: UN3077

Shipping Name: Environmentally Hazardous Substance, solid, n.o.s. (cupric sulfate)

Hazard Class: 9 (Miscellaneous Hazardous Material)

Packing Group: III

Required Label(s): Class 9 (Miscellaneous Hazardous Materials)

RQ Quantity: 10 lbs (4.54 kg)[Cupric Sulfate]

Additional Shipping Information: Cupric Sulfate is a Severe Marine Pollutant (49 CFR 172.322) and requires the marine pollutant mark for vessel transportation. Because Copper Sulfate is listed as a Severe Marine Pollutant as found in Appendix B to 172.101 and when shipped by vessel, each inner package which exceeds 500 g (17.6 oz) will need a marine pollutant marking, UN-certified package, marked with the Proper Shipping Name, UN Number will be required when shipped by vessel, when each inner package exceeds 500 g (17.6 oz).

Limited Quantity Shipments: Inner packagings less than 500 g (17.6 oz) will not need to be in a UN-approved box and will not need a Marine Pollutant marking. Such shipments need not be marked with the Proper Shipping Name of the contents, but shall be marked with the UN Number (3077) of the contents, preceded by the letters "UN", placed within a diamond. The width of the line forming the diamond shall be at least 2 mm; the number shall be at least 6 mm high. The total weight of each outer packaging cannot exceed 30 kg (66 lb). For a shipment by air the Class 9 label will be required.

Domestic Transportation Exception:

49 CFR 172.504(f)(9) Domestic transportation, a Class 9 placard is not required. A bulk packaging containing a Class 9 material must be marked with the appropriate identification number displayed on a Class 9 placard, an orange panel or a white-square-on-point display configuration as required by subpart D of this part. 49 CFR 172.322 (d)(3) allows the use of the Class 9 placard to replace the marine pollutant marking for domestic shipments.

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

*** Section 14 - Transportation Information (Continued)***

International Air Transport Association (IATA)

For Shipments by Air transport: We classify this product as hazardous (Class 9) when shipped by air because 49 CFR 173.140 (a). "For the purposes of this subchapter, miscellaneous hazardous material (Class 9) means a material which presents a hazard during transportation, but which does not meet the definition of any other hazard class. This class includes: (a) Any material which has an anesthetic, noxious, or other similar property which could cause extreme annoyance or discomfort to a flight crew member so as to prevent the correct performance of assigned duties."

UN: UN 3077

Proper Shipping Name: Environmentally hazardous substance, solid, n.o.s. (cupric sulphate)

Hazard Class: 9

Packing Group: III

Passenger & Cargo Aircraft Packing Instruction: 911

Passenger & Cargo Aircraft Maximum Net Quantity: 400 kg

Limited Quantity Packing Instruction (Passenger & Cargo Aircraft): Y911

Limited Quantity Maximum Net Quantity (Passenger & Cargo Aircraft): 30 kg

Special Provisions: A97, A149

ERG Code: 9L

Limited Quantity Shipments: Such shipments must be marked with the proper shipping name, UN number, and must be additionally marked with the words LIMITED QUANTITIES or LTD. QTY. The total weight of each outer packaging cannot exceed 30 kg (66 lb.). For a shipment by air the class 9 label will be required

International Maritime Organization (I.M.O.) Classification

For shipments via marine vessel transport, the following classification information applies.

UN #: UN3077

Proper Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Cupric sulfate)

Hazard Class: class 9

Packing Group: III

Special Provisions: 274, 909, 944

Limited Quantities: 500g.

Packing Instructions: P002, LP02

Packing Provisions PP12

EmS: Fire F-A Spill S-F

Stowage and Segregation: Category A

Marine Pollutant: This material is considered a severe marine pollutant by the IMO and shipments of the material must carry the marine pollutant mark label. Refer to IMO Amendment 31-02 Chapter 2.10.

Limited Quantity Shipments: Inner packaging less than 500 g (17.6 oz) will not need to be in a UN-approved box and will not need a Marine Pollutant marking. Such shipments need not be marked with the Proper Shipping Name of the contents, but shall be marked with the UN Number (3077) of the contents, preceded by the letters "UN", placed within a diamond. The width of the line forming the diamond shall be at least 2 mm; the number shall be at least 6 mm high. The total weight of each outer packaging cannot exceed 30 kg (66 lb.).

*** Section 15 - Regulatory Information ***

US Federal Regulations

A: General Product Information

Copper Sulfate Pentahydrate (CAS # 7758-99-8) is listed as a Priority and Toxic Pollutant under the Clean Water Act.

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

*** Section 15 - Regulatory Information (Continued)***

US Federal Regulations (continued)

B: Component Analysis

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4):

Copper Compounds (7440-50-8)

SARA 313: final RQ = 5000 pounds (2270 kg) Note: No reporting of releases of this substance is required if the diameter of the pieces of the solid metal released is equal to or greater than 0.004 inches.

Cupric Sulfate (7758-98-7)

CERCLA: final RQ = 10 pounds (4.54 kg)

C: Sara 311/312 Tier II Hazard Ratings:

Component	CAS #	Fire Hazard	Reactivity Hazard	Pressure Hazard	Immediate Health Hazard	Chronic Health Hazard
Copper Sulfate Pentahydrate	7758-99-8	No	No	No	Yes	Yes

State Regulations

A: General Product Information

California Proposition 65

Copper Sulfate Pentahydrate is not on the California Proposition 65 chemical lists.

B: Component Analysis - State

The following components appear on one or more of the following state hazardous substance lists:

Component	CAS #	CA	FL	MA	MN	NJ	PA
Copper	7440-50-8	Yes	No	Yes	No	Yes	Yes
Copper, fume, dust and mists	N/A	No	Yes	No	Yes	No	Yes
Copper Sulfate Pentahydrate	7758-99-8	No	No	No	No	Yes	Yes

Other Regulations

A: General Product Information

When used as a pesticide, the requirements of the U.S. Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), or requirements under the Canadian Pest Control Act, are applicable.

B: Component Analysis - Inventory

Component	CAS #	TSCA	DSL	EINECS
Copper Sulfate Pentahydrate	7758-99-8	Exempted	No	Yes

Although this compound is not on the TSCA Inventory, it is exempted as a hydrate of a listed compound, Copper Sulfate (CAS # 7758-98-7), per 40 CFR 710.4 (d)(3) and 40 CFR 720.30 (h)(3). Under this section of TSCA, any chemical substance which is a hydrate of a listed compound is exempted.

C: Component Analysis - WHMIS IDL

The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

Component	CAS #	Minimum Concentration
Copper Sulfate Pentahydrate	7758-99-8	1 percent

ANSI Labeling (Z129.1):

WARNING! MAY BE HARMFUL OR FATAL IF SWALLOWED. CAUSES SKIN AND EYE IRRITATION. HARMFUL IF INHALED. Keep from contact with clothing. Do not taste or swallow. Do not get on skin or in eyes. Avoid breathing dusts or particulates. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Wear gloves, goggles, facemasks, suitable body protection, and NIOSH-approved respiratory protection, as appropriate. **FIRST-AID:** In Case of Contamination of Skin or Clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. In Case of Contamination of Eyes: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue to rinse eye. If Inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth to mouth, if possible. If Ingested: Call poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Do not give anything by mouth to an unconscious person. Call a poison control center or doctor for treatment advice. Have the product container or label with you when calling a poison control center or doctor, or going for treatment. In the event of a medical emergency, you may also contact

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

*** Section 15 - Regulatory Information (Continued) ***

The National Pesticide Information Center at 1-800-858-7378. **IN CASE OF FIRE:** Use water fog, dry chemical, CO₂, or "alcohol" foam. **IN CASE OF SPILL:** Absorb spill with inert material. Place residue in suitable container. Consult Material Safety Data Sheet for additional information.

Labeling Information for Pesticide Use of Product:

DANGER! HAZARD TO HUMANS AND DOMESTIC ANIMALS.

DANGER: CORROSIVE: Causes eye damage and irritation to the skin and mucous membrane. Harmful or fatal if swallowed. Do not get in eyes, on skin or on clothing. Do not breathe dust or spray mist. May cause skin sensitization reactions to certain individuals.

PERSONAL PROTECTIVE EQUIPMENT: Applicators and other handlers must wear long-sleeved shirt and long pants, chemical-resistant gloves, made of any water-proof material, shoes, plus socks and protective eyewear. Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this solutions of this product. Do not reuse such contaminated items. Follow manufacturer's instructions for cleaning and maintaining PPE. If no such instructions for reusable items exist, wash using detergent and hot water. Keep and wash PPE separately for other laundry.

USER SAFETY RECOMMENDATIONS: Persons using this product should wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove clothing immediately if contaminated by the pesticide. Wash contaminated clothing thoroughly and put on clean clothing. Remove PPE immediately after use with this product. Wash outside of gloves and other equipment before removing. After removal of PPE, wash thoroughly and change into clean clothing.

ENVIRONMENTAL HAZARDS: This product is toxic to fish. Direct application of Copper Sulfate to water may cause a significant reduction in populations of aquatic invertebrates, plants and fish. Do not treat more than one-half of lake or pond at one time in order to avoid depletion of oxygen from decaying vegetation. Allow 1 to 2 weeks between treatments for oxygen levels to recover. Trout and other species of fish may be killed at application rates recommended on this label, especially in soft or acid waters. However, fish toxicity generally decreases when the hardness of the water increases. Do not contaminate water by cleaning of equipment or disposal of wastes. Consult local State Fish and Game Agency before applying this product to public waters. Permits may be required before treating such waters.

STORAGE AND DISPOSAL: PROHIBITIONS: Do not contaminate water, food or feed by storage or disposal. Open burning and dumping is prohibited. Do not re-use empty containers. Keep pesticide in original container. Do not put concentrate or dilutions of concentrate in food or drink containers. Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture or rinsate is a violation of Federal law. If these wastes cannot be disposed of by use, according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste Representative at the nearest EPA Regional Office for guidance. Completely empty bag of product into application equipment. Dispose of empty bag in a sanitary landfill or by incineration, or if allowed by State and local authorities, by burning. If burned, avoid smoke.

DIRECTIONS FOR USE: It is a violation of Federal Law to use this product inconsistent with its labeling. Do not apply this product in a way that will contaminate workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For requirements specific to your State, consult the agency responsible for your pesticide regulations.

AGRICULTURAL USE REQUIREMENTS: Use this product only in accordance with its labeling and with the Worker Protection Standard, CFR Part 170. This standard contains requirements for the protection of agricultural workers on farms, forests, nurseries and greenhouses, and handlers of agricultural pesticides. The Standard contains requirements for the training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE), and restricted-entry interval. These requirements only apply to uses of this product that are covered under the Worker Protection Standard. Do not apply this product in a way that will contaminate workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. Do not allow worker entry into treated areas during the restricted interval (REI) of 24 hours. PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil or water, is "Coveralls, waterproof gloves, shoes, plus socks and protective eyewear."

Material Safety Data Sheet

Material Name: Copper Sulfate Pentahydrate

ID: C1-121A

*** Section 15 - Regulatory Information (Continued) ***

Labeling Information for Pesticide Use of Product (continued):

GENERAL USE INSTRUCTIONS: Water hardness, temperature of the water, the type and amount of vegetation to be controlled and the amount of water flow, are to be considered in using Copper Sulfate to control algae. Begin treatment soon after plant growth has started. If treatment is delayed until a large amount of algae is present, larger quantities of Copper Sulfate will be required. Algal growth is difficult to control with Copper Sulfate when water temperatures are low or when water is hard. Larger quantities of Copper Sulfate will be required to kill and control algae in water which is flowing than in a body of stagnant water. If possible, curtail the flow of water before treatment and hold dormant until approximately three days after treatment or until the algae have begun to die. When preparing a Copper Sulfate solution in water, the mixing container should be made of plastic or glass, or a painted, enameled, or copper-lined metal container. It is usually best to treat algae on a sunny day when the heavy mats of filamentous algae are most likely to be floating on the surface, allowing the solution to be sprayed directly on the algae. If there is some doubt about the concentration to apply, it is generally best to start with a lower concentration and to increase this concentration until the algae are killed.

ENDANGERED SPECIES RESTRICTION: It is a violation of Federal Law to use any pesticide in a manner that results in the death of an endangered species or adverse modification to their habitat. The use of this product may pose a hazard to certain Federally Designated species known to occur in specific areas. Contact the EPA for information on these areas. Obtain a copy of the EPA Bulletin specific to your area. This bulletin identifies areas within specific State counties where the use of this pesticide is prohibited, unless specified otherwise. The EPA Bulletin is available from either your County Agricultural Extension Agent, the Endangered Species Specialist in your State Wildlife Agency Headquarters, or the appropriate Regional Office of the U.S. Fish and Wildlife Service. THIS BULLETIN MUST BE REVIEWED PRIOR TO PESTICIDE USE.

EPA REG. NO. 56576-

EPA EST. NO. 52117-MX-001

*** Section 16 - Other Information ***

Other Information

Chem One Ltd. ("Chem One") shall not be responsible for the use of any information, product, method, or apparatus herein presented ("Information"), and you must make your own determination as to its suitability and completeness for your own use, for the protection of the environment, and for health and safety purposes. You assume the entire risk of relying on this Information. In no event shall Chem One be responsible for damages of any nature whatsoever resulting from the use of this product or products, or reliance upon this Information. By providing this Information, Chem One neither can nor intends to control the method or manner by which you use, handle, store, or transport Chem One products. If any materials are mentioned that are not Chem One products, appropriate industrial hygiene and other safety precautions recommended by their manufacturers should be observed. Chem One makes no representations or warranties, either express or implied of merchantability, fitness for a particular purpose or of any other nature regarding this information, and nothing herein waives any of Chem One's conditions of sale. This information could include technical inaccuracies or typographical errors. Chem One may make improvements and/or changes in the product (s) and/or the program (s) described in this information at any time. If you have any questions, please contact us at Tel. 713-896-9966 or E-mail us at Safety@chemone.com.

Contact: Sue Palmer-Koleman, PhD

Contact Phone: (713) 896-9966

Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act; ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration

Revision log 07/24/00 4:24 PM SEP Changed company name, Sect 1 and 16, from Corporation to Ltd.

07/27/00 2:49 PM SEP Added "Fine 200, FCC IV, Very High Purity" to synonyms, Section 1

08/23/00 3:15 PM SEP Added "Copper Sulfate Crystals" to synonyms, Section 1

05/31/01 9:31 AM HDF Checked exposure limits; made changes to Sect 9; overall review, add SARA 311/312 Haz Ratings.

06/01/01 7:28 AM HDF Added text to label information from EPA Approved Label

07/24/01 4:31 AM CLJ Add Shipments by Air information to Section 14, Changed contact to Sue, non-800 Chemtrec Num.

09/18/01 11:34 AM SEP Added Domestic Transportation Exception, Sect 14

10/05/01 3:30 PM SEP Deleted Alternate Shipping Name, Sect 14

02/15/02 11:01 AM: HDF Revision of SARA Chronic Hazard Rating to "Yes".

2/21/02 4:21 PM HDF Added more information on Marine Pollutant Markings and Limited Quantity Shipments

9/16/03: 3:45 PM HDF Addition of chronic health hazard information. Addition of inhalation hazard information, Section 3. Section 4. expansion of information on Information for Physicians. Up-graded Section 10 Reactivity Information. Up-dated DFG MAK exposure limits. Up-Dated entire Section 14 Transportation Information to include IATA, IMO and current Canadian transport information.

06/22/05 2:24PM SEP Update IATA Section 14

01/06/2006 10:12 am SEP Corrected Section 14 DOT domestic transport exception to read 49 CFR 172.322 (d) (3).

09/08/06 2:52PM SEP Updated DOT and IMO Section 14

09/25/06 08:43 HDF Review of new toxicological data and addition of data to Section 11.

10/17/06 12:15 pm SEP Updated Section 11.

10/16/07 9:48am SEP Updated Section 14- IATA

This is the end of MSDS # C1-121A

Appendix C: Calculation of Acceptable Concentrations of Copper in Surface Water

The following memorandum examines the potential effects that copper added to surface water as a zebra mussel treatment could have on birds and mammals that may ingest treated lake water.

METHODOLOGY

To calculate a copper surface water concentration that would be “safe” (i.e., no adverse effects when ingested by terrestrial receptors), several potential receptor species were selected. Water ingestion rates, body weights and other relevant characteristics are compiled in Table C-1. Terrestrial receptors selected as representative of birds and mammals that may potentially use the lake as a drinking water source are: belted kingfisher, mink, raccoon and white-tailed deer. The following equation calculates each receptor’s average daily dose of copper ingested through water:

$$ADD = \frac{IR_{\text{water}} * C_{\text{water}}}{BW}$$

Where:

ADD	=	Average Daily Dose (mg/kg-BW/day)
IR _{water}	=	L/day
C _{water}	=	Concentration of copper in water (mg/L)
BW	=	Body Weight (kg)

The ADD is the average daily dose of copper that a receptor may ingest based on an individual’s water ingestion rate and body weight. It is important to note that for purposes of this evaluation, it is assumed that the daily intake of water for each receptor comes entirely from the treated lake water (and no other sources which would reduce the overall copper dose to the organism).

By rearranging the equation and assuming the ADD is equal to a no-observed-adverse-effect level (NOAEL), a “safe” concentration of copper in surface water can be calculated for each receptor:

$$C_{\text{water}} = \frac{NOAEL * BW}{IR_{\text{water}}}$$

TOXICITY REFERENCE VALUES

Representative NOAELs were selected from among toxicity data presented in USEPA’s *Ecological Soil Screening Level for Copper* (2007). Avian and mammalian studies were reviewed in which test species were exposed to copper through drinking water. This document was used as a reliable source of toxicity information because each study has

been evaluated as acceptable through a rigorous scientific review process. For estimating acceptable copper surface water concentrations, ecologically relevant endpoints were considered to include growth, reproduction and survival (that is, neurological, histological and behavioral endpoints were not included). Table C-2 presents a summary of each test and includes a full citation of each reference.

To calculate acceptable short-term copper surface water concentrations for each receptor, the lowest available NOAEL was selected for each receptor. For the belted kingfisher, the NOAEL for growth in mallard ducklings (10.2 mg/kgBW/day) was selected. For the mink, raccoon, and white-tailed deer the NOAEL for growth in rat pups (17.2 mg/kgBW/day) was selected.

In addition, it is notable that sheep appear to be highly sensitive to copper. Although deer and sheep are closely related, it is not known whether the white-tailed deer is as sensitive to copper as domestic sheep. To be conservative, the domestic sheep was also considered a potential surrogate for the white-tailed deer. However, neither study on sheep in Table Cu-2 provided a NOAEL (McNatt et al. 1971, Ortolani et al. 2003). Therefore, the lowest LOAEL was divided by an uncertainty factor of 10 to derive an estimated NOAEL (0.3mg/kgBW/day).

RESULTS

The calculated acceptable copper surface water concentrations are presented in Table C-3. The lowest value among typical wildlife receptors was 75 mg/L, for the belted kingfisher. For the white-tailed deer compared with the sheep NOAEL, the calculated acceptable level at which no effects would be observed was 4.6 mg/L.

Assuming that the deer is as sensitive as the sheep, 4.6 mg/L is the concentration of copper in surface water at which no adverse effects on growth would be observed in an individual juvenile deer should it drink all of its water from the treated lake for a period of at least 35 days. Using the LOAEL, it would take a concentration of 45.7 mg/L copper to reduce growth under the same exposure assumptions. Thus, the NOAEL-based value of 4.6 mg/L is a highly conservative estimate of acceptable copper surface water concentrations for three reasons: 1) it is based on a no-observable effects level; 2) it is unlikely that a white-tailed deer would take all of its drinking water from a single source when it has a 59 hectare foraging range; and 3) the duration of the copper treatment to the lake will be of short duration relative to the 35 day exposure in the toxicity study.

TABLE C-1
Ecological Receptor Characteristics and Sources of Assumptions

Receptor of Interest	Guild	Body Weight (kg)	Foraging Territory (ha)	Food Ingestion Rate (kg dw/day)	Food Ingestion Rate (kg ww/day)	Water (L/day)	Sediment/ Soil Ingestion Rate (kg dw/day)	Plants (fraction of diet)	Invertebrates (fraction of diet)	Small Mammals (fraction of diet)	Forage Fish (fraction of diet)	Birds (fraction of diet)
Belted Kingfisher	Carnivore	0.148	1.2	0.019	0.074	0.02	0		0.24		0.76	
Mink	Carnivore	0.8	1.85	0.046	0.137	0.099	0.0005		0.09	0.4	0.45	0.06
Raccoon	Omnivore	6.67	156	0.327	1.090	0.554	0.0307	0.6	0.28	0.06	0.05	0.01
White-Tailed Deer	Herbivore	60.7	59	1.732	2.887	3.986	0.017	1				

Belted Kingfisher

AU - average of shoreline used in Pennsylvania and Ohio streams; Brooks & Davis (1987) and Davis (1980) in USEPA (1993)

BW- mean size of adults reported for Pennsylvania and Ohio; Brooks and Davis (1987) in USEPA (1993)

IRf- 0.50 g/g-day ww; based on value for adults in Alexander (1977) in USEPA (1993); converted to dry wt assuming 75% moisture content for small fish; USEPA (1993)

IRw - 0.11 g/g-day; USEPA (1993)

IRs - assumed to be negligible

Diet - Based on diets along lower Michigan lake from Alexander (1977) in USEPA (1993). Crustacea and insects pooled in invertebrates, remainder assumed to be equivalent to fish

Mink

Area Use – mean for females between sparse and heavily vegetated areas; Mitchell (1961) in USEPA (1993)

Body Weight – mean of males and females in Indiana; Silva and Downing (1995)

Food Ingestion Rate – mean (g/g-day ww) of males and females. Converted to dw using 66.2% moisture content as reported in study; Bleavins and Aulerich (1981) in USEPA (1993)

Water Ingestion Rate - Sample et al. (1997)

Dietary Composition - based on diets for Missouri; Korschgen (1958) in USEPA (1993)

Soil/Sediment Ingestion Rate – Assumed 1% of dw ingestion rate; USEPA (2000)

Raccoon

AU - 156 ha; based on mean for males and females in Michigan riparian areas; Stuewer (1943) in USEPA (1993)

BW - 6.67 kg; average adult weight for west central Illinois; Sanderson (1984) in USEPA (1993)

IRf - Allometric equation of Nagy (1987) for all mammals as reported in USEPA (1993). Assumed 70% moisture in diet for converting to ww rate.

IRw - 0.083 g/g-day; USEPA (1993)

IRs - 9.4% of diet (dry weight); USEPA (1993)

Diet - seasonally averaged diets from Tennessee and Maryland; USEPA (1993)

Whitetail Deer

AU - 59 ha; Sample and Suter II (1994)

BW - 60.7 kg; average of males and females in Indiana; Silva and Downing (1994)

IRf - Dry weight rate based on allometric equations of Nagy (1987) for herbivores reported in USEPA (1993). For ww calculations, the herbivore diet was assumed to contain 40% moisture on average (average of young and mature grasses) ; USEPA (1993)

IRw - based on allometric equations of Caulder and Braun (1983) for all mammals reported in USEPA (1993)

IRs - 1% assumed; based on less than 2%; Beyer et al. (1994)

Diet - plant 100%; Sample and Suter II (1994)

TABLE C-2
Toxicity Reference Values for Birds and Mammals Exposed to Copper Through Ingestion of Drinking Water

Test Species	Age	Route of Exposure	Duration	Effect	Dose mg/kgBW/d		Reference
					NOAEL	LOAEL	
<i>Birds</i>							
Mallard (<i>Anas platyrhynchos</i>)	JV	Drinking water	14 days	Growth	10.2	51.6	Foster 1999
Turkey (<i>Melagris gallopavo</i>)	JV	Drinking water	10 days	Growth	26.6		Ward et al. 1995
Turkey (<i>Melagris gallopavo</i>)	JV	Drinking water	10 days	Mortality	26.6		Ward et al. 1995
Mallard (<i>Anas platyrhynchos</i>)	JV	Drinking water	4 days	Mortality		78.5	Foster 1999
<i>Mammals</i>							
Rat (<i>Rattus norvegicus</i>)	AD	Drinking water	12 weeks	Testes weight		41.2	Bataineh et al. 1998
Rat (<i>Rattus norvegicus</i>)	JV	Drinking water	15 days	Growth	17.2	51.6	Hebert 1993
Mouse (<i>Mus musculus</i>)	JV	Drinking water	8 days	Growth	33.8	101	Hebert 1993
Rat (<i>Rattus norvegicus</i>)	JV	Drinking water	11 months	Growth	45.8		De Vries et al. 1986
Rat (<i>Rattus norvegicus</i>)	JV	Drinking water	1 week	Growth	50	64	Komulainen 1983
Rat (<i>Rattus norvegicus</i>)	JV	Drinking water	6 weeks	Growth	73.4		Myers et al. 1993
Rat (<i>Rattus norvegicus</i>)	JV	Drinking water	2 weeks	Growth	259	400	Hebert et al. 1993
Mouse (<i>Mus musculus</i>)	JV	Drinking water	2 weeks	Growth	1430	3400	Hebert et al. 1993
Sheep (<i>Ovis aries</i>)	JV	Drinking water	35 days	Growth	0.3 ¹	3	Ortolani et al. 2003
Rat (<i>Rattus norvegicus</i>)	JV	Drinking water	91 days	Growth		5.78	Freundt and Ibrahim 1990
Rat (<i>Rattus norvegicus</i>)	JV	Drinking water	15 days	Mortality	33.3	111	Hebert 1993
Mouse (<i>Mus musculus</i>)	JV	Drinking water	15 days	Mortality	33.8	101	Hebert 1993
Rat (<i>Rattus norvegicus</i>)	JV	Drinking water	2 weeks	Mortality	259	400	Hebert et al. 1993
Mouse (<i>Mus musculus</i>)	JV	Drinking water	2 weeks	Mortality	1430	3400	Hebert et al. 1993
Sheep (<i>Ovis aries</i>)	JV	Drinking water	10 weeks	Mortality		5.09	Gopinath et al. 1974
Rat (<i>Rattus norvegicus</i>)	JV	Drinking water	3 weeks	Mortality		114	McNatt et al. 1971

Source: USEPA. 2007. Ecological Soil Screening Levels for Copper, Interim Final. OSWER Directive 9285.7-68

TABLE C-2
Toxicity Reference Values for Birds and Mammals Exposed to Copper Through Ingestion of Drinking Water

mg - milligrams

kg - kilograms

BW - Body weight

d - day

JV - Juvenile

AD - Adult

NOAEL - No-observed-adverse-effects level

LOAEL - Lowest-observed-adverse-effects level

¹ - NOAEL estimated by dividing LOAEL by an uncertainty factor of 10

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TABLE C-2
Toxicity Reference Values for Birds and Mammals Exposed to Copper Through Ingestion of Drinking Water

Pharmacol Toxicol . 53(1): 33-8. Ref

McNatt, E. N., Campbell, W. G. Jr, and Callahan, B. C. 1971. effects of dietary copper loading on livers of rats. i. changes in subcellular acid phosphatases and detection of an additional acid p-nitrophenylphosphatase in the cellular supernatant during copper loading. Am J Pathol. 64(1): 123-44.

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Ortolani, E. L., Machado, C. H., and Sucupira, M. C. A. 2003. assessment of some clinical and laboratory variables for early diagnosis of cumulative copper poisoning in sheep. Veterinary and Human Toxicology [Vet. Hum. Toxicol.]. Vol. 45, No. 6, P. 289. Dec 2003.

Ward, T. L., Watkins, K. L., and Southern, L. L. 1995. interactive effects of dietary copper, water copper, and eimeria spp.infection on growth, water intake, and plasma and liver copperconcentrations of poults. Poultry Science 74(3): 502-509.

TABLE C-3
Calculation of Acceptable Copper Surfacer Water Concentrations for Receptors of Concern

Receptor	Body Weight (kg)	Water Ingestion Rate (L/day)	Copper Drinking Water NOAEL (mg/kgBW/day)	Acceptable Short-Term Copper Surface Water Concentration (mg/L)¹
Belted Kingfisher	0.148	0.02	10.2	75
Mink	0.8	0.099	17.2	139
Raccoon	6.67	0.554	17.2	207
White-tailed Deer ²	60.7	3.986	17.2	262
White-tailed Deer ³	60.7	3.986	0.3	4.6

Notes:

NOAEL - No-observed-adversed-effects level

¹ - Assumes entire daily water intake is from treated lakewater

² - Using the rat as a surrogate test species

³ - Using sheep as a surrogate test species

kg = kilogram

L/d = Liters per day

mg/kgBw/day = milligrams per kilogram bodyweight per day

mg/L - milligrams per Liter

mg/L = ppm

ppm = parts per million

No public comments were received.



Fact Sheet – Horse Owners

Eradication of Zebra Mussels from the Base Lake

Zebra mussels

Zebra mussels are non-native, fingernail-sized, freshwater mollusks (clams) that were accidentally introduced to North America via ballast water from a transoceanic vessel. They have few known predators.

The zebra mussels are believed to have gained access to the Base Lake at Offutt Air Force Base (AFB) via contaminated bilge water from a private boat that was brought to the Base Lake.

The tendency of zebra mussels to colonize on hard surfaces, such as water intake pipes and valves, boat hulls, and docks, has led to serious economic impact in municipal, industrial, and private water systems in other areas of the country. Additionally, zebra mussels can have profound effects on the ecosystems they invade by changing the natural balance of invertebrates and sun-light penetration. This can have serious negative impacts to fish species living in the infested waters.

The zebra mussel population in the Base Lake is the only known population in Nebraska. To control the spread of the zebra mussels, private boats have been banned from the Base Lake and the Lake's outlets to the Bellevue Drain have been sealed with concrete.

Due to the highly invasive nature of this mussel, Offutt AFB has determined that the best action to limit the spread of zebra mussels to other bodies of water in the state would be to eradicate the zebra mussel from the Base Lake.

Method of Eradication

Recent studies have shown copper sulfate to have success against zebra mussels. Therefore, it has been selected as the chemical that will be used to eradicate zebra mussels from the Base Lake. It is an unrestricted use fungicide, herbicide and pesticide and can be purchased at many garden centers. The compound is frequently used to control fungus, mildew, etc. on nuts, fruits and other types of vegetation and crops. It can also be used to control invasive exotic aquatic plants, to remove snails from aquariums, and control algae in ponds, lakes, and stock tanks.

Potential Exposure Concerns – Horses

Copper sulfate is a strong irritant which can be harmful to domestic animals. It can cause eye damage and irritation to the skin and mucous membranes. Therefore, you should restrict your horse's contact with or breathing the copper sulfate dust. It can also cause skin sensitization reactions in equines.

Fact Sheet – Horse Owners

Base Stable Area Restrictions

Application of the copper sulfate will occur during two separate 48-hour periods – one in September of 2008 and one in the Spring of 2009. The most likely exposure route for horses at the lake is from copper sulfate dust during application activities. Therefore, as part of the application process, the following restrictions will be placed on the lake:

- During application, the general public will be restricted to the lake perimeter road and the areas landward of the lake perimeter road, including the FAMCAMP, Boathouse, and Pavilion. Horse owners will continue to have access to the horse stable during application.
- Horses housed in the nearby stable will be confined to their stalls with doors closed during the days of the applications.
- Feed (including hay) should be covered to limit potential contact with copper sulfate dust during application activities
- Outdoor water tanks/buckets should be emptied prior to application and remain empty until application is complete. These water sources should be rinsed before refilling following application of copper sulfate.

These restrictions will minimize any potential exposure to copper sulfate during application, thereby, minimizing the risk for any adverse effects. However, if owners would prefer to stable their horses at an off-base location until the application activities have been completed, the dates for the actual application will be available several weeks ahead of the application.

First Aid

If on skin or clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15 to 20 minutes. Call a poison control center or doctor for treatment advice.

If inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth to mouth, if possible. Call a poison control center or doctor for further treatment advice.

If in eyes: Hold eye open and rinse slowly and gently with water for 15 to 20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue to rinse eye. Call a poison control center or doctor for treatment advice.

If swallowed: Call poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Do not give anything by mouth to an unconscious person.

In the event of a medical emergency, you may also contact the **National Pesticide Information Center** at **1-800-858-7378** or the **Poison Control Center** at **1-800-222-1222**.

For more information on the application of Copper Sulfate to the Base Lake, please call: Mr. Karl Morris, 55 CES/CEVN, (402) 232-5891. For additional copies of this fact sheet, visit our website at: <http://www.offutt.af.mil/library/factsheets/index.asp>

Fact Sheet – General Public



Eradication of Zebra Mussels from the Base Lake

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Zebra mussels are non-native, fingernail-sized, freshwater mollusks (clams) that were accidentally introduced to North America via ballast water from a transoceanic vessel. They have few known predators.

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The tendency of zebra mussels to colonize on hard surfaces, such as water intake pipes and valves, boat hulls and docks, has led to serious economic impact in municipal, industrial, and private water systems in other areas of the country. Additionally, zebra mussels can have profound effects on the ecosystems they invade by changing the natural balance of invertebrates and sun-light penetration. This can have serious negative impacts to fish species living in the infested waters.

The zebra mussel population in the Base Lake is the only known population in Nebraska. To control the spread of the zebra mussels, private boats have been banned from the Base Lake and the Lake's outlets to the Bellevue Drain have been sealed with concrete.

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Recent studies have shown copper sulfate to have success against zebra mussels. Therefore, it has been selected as the chemical that will be used to eradicate zebra mussels from the Base Lake. It is an unrestricted use fungicide, herbicide and pesticide and can be purchased at many garden centers. The compound is frequently used to control fungus, mildew, etc. on nuts, fruits and other types of vegetation and crops. It can also be used to control invasive exotic aquatic plants, to remove snails from aquariums, and control algae in ponds, lakes, and stock tanks.

Potential Public Health Concerns

Copper sulfate is a strong irritant which can be harmful to humans. It can cause eye damage and irritation to the skin and mucous membranes. Therefore, you should avoid contact with skin, eyes, and clothing. Breathing the dust should also be avoided. It can also cause skin sensitization reactions in certain individuals. Copper sulfate can be fatal if swallowed in large enough quantities.

Fact Sheet – General Public

Lake Use Restrictions

Application of the copper sulfate will occur during two separate 48-hour periods – one in September of 2008 and one in the Spring of 2009. Contact with the skin via dust during application activities and contact with water following an application are the most likely exposures for people at the lake. **Therefore, during and immediately following application, the general public will be restricted to the lake perimeter road and the areas landward of the lake perimeter road. In addition, no recreational activities involving water contact (including fishing) will be allowed until the copper concentrations at all locations in the lake are less than 1.3 parts per million, which is the drinking water standard. The public will continue to have access to the FAMCAMP, Boathouse, and Pavilion.** These restrictions will minimize any potential exposure to copper sulfate, thereby, minimizing the risk for any adverse effects on the general public.

First Aid

If on skin or clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15 to 20 minutes. Call a poison control center or doctor for treatment advice.

If inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth to mouth, if possible. Call a poison control center or doctor for further treatment advice.

If in eyes: Hold eye open and rinse slowly and gently with water for 15 to 20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue to rinse eye. Call a poison control center or doctor for treatment advice.

If swallowed: Call poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Do not give anything by mouth to an unconscious person.

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