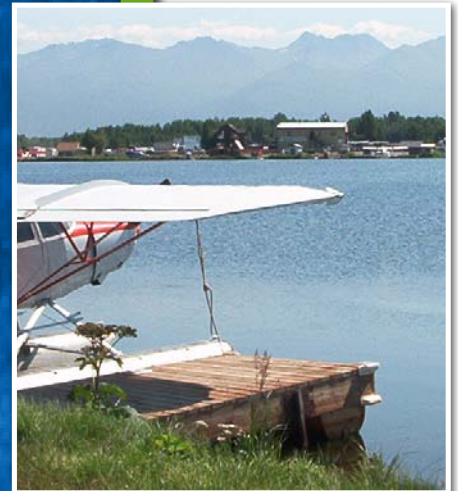


# AQUATIC VEGETATION MANAGEMENT PLAN

**PREPARED FOR**  
Ted Stevens Anchorage International Airport,  
Environmental Compliance Section  
State of Alaska Department of Transportation and Public Facilities  
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APRIL 2005



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*Report*

# **Aquatic Vegetation Management Plan**

Prepared for  
**Ted Stevens Anchorage International Airport  
Environmental Compliance Section  
State of Alaska Department of Transportation  
and Public Facilities**

P.O. Box 196960  
Anchorage, Alaska 99519-6960

April 2005



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# Abbreviations

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ADA	Alaska Division of Agriculture
ADEC	Alaska Department of Environmental Conservation
ADFG	Alaska Department of Fish & Game
ADNR	Alaska Department of Natural Resources
Airport	Ted Stevens Anchorage International Airport
DO	dissolved oxygen
hp	horse power
MOA	Municipality of Anchorage
NPDA	Outfall Sampling Point A
NPDB	Outfall Sampling Point B
NPDC	Outfall Sampling Point C
NPDD	Outfall Sampling Point D
NPDE	Outfall Sampling Point E
N:P ratio	Nitrogen: Phosphorous ratio
ppb	parts per billion
ppm	parts per million
USACE	U.S. Army Corps of Engineers
WAPMS	Western Aquatic Plant Management Society





# Executive Summary

---

In anticipation of the completion and implementation of the Water Body Recovery Plan for Lakes Hood and Spenard, Ted Stevens Anchorage International Airport (ANC) is proactively identifying issues that may arise as water quality in the lakes begins to improve. A major issue is the recently observed increase in aquatic vegetation accompanying an increase in water column transparency. As ANC implements new best management practices that reduce pollutant loading to the lakes, lake clarity has increased, giving rise to increased macrophyte densities. The exact mechanism driving the changes in water quality is not fully understood, but is actively being investigated.

Excessive aquatic vegetation has begun to be a nuisance and could be a source of problematic operating conditions at Lakes Hood and Spenard. The main concern to ANC management is the safety issue that vegetation poses to float planes. ANC analyzed all potential control options, and created an integrated strategy considering cost, environmental issues, and effectiveness. The chosen strategy is scientifically sound, and addresses specific issues in the lakes. This strategy should also be easy to permit, because herbicides will not be used and the potential to disturb sediment are minimal.

This aquatic vegetation management plan is the first step in mitigating and preventing aquatic vegetation problems and impairments in Lakes Hood and Spenard. The plan considers control methods that fit within three general categories: physical/mechanical, chemical, and biological. Each control method is evaluated based on its advantages, disadvantages, cost, long-term effects and impacts, and permitting requirements. The various control methods were assessed by ANC to determine the most appropriate for use in Lakes Hood and Spenard.

Under the vegetation management approach selected, ANC is responsible for controlling vegetation outside of the slips in the open water, while individual slip owners take care of their own slips with ANC's guidance. A variety of specific vegetation control methods are incorporated in this approach. Harvesters were selected as the primary method of controlling vegetation in the open water because they achieve the desired goal of reducing vegetation, yet they leave vegetation on the shoreline intact which helps protect against erosion. Additionally, harvesters cause minimal environmental concern, and would likely be the most attractive option to the public. For the summer of 2005, ANC plans to use the harvester owned by the Alaska Department of Transportation and Public Facilities that resides in Homer most of the year. Because ANC will be sharing the harvester with Homer during 2005, ANC maintains the use of a contracted harvester for no more than five days on an as-needed basis. ANC will work on ordering and procuring a new harvester for use starting in the summer of 2006.

Individual slip owners will have the option of using weed rakes to maintain their float plane slips. Hand rakes are another environmentally sensitive and inexpensive vegetation control method that can be used by the owners on an as-needed basis.



## SECTION 1

# Background and Water Body Description

---

Anchorage is located in south-central Alaska at the head of Cook Inlet. It lies at approximately 61°13'N latitude, 149°53'W longitude (Section 28, T013N, R004W, Seward Meridian). The city encompasses 1,697 square miles of land and 264 square miles of water (Figure 1-1).

Lakes Hood and Spenard are located on the northeastern part of the property of the Airport, which is situated on a bluff overlooking Turnagain Arm of the Cook Inlet, on Anchorage's western edge. The Airport encompasses 4,500 acres. The surface area of Lakes Hood and Spenard combined is 208 acres. The mean depth of the lakes is 7.9 feet, and the combined volume of the lakes is 1,686 acre-feet (HDR, 1997).

## 1.1 History of Lakes Hood and Spenard

Lakes Hood and Spenard were originally two separate bog lakes. By 1940, the land between the lakes was excavated to form a channel. Floatplane moorings were added during the 1950s. A second channel was dredged in 1975, creating an island between the two channels, named Gull Island. Five smaller channels with additional moorings were also constructed, expanding the western edge of the water body.

## 1.2 Multiple Uses and Functions of Lakes Hood and Spenard

The primary use of the lakes is as a floatplane base for private and commercial aviation. Three runways are situated on the lakes to accommodate floatplane landing and takeoff operations. The first runs north-south on Lake Hood, the second runs east-west via the south connecting channel and into both lakes, and the third runs northwest-southeast on Lake Hood. The entire shoreline of Lake Hood and the east and south shoreline of Lake Spenard are leased to floatplane operators for mooring or parking aircraft, with approximately 500 floatplane slips. The average annual number of flight operations on the lakes between 1999 and 2003 was 46,866 (the Airport Planning, 2004). Operations occur year-round, except during freeze or thaw periods, when the ice conditions will not support aircraft.

Additional land use near the water body includes recreation, single-family homes, multi-family residential units, motels, office buildings, commercial air tour companies, aircraft support facilities, roadways, and taxiways.

## 1.3 Aquatic Vegetation

The general categories of aquatic plants that inhabit freshwater are characterized as follows:

- **Emergent** macrophytes are plants that are rooted in the sediment and have stems submersed in water and plant tops extending into the air. Most emergent macrophytes

are perennials, meaning that the plant or part of the plant lives for more than one year. Emergent plants develop strong roots to withstand the wind and waves in the shallow water zone. Species can spread via seeds, expanding root systems, or expanding rhizome (underground stem) systems. Common emergent macrophytes include plants such as reeds (*Phragmites* spp.), bulrushes (*Scirpus* spp.), and cattails (*Typha* spp.). Emergent macrophytes generally reside in the upper littoral zone, part of the shoreline that lies between the highest and lowest seasonal water levels. This zone generally extends from the water's edge to a depth of three feet.

- **Free-floating** macrophytes are plants that are not rooted in the sediment. These plants float on or just under the water surface with their roots dangling in the water. The plants rely on the nutrient supply in the water and can be controlled by decreasing the nutrient loading on the lakes. Plants in this group include duckweed (*Lemna* spp.), mosquito fern (*Azolla caroliniana*), water fern (*Salvinia* spp.), water hyacinth (*Eichhornia crassipes*), and frog's bit (*Limnobium spongia*). Waves and wind move free-floating plants about the water body. Often the plants accumulate in quiescent areas. The presence of free-floating macrophytes in Lakes Hood and Spenard has not been confirmed.
- **Floating-leaved** macrophytes are plants that are rooted in the sediment and have leaves that float on the surface of the water. Floating-leaved plants spread via rhizomes. The floating leaves have a thick, waxy coating on top of the leaf, which can make the plant resilient to herbicides. These plants generally reside in the middle littoral zone, the part of the shoreline generally between three to nine feet deep, and generally in areas protected from wind and wave action. They can exist with leaves submersed for a considerable time. Common species that inhabit this area in Lakes Hood and Spenard include water lilies (*Nymphaea* spp.), spatterdock (*Nuphar lutea* ssp.), water shield (*Brasenia* spp.), and yellow pond lily (*Nuphar* spp.).
- **Submersed** macrophytes grow completely under the water, rooted in the sediment, with the tops of the plant below or at the water surface. A wide range of species comprises this group of macrophytes. Some of the submerged macrophytes at the Airport provide erosion control benefits, and others, such as water milfoil, are a significant nuisance to lake users. Submersed plants are able to absorb nutrients from both the sediment and water, but generally absorb them from the sediments (Hoyer and Canfield, 1997). Species in this group are made up of approximately 95 percent water and put little energy into developing a strong root system. These plants generally spread by breaking off, predominantly after flowering. The drifting plant stems are able to root into the sediment and create a new plant. Submersed macrophytes reside in all depths within the photic zone (Wetzel, 1983), the area in which at least 1 percent of surface light intensity penetrates, allowing for photosynthesis to occur. The photic zone marks the lower limit of the lower littoral zone. Submersed plants can grow down to two to three times the Secchi depth if there is sediment present to support plant life (Hoyer and Canfield, 1997).

The above categories may occupy different regions of the lake. Emergent and floating-leaved plants tend to be confined to the shoreline. Submersed plants can extend deeper and farther out in areas of open water, as long as there is sufficient light. Free-floating plants can potentially be anywhere on the lake, but wave action and wind can drive them to the shore.

LEGEND:

- AIRPORT BOUNDARY
- - - WATERSHED BOUNDARY
- A-E WATERSHED DRAINAGE BASINS
- - - EXISTING STORM DRAIN
- - - EXISTING DRAINAGE DITCHES
- STORM WATER OUTFALLS
- TENANT LOCATION

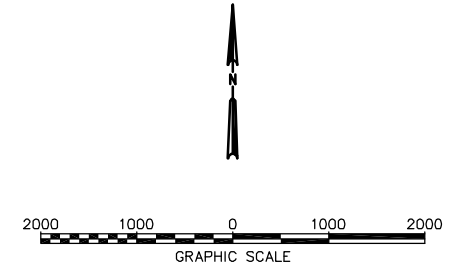
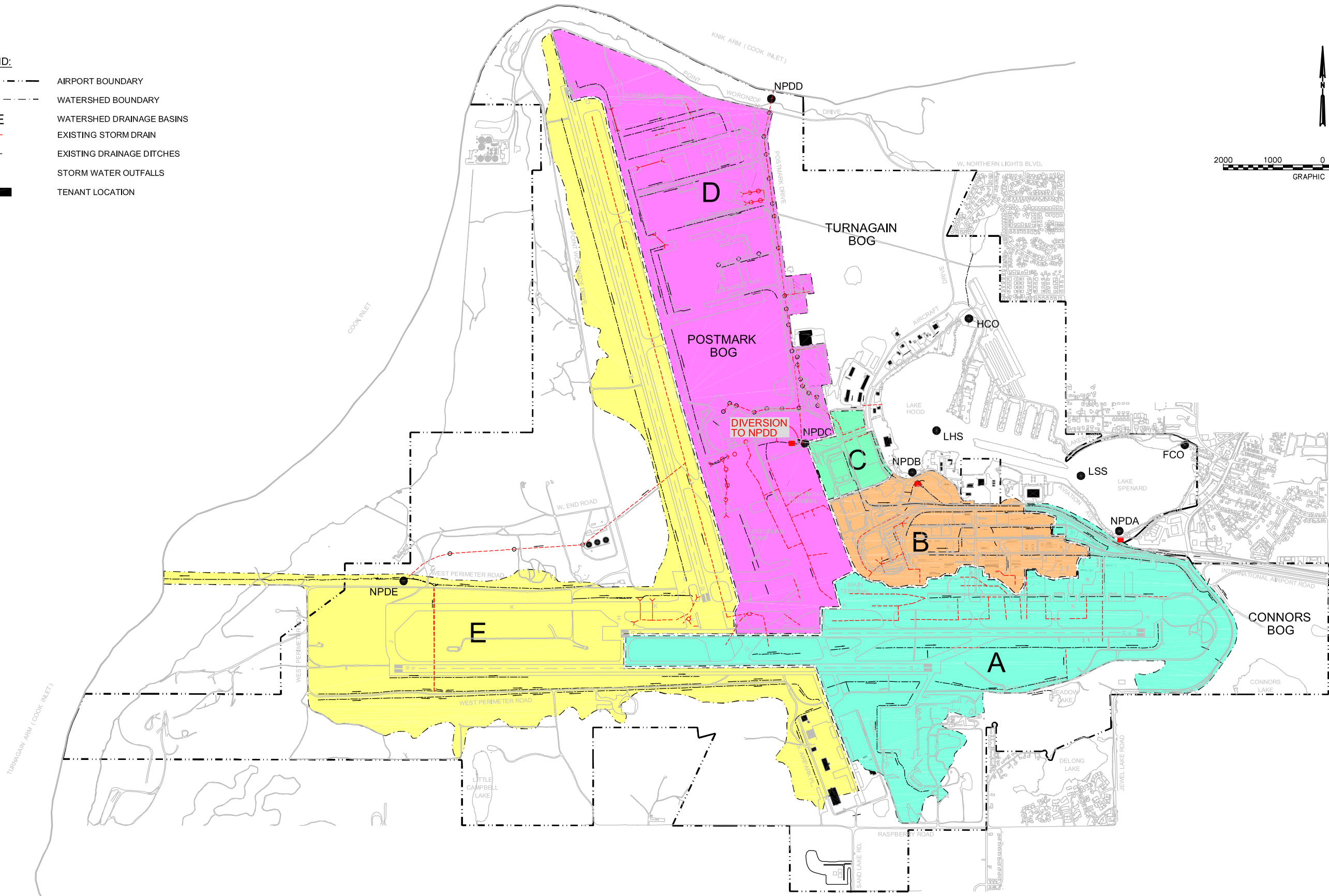


FIGURE 1-1  
TED STEVENS  
ANCHORAGE INTERNATIONAL AIRPORT

Aquatic vegetation surveys were conducted in Lakes Hood and Spenard during the summer of 2004. A wide range of plant species are found in the lakes, including the following representative species:

- *Myriophyllum sibiricum* (northern milfoil)
- *Scirpus subterminalis* (water bulrush)
- *Nuphar polysepala* (spatterdock)
- *Potamogeton pectinatus* (Sago pondweed)
- *Eleocharis parvula* (small spikerush)
- *Eleocharis acicularis* (needle spikerush)
- *Najas flexilis* (bushy pondweed)
- *Potamogeton zosteriformis* (flat-stemmed pondweed)
- *Myriophyllum Farwellii* (Farwell's milfoil)
- *Najas flexilis* (bushy pondweed)
- *Zannichellia palustris* (horned pondweed)
- *Potamogeton Richardsonii* (clasping leaf pondweed)

Spikerush, bulrush, pondweed, and milfoil were the most common plants observed. Spikerush and bulrush are not considered to be a nuisance; and therefore will not be targeted for control due to their ability to stabilize the shoreline, inhibit erosion, and uptake nutrients while they do not pose a safety hazard to floatplane operations. Pondweed and milfoil tend to be more of a problem for floatplanes, and are the primary focus for removal and control.

It was estimated in July 2004 that approximately 15 percent of the lake bottom was covered with vegetation (Serrano, 2004). The littoral zone (i.e., where sunlight penetrates to the sediment) is defined as three times the Secchi depth, or the area extending from the shoreline out to 5 feet deep. This depth represents approximately 15 percent of the bottom of the Lakes. However, Secchi readings at Lakes Hood and Spenard have been as deep as 10 feet in the late summer, indicating that the littoral zone extends well beyond 5 feet. Two littoral depths, 5- and 10-feet deep, were considered in evaluating treatment schemes and represent approximate lower and upper limits, respectively, of treatment area requirements.

## 1.4 Water Quality

Water quality in Lakes Hood and Spenard has changed substantially over the past few decades. The lakes have been used as a floatplane base and receiving water for the Airport stormwater for many years. Prior to 1998, water quality had decreased over time due to pollutant loading from floatplane operations and aircraft and pavement deicing runoff from the Airport entering the lake each year. Lakes Hood and Spenard are 303(d) listed, as per the

federal Clean Water Act, for dissolved oxygen (DO). The cause for DO impairment is primarily oxygen-demanding deicing chemicals flushing into the lakes (CH2M HILL, 2004). Stormwater runoff from the Airport is also high in ammonia from the urea used for pavement deicing. This ammonia load has implications to both nutrient and ammonia toxicity.

Since 1998, considerable progress has been made in diverting stormwater and improving deicing techniques. As the Airport continues to implement methods that reduce the ammonia nitrogen loading on the lakes, the presence of algae has decreased and water clarity has increased. Nitrogen concentrations are still high enough in the water column that Nitrogen:Phosphorus (N:P) ratios are indicative of phosphorus limitation, so the exact mechanism behind these changes is unclear. It is suspected that an imbalance in the food web has occurred, resulting in dramatic reductions in phytoplankton populations, and allowing aquatic vegetation to flourish with the increased water clarity. This subject is being actively investigated by the Airport.

#### **1.4.1 Recovery of Water Quality in Lakes Hood and Spenard and Resulting Implications**

As the Airport continues to reduce pollutant loadings entering the lakes, water quality will continue to improve. Figure 1-2 shows that as the seasonal urea usage decreased, the lake clarity, measured by Secchi depth, has increased. As water clarity increases, sediment that previously was light-limited can sustain plant growth, which leads to the increase in the extent of aquatic plants in the lakes. Another factor contributing to increased abundance of rooted macrophytes is the increased oxidation of the sediment. As oxidation increases, the sediment becomes more habitable for rooted aquatic vegetation to thrive.

Excessive vegetation growth can negatively impact the water quality of the lakes. For example, if decaying vegetation is abundant, DO concentrations can be depressed. Also, death and decay of vegetation adds organic matter to the sediment, increasing sediment oxygen demand and, over the long term, decreasing water depth and increasing the extent of the littoral zone. In addition, dense growths of floating or matted vegetation inhibit oxygen exchange with the atmosphere, decreasing oxygenation of the water (Hoyer and Canfield, 1997).

A positive impact of increased shoreline vegetation is the added erosion protection that it provides. In recent history, the Airport had been considering expensive measures to stabilize the shoreline against erosion in the slips. The root systems of the vegetation on and near the shoreline act as an anchor, holding the soil in place and reducing erosion.

To estimate aquatic vegetation growth rate in the lakes during the 2005 sampling season, samplers are noting the density and location of aquatic vegetation in the vicinity of outfalls NPDA, NPDB, and NPDC and at in-lake sampling locations. Aerial photography, ultrasound imaging, and infrared photography are alternative methods that may be considered in the future to help determine the extent of aquatic vegetation growth throughout the lakes.

### Historical Secchi vs ADF Seasonal Usage

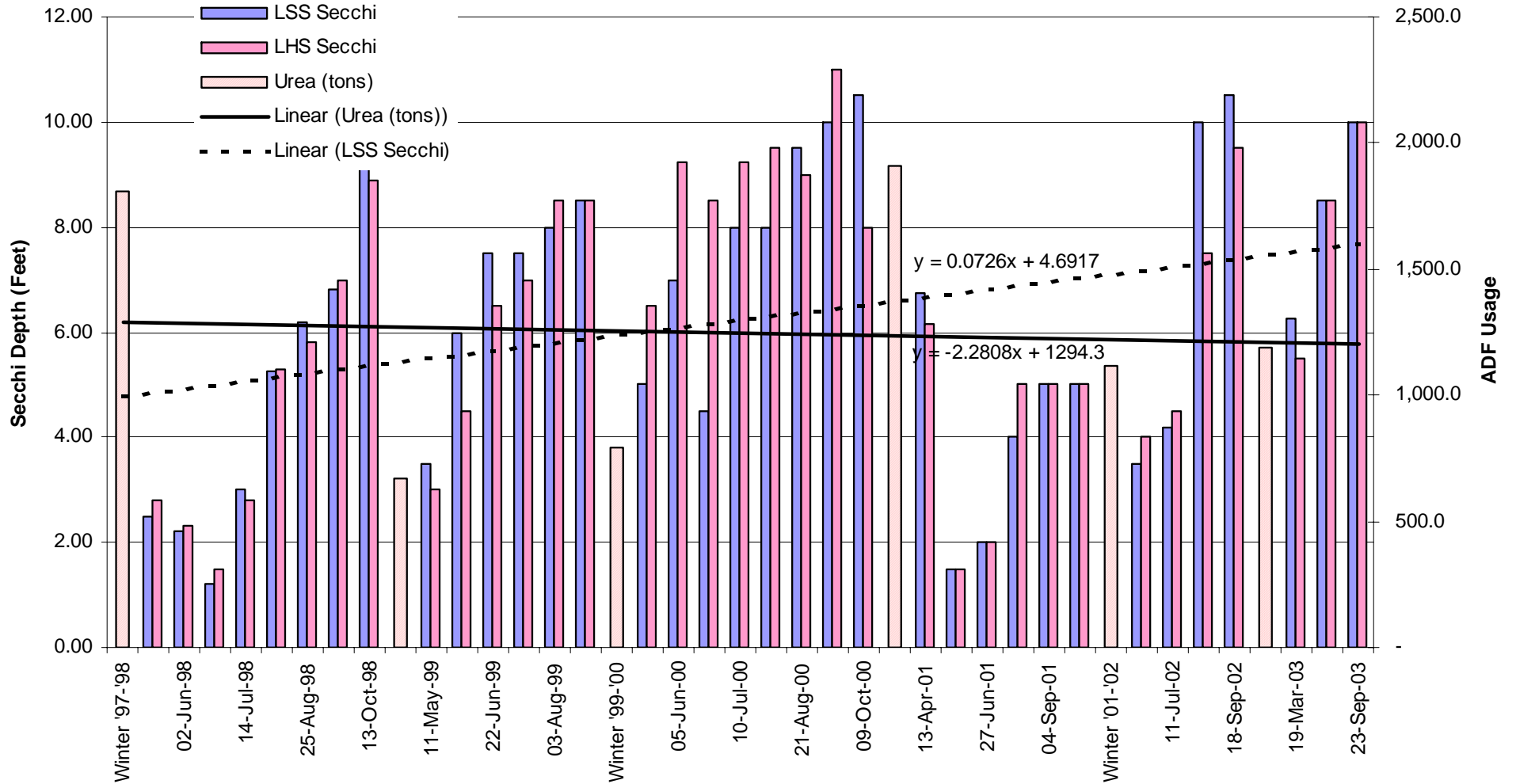


FIGURE 1-2. HISTORICAL SECCHI VERSUS AIRCRAFT DEICING FLUID USAGE 1997-2003.



## SECTION 2

# Problem Statement

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Excessive aquatic vegetation could potentially cause a number of serious problems for users and managers of Lakes Hood and Spenard. The primary concern is maintaining safe float plane operations by minimizing the risks posed by aquatic vegetation.

To address these problems, the Airport is seeking an integrated strategy for reducing the densities and extent of aquatic vegetation. The strategy must be scientifically sound, effective in addressing the specific issues in the lakes, permissible by regulatory authorities, and cost-effective.



## SECTION 3

# Aquatic Plant Management Strategy

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Efforts continue to be made to reduce nutrient loading to the lakes. Aquatic vegetation is likely to become more of an issue as the lakes become clearer and light is able to penetrate deeper.

The Airport intends to proactively manage aquatic vegetation to maintain aircraft safety in Lakes Hood and Spenard. The overarching goal is to provide slip owners, visiting pilots, and passengers who fly in and out of Lakes Hood and Spenard with a safe flying and maneuvering environment. The Airport aims to protect the natural environment and water quality of the lakes while providing safe passage when taxing, taking off, and landing.

The strategies that the Airport employs to ensure that goals are met include:

- Using the best science and information available to research options for vegetation control in Lakes Hood and Spenard
- Selecting the most cost effective and overall best option or combination of options for success with aquatic vegetation control as a part of the Airport's Integrated Vegetation Control Plan (Plan)
- Implementing the Plan for five years, with monitoring to evaluate effectiveness
- Involving the community in the Plan as it is implemented
- Reviewing and reporting on effectiveness, drawbacks, and cost of chosen actions annually and at end of five year period
- Adjusting the Plan and management strategy, as needed, to achieve overall goals



# Physical Aquatic Plant Control Techniques

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## 4.1 Introduction

A variety of physical or mechanical methods for controlling the extent and density of aquatic vegetation are available. The methods include removal by hand, bottom barriers, mechanical harvesting, water level draw-down, rotovation, and dredging, as described below.

## 4.2 Hand Pulling or Cutting

### 4.2.1 Description of Technique

Removal by hand can be accomplished using the following methods:

- **Hand pulling** the vegetation by the roots – The entire plant, including leaves, stem, and root crown, is removed and disposed of away from the water body. Equipment that may be required in shallow water (less than three feet deep) includes a trowel, shovel, and long knife if the sediment is compacted or heavy. A boat may be required if the sediment is loose and flocculent. In deeper waters, divers may need to be equipped with scuba gear and a mesh bag to carry away the removed vegetation.
- **Cutting** the vegetation – An alternative to hand pulling is cutting the vegetation, leaving the roots in place. This method involves standing along the shoreline or on a dock and using a V-shaped cutting tool attached to a long rope. The cutter is thrown into the water body, and as the cutter is retrieved through the water, a 48-inch swath is made through the vegetation. The cut weeds float to the surface and can be retrieved by a net if the wind is favorably blowing the weeds to shore, otherwise they have to be manually pulled from the water. The vegetation is disposed of away from the shoreline.
- **Raking** the vegetation from the surface of the water body – The surface of the water is raked from the shoreline or dock to remove any detached, floating vegetation. By removing only detached vegetation, no plants are pulled out by the roots and the sediment is not disturbed. Rakes can be equipped with floats to facilitate use. Plants are raked to shore for disposal away from the water body.

In under-ice conditions, the dry dead stems often supply oxygen for root respiration. By cutting off stems below the water surface before the lake freezes, the oxygen supplied to the plant is limited and can sometimes kill rhizomes.

The method used determines whether or not permitting will be required. Methods that do not significantly stir bottom sediment into the water column will not require permitting. Pulling the vegetation out by the roots in a fashion that substantially disturbs bottom

sediment using any type of machine would have permitting ramifications from the U.S. Army Corps of Engineers (USACE) (Baij, 2005).

## 4.2.2 Advantages and Disadvantages

The advantages of all three methods of hand removal are that they require little capital investment, they are easy to use around docks, and they allow for selective removal of aquatic vegetation should that be desired. This method also removes the entire plant, minimizing the chance for re-growth. Raking and cutting do not disturb the bottom sediment, thereby eliminating the need for permitting.

The disadvantages are that removal of aquatic vegetation by hand is labor-intensive, and aquatic vegetation may re-grow or colonize from plant fragments, requiring treatment to be repeated several times throughout the summer. Containing all plant fragments during the removal process is virtually impossible. Drifting fragments could cause the plants to colonize other areas of the water body. Aquatic vegetation with massive rhizomes, such as the water lily, is extremely difficult to remove by hand pulling. In addition, hand pulling disturbs the bottom sediments, which can entrain sediment in the water column.

## 4.2.3 Cost

The cost associated with aquatic vegetation removal by hand is directly related to the cost of labor. Costs will vary depending on whether contract divers and laborers or volunteers are used. Hiring students on summer break can minimize labor costs. Expenses can range from \$500 to \$2,400 per day for labor. The area covered each day will depend on plant density (Washington State Department of Ecology, 2004).

## 4.2.4 Long-Term Effects and Impacts

No method will entirely remove aquatic vegetation from the lakes. The rate of reduction and the timeframe to achieve a desirable level of aquatic vegetation is dependent upon several factors. These include, but are not necessarily limited to, the level of vegetation currently present, the rate of colonization by drifting plant fragments, nutrient loading, lake transparency, temperature, and severity of the previous winter.

Hand raking and cutting reduces the impact of aquatic vegetation on lake users in critical near-shore areas, and would therefore be most applicable for short-term and small-scale control around docks and in areas of light infestation along the shoreline.

## 4.2.5 Permit Requirements

Although the Lakes are not directly in the Coastal Zone, a Coastal Project Questionnaire will be required by the Alaska Department of Natural Resources (ADNR) because Fish Creek Outlet connects Lakes Hood and Spenard to waterways in the Coastal Zone. A blank Coastal Project Questionnaire form is located in Appendix C.

Hand pulling would not require issuance of an ADEC Water Quality Variation (18 AAC 70.200) or application for a Section 404 permit to the USACE due to the small scale of disturbance (Baij, 2005). The Airport has been issued a letter of non-objection from the ADEC in the past when dredging slips, and it is anticipated the same would be issued for

this type of work. The Airport's most recent letter of non-objection from ADEC for dredging purposes is shown in Appendix D.

### 4.3.3 Bottom Barriers

#### 4.3.1 Description of Technique

Bottom barriers are used to cover the sediment like a blanket, and reduce or block sunlight from vegetative habitat, thereby reducing or eliminating rooted vegetative growth. Bottom barriers are anchored to the bottom of the water body to counter buoyancy caused by gasses. Rotting vegetation can produce gasses and installation early in the growing season can reduce the amount of gas produced. Anchors can be made from rocks, blocks, or sandbags. Barrier material can be made of woven-synthetic, perforated, black Mylar, plastics, or burlap. One commercially available barrier is Texel, a heavy, felt-like polyester material designed to control aquatic vegetation. Burlap is an inexpensive alternative, but has the tendency to rot in a few years.

#### 4.3.2 Advantages and Disadvantages

Bottom barriers do not require high capital expenditure for small areas, but do require routine maintenance. However, they are less labor intensive than hand removal methods once installed. Barriers may not have to cover the same site throughout the entire growing season to be effective. In New York, a lakeshore resident installed a bottom barrier screen for three weeks during the summer, and the weeds were effectively reduced for the entire summer swimming season (Conesus Lake Association, Inc., 2002). Barrier screens may be an effective control method for slip owners to construct and install in their own slips.

One disadvantage to using screens is that they require substantial inspection and maintenance. Maintenance would include confirming that the screens have not been dislodged. A dislodged screen could present a safety problem for floatplanes. Screens should also be routinely checked for sediment buildup. If sediment collects on top of the screen, plants can potentially root in the sediment and grow on top of the screen. Additionally, some plants, such as milfoil, can send out lateral shoots and canopy over the top of the bottom barrier.

#### 4.3.3 Cost

The cost for materials to build a bottom barrier ranges from \$0.22 to \$1.25 per square foot. Commercial installation of bottom barriers can cost up to \$750 for 1,000 square feet. Costs can vary based on the type of bottom screen selected and the sediment characteristics (Washington State Department of Ecology, 2004).

#### 4.3.4 Long-Term Effects and Impacts

Bottom barriers may be effective inside floatplane slips where the depth of sediment is within the photic zone and aquatic vegetation is a nuisance. Barriers can be effective for numerous years if they are maintained and repaired on a regular basis to prevent plants from growing up and over the barrier, or from breaking through the barrier. If barriers are not properly maintained, they can be overtaken by plants within a year or two.

### 4.3.5 Permit Requirements

Bottom barriers would not require a permit from any state or federal agencies because they do not disturb bottom sediment.

## 4.4 Water-Level Drawdown

### 4.4.1 Description of Technique

Water-level drawdown involves lowering the water level to expose aquatic vegetation to freezing or desiccation. Water-level drawdown in reservoirs for power generation, flood control, or irrigation has helped minimize the extent of aquatic vegetation, especially in areas that experience little precipitation. Snow cover and rain help protect plants and thus counter the effectiveness of water-level drawdown. Generally, drawdown is most commonly conducted during the winter months to take advantage of both drying and freezing of plants and minimize impact on recreational water use. Under drawdown conditions in the winter, frost can often "heave" the rhizomes out of the bottom sediment, which results in a thinning of dense stands of aquatic vegetation. Summertime drawdown can potentially aid the spread of emergent plants such as cattails, rushes, and willows.

Water-level drawdown requires an outlet structure or pump station to control the level of water in the water body. The outlet structure is opened to let water flow out until the water surface has reached the desired elevation. A pump station is necessary if the lake outlets are higher than the desired water level.

Water-level drawdown is not considered a viable control method due to the impact on the operation of floatplanes on Lakes Hood and Spenard.

### 4.4.2 Advantages and Disadvantages

This method has been effectively used to control water milfoil in the Lower 48. Drawdown can enhance the expansion of native aquatic plants in areas formerly occupied by exotic species. Drawdown provides an opportunity to repair and improve docks and other structures, and can allow loose, flocculent sediments to consolidate. Water-level drawdown also has the added effects of oxidizing and consolidating flocculent sediments, potentially altering fish populations, and impacting resident sediment animal species. Finally, water-level drawdown can be accomplished at minimal cost if a control structure is already in place.

The disadvantages to drawdown include the significant impact on floatplane operations caused by the change in water elevation. Float slip docks may be left high and dry. The capital cost to construct an outfall structure and the operation and maintenance costs for an associated pump station are very high. Seasonal conditions may reduce the effectiveness of drawdown. Snowfall before a hard freeze may act as an insulator, preventing frost kill of the roots of target species. Mild and wet Alaskan summers may prevent heating and desiccating of exposed plant roots and rhizomes. People may object to the reduced aesthetics and possible odor from rotting plants.



### 4.4.3 Cost

If a water-level structure is in place, costs may be minimal. Cost to construct an outfall structure can range from \$50,000 to several million dollars.

### 4.4.4 Long-Term Effects and Impacts

Water-level drawdown effects would most likely be short term, with plants re-propagating as soon as the water level is raised. The effect would only last as long as the water level was lowered.

### 4.4.5 Permit Requirements

Water level draw-down is not anticipated to result in any permitting requirements.

## 4.5 Mechanical Harvesting

### 4.5.1 Description of Technique

Mechanical harvesting controls aquatic vegetation by cutting and removing the plants. The harvester travels along the surface of the water and cuts the plants in the targeted area. Depending on the harvester model, plants are cut in a swath between 6 and 15 feet wide. The plants are cut to a depth of 4 to 10 feet below the water surface. Transport vessels can be used to move the cut material to a disposal site. Alternatively, the harvester can store the vegetation until it is disposed of. Most harvester manufacturers provide shore conveyor or trailer conveyor systems that allow the cut vegetation to be unloaded and transported to an upland disposal site.

One study showed that Eurasian milfoil grew back at a slightly higher rate in harvested areas than in reference areas that were left unharvested (Crowell, et al., 1994). By six weeks after harvesting, the biomass and canopy density in the harvested areas achieved that of the reference areas. The biomass and canopy density did not increase significantly beyond that achieved by week six and at no time exceeded that of the reference areas.

### 4.5.2 Advantages and Disadvantages

Mechanical harvesting has several advantages. This method provides aquatic vegetation control immediately in small areas. Mechanical harvesting minimizes objectionable dead and dying vegetation that may be associated with other methods.

Disadvantages that may limit the use of mechanical harvesting include higher cost and more maintenance and repair costs than those of other methods. Other methods may also achieve quicker control for large areas. Water depth and obstructions may limit the areas that a mechanical harvester can reach, and harvesting in close proximity to moored aircraft must be conducted very carefully. Disturbance of bottom sediment during harvesting can cause temporary increases in turbidity. Harvested vegetation must be disposed of in a suitable area. Harvesting can also disrupt aquatic wildlife and desirable vegetation.

### 4.5.3 Cost

Harvesters range in price between \$60,000 and \$130,000. Services can also be contracted out. A local private contractor charges \$2,200 per day for an EH-220 harvester, including vegetation removal.

### 4.5.4 Long-Term Effects and Impacts

Depending on the rate of growth of the aquatic vegetation, mechanical harvesting has to be repeated at least annually. Mechanical harvesting may not be practical in close proximity to floatplanes on Lakes Hood and Spenard.

### 4.5.5 Permit Requirements

Harvesting will require that the Airport submit a Fish Habitat Permit Application to the Alaska Department of Natural Resources Office of Habitat Management and Permitting. A copy of the Fish Habitat Permit Application is located in Appendix C.

## 4.6 Rotovation

### 4.6.1 Description of Technique

Rotovation involves underwater rototilling using a barge-mounted rototiller or amphibious tractor towing a cultivator. Bottom sediments are tilled to a depth of up to 12 inches, uprooting plants and root crowns. To reduce plant re-growth potential, bottom tillage is best performed during spring. This technique is generally used for milfoil control.

### 4.6.2 Advantages and Disadvantages

The first advantage of using rotovation for vegetation removal is that a high percentage of plants, including their root systems, can be removed during tillage. Tilling stimulates the growth of native plants by removing the canopy formed by nuisance species, which is often beneficial to fish populations.

The main disadvantages of rotovation include permitting difficulties and its limited use around bottom obstructions. If excessive nutrients and/or metals are present in the sediment, potential exists for their release into the water column. The release of nutrients could promote the growth of algae and reduce the DO in the water. Rototilling does not collect plants and produces plant fragments. The drifting fragments can colonize in other parts of the lake. Disturbance of the sediments causes short-term turbidity increases in the area of operation. Disturbance to the benthic invertebrate community can occur in the area of operation. Rotovation is not species selective and will effect both native and nuisance species.

### 4.6.3 Cost

Factors influencing costs include treatment scale, density of plants, machinery used, and other site constraints. In Washington State, the cost to contract out rotovation ranges from \$1,200 to \$1,700 per acre (Washington State Department of Ecology, 2004).

#### 4.6.4 Long-Term Effects and Impacts

Control offered by rotoation may last up to two or three years, depending on plant density.

#### 4.6.5 Permit Requirements

The use of rotoation for bottom tillage would normally require an ADEC issued Short-Term Water Quality Variance (18 AAC 70.200). However, the Airport has a letter of non-objection for dredging operations in Lakes Hood and Spenard from ADEC (Appendix D); therefore no application would be necessary. The Airport would have to apply for a Section 404 permit from the USACE due to the mechanical nature of rotoation and potential for sediment disturbance (Baij, 2005). Obtaining letters of approval from the ADNR and the ADFG would also be required.

Although Lakes Hood and Spenard are not located directly in the Coastal Zone, a Coastal Project Questionnaire would be required by the ADNR because Fish Creek Outlet connects the Lakes to waterways in the Coastal Zone. A blank Coastal Project Questionnaire form is located in Appendix C.

### 4.7 Diver Dredging

#### 4.7.1 Description of Technique

Diver dredging, also called suction dredging, involves scuba divers using hoses attached to small dredges to suck plant material from the sediment. The goal is to remove all parts of the target plant including the roots, leaving native species untouched. The suction hose pumps and deposits the plant material and the sediments into a screened basket at the surface. Some permits allow the water and sediment to be returned back to the water column. The turbid water is generally discharged to an area isolated from the rest of the lake by a silt curtain. The plants are disposed of on shore. Removal rates vary depending on plant density, sediment type, and diver efficiency, and can range from 0.25 acres per day to 1 acre per day.

The type of sediment can impact the effectiveness of diver dredging. Softer sediment allows for easy removal of entire plants although water turbidity is increased. Harder sediment may require the use of a tool such as a knife to help loosen sediment from around the roots. Very hard sediments defeat the purpose of diver dredging because plants are broken off at the roots. Diver dredging is also less effective where seeds or tubers remain in the sediments to sprout the next growing season.

#### 4.7.2 Advantages and Disadvantages

Diver dredging is advantageous in that it can be used to selectively remove target plant species. Divers can remove plants around obstacles such as docks and in other difficult to reach areas. Diver dredging can be used in situations where other control methods, such as herbicide use, are not an option for aquatic plant management.

The disadvantages to diver dredging include stirring up the sediment, which can release nutrients or other materials such as metals into the water column if present. In harder

sediments, the tops of plants may be removed, leaving a viable root crown behind to initiate growth.

### **4.7.3 Cost**

Factors influencing cost include density of the plants, specific equipment used, and disposal requirements. Costs can range from a minimum of \$1,500 to \$2,000 per day (Washington State Department of Ecology, 2004).

### **4.7.4 Long-Term Effects and Impacts**

Diver dredging is expensive, but may be an appropriate means for effectively reducing the number of plants for a year or two at a time.

### **4.7.5 Permit Requirements**

Diver dredging would normally require an ADEC issued Short-Term Water Quality Variance (18 AAC 70.200). However, the Airport has a letter of non-objection for dredging operations in Lakes Hood and Spenard from ADEC (Appendix D); therefore no application would be necessary. The Airport would have to apply for a Section 404 permit from the USACE due to the potential for sediment disturbance (Baij, 2005). Obtaining letters of approval from the ADNR and the ADFG would also be required.

Although Lakes Hood and Spenard are not located directly in the Coastal Zone, a Coastal Project Questionnaire would be required by the ADNR because Fish Creek Outlet connects the Lakes to waterways in the Coastal Zone. A blank Coastal Project Questionnaire form is located in Appendix C.

# Biological Aquatic Plant Control Techniques

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## 5.1 Introduction

Biological control involves the purposeful release of an organism to limit growth of other nuisance or undesirable species. Approaches include direct predation by fish or insects, and weed reduction through the use of pathogens or disease. Before using a biological control, one must understand the agent's feeding preferences, its effectiveness, how it is regulated, and what it will take to maintain the agent (Cofrancesco, 2000). Release of a biological control can be done through one of the following approaches:

- Inundating – Releasing large numbers of the control agent sufficient to control the plant
- Augmenting – Adding to an already existing population of agents
- Conserving – Reducing limiting factors of the agent so that the existing agent population increases naturally (Cofrancesco, 2000)

Biological controls have been used around the country to manage problem species of plants. Research is limited, however, and introduction of non-native biological agents is controversial.

## 5.2 Triploid Grass Carp

### 5.2.1 Description of Technique

Sterile, or triploid, grass carp have been used to control submerged plant populations in the United States. Grass carp is a non-native species of fish originating in Asia. In the United States, grass carp are engineered with one extra chromosome and so cannot reproduce. They have food preferences, but do not target a specific plant. In some cases, they have eliminated all submerged vegetation in the water body. Their life span is approximately 10 years.

### 5.2.2 Advantages and Disadvantages

Initial cost is inexpensive when compared to other methods. Once stocked, the carp do not need to be further controlled or stocked for approximately 10 years. When and if all plant material is removed from the lake, grass carp consume organic material from the sediments.

Carp may show a preference for other plants besides the target species or may prey on other species once the problem species has been eliminated. Carp should only be used in areas where complete elimination of all the submerged plant life is acceptable. Lake outlets must be gated to prevent carp from escaping into downstream waters. Grass carp do not feed from the bottom and so do not directly stir up nutrients from the sediment, but complete elimination of aquatic plant life will increase water turbidity. Fish waste by-products may also increase the internal nutrient load on the lake and result in algal blooms. Once the lake has been stocked, it is difficult to recapture the carp if necessary. Grass carp may prey on

other, more preferred species before eating milfoil. They may also feed on emergent plants, water lilies, or filamentous algae, but are not considered an effective control for those species unless all other vegetation has been eliminated. Carp may be adversely affected by stress, water chemistry changes, and temperature, resulting in a low control rate (Hanlon et al., 2000).

The Alaska Department of Fish and Game is not supportive of stocking Alaska lakes with any non-native species (Pierkowski, 2005).

### 5.2.3 Cost

Stocking Lakes Hood and Spenard with triploid carp for aquatic vegetation management would cost an estimated \$30,000 if the vegetation covered the bottom to a depth of 10 feet deep (\$12 per fish and a stocking rate of 10 fish per vegetated acre, plus the cost of shipping).

Fish screens for the lake outlets would cost an estimated \$20,000 each (Washington State Department of Ecology, 2004).

### 5.2.4 Long-Term Effects and Impacts

Aquatic weed control may take two to five years. Triploid grass carp may not control any of the target species, or could effectively wipe out all of the submerged vegetation in the lake. After the carp die off in about 10 years, vegetation would most likely grow back.

### 5.2.5 Permit Requirements

Stocking Alaska lakes is regulated by Alaska Statute 16.05.251(a)(9), which states "The Board of Fisheries may adopt regulations it considers advisable in accordance with AS 44.62 (Administrative Procedure Act) for prohibiting and regulating the live capture, possession, transport, or release of native or exotic fish or their eggs." Conversations with ADFG biologists suggested that permitting triploid carp in Alaska would be "a most challenging endeavor" (Pierkowski, 2005). The Airport would need to get special approval from ADFG, and would also need to petition to the Alaska Board of Fish, which is a governor appointed regulatory body.

AAC 41.005 regulates fish transport, which states that "No person may transport, possess, export from the state, or release into the waters of the state, any live fish unless the person holds a fish transport permit issued by the commissioner or his authorized designee, and the person is in compliance with all conditions of the permit and the provisions of this chapter." The maximum permit length is five years, to be determined by the ADFG.

No permits for stocking with triploid grass carp have been issued to date in Alaska.

## 5.3 Insects

Weevils that prey on northern milfoil often occur naturally where northern milfoil grows in the United States. Weevils have recently been investigated in Washington State as a control for Eurasian milfoil, a related nuisance and exotic species.

### 5.3.1 Description of Technique

The milfoil weevil feeds on the upper leaves and reproduces on the milfoil plant by burrowing into the stems. Further damage to the plant may be caused by collapsing the stems, forcing the upper canopy of the plant out of the well-lit water. It is beneficial to stock weevils as early in the season as possible to increase the number of generations. A general guideline is to stock 3,000 insects per acre for effective control within 2 seasons (Madsen et al., 2000). The whole life cycle of the milfoil weevil is based on the growth of the plant, and it is not believed that this control would affect other species.

### 5.3.2 Advantages and Disadvantages

Milfoil weevils may already exist in this environment and may just need to be augmented. Once released, the weevil may be difficult to control or re-collect, if necessary. Research on insect use and effectiveness is limited. Over-wintering survival may limit populations in Alaska. Northern milfoil has thicker stems than the Eurasian milfoil and thus may not sustain as much damage as has been shown in research on the Eurasian milfoil.

### 5.3.3 Cost

Weevil and other insect costs can be quite high because of the time needed to locate and cultivate these organisms. Insects can sell for as much as \$1.00 each (Washington Department of Ecology, 2004). Air freighted weevils could cost up to \$624,000 (at an average of 3,000 weevils per acre for the 208 acre lakes).

### 5.3.4 Long-term Effects and Impacts

Long-term impacts are based on how effectively the control of the insects can be managed.

### 5.3.5 Permit Requirements

In other states, weevil stocking is regulated by Agricultural departments. There is not a permit available for weevil stocking in Alaska at this time. Additionally, no permits for stocking lakes with weevils have been issued to date. ADFG biologists indicated that extensive research would be required before considering their use in this state (Pierkowski, 2005).





# Chemical Aquatic Plant Control Techniques

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## 6.1 Introduction

Unwanted aquatic vegetation is widely controlled using herbicidal chemical treatment. Herbicides are any chemicals that kill plant tissue or adversely affect their growth processes. Herbicides can be used to effectively manage plant growth; however, potential unwanted side effects must be considered.

Eight herbicides are currently registered for use in aquatic systems. Herbicides most commonly used at aquatic sites in the United States include 2,4-D, diquat, endothall, fluridone, and glyphosate (Hoyer and Canfield, 1997). Trichlopyr has been recently approved for use in lakes. Commonly used herbicides are described in detail in Table 6-1 to help evaluate their potential effectiveness at Lakes Hood and Spenard. See Appendix A for herbicide labels.

There are four categories of herbicides, based on the mechanism of retarding or eliminating aquatic plant growth:

- **Contact** herbicides are fast-acting and kill plants by direct contact. These herbicides are most effective for annual plant species and less so for perennials. The root systems of perennials are able to survive and re-grow the year after treatment with contact herbicides. One shortcoming of contact herbicides is that they may not be completely effective on the first application and may have to be reapplied multiple times throughout the growing season for adequate treatment.
- **Systemic** herbicides are absorbed into the body of the plant by either the root systems or the leaves. Systemic herbicides tend to act slowly and are effective for use with perennial and woody plants.
- **Broad-spectrum** herbicides, also known as nonselective herbicides, control all vegetation where the chemical is applied.
- **Selective** herbicides are used to kill specific plants but leave others unharmed. Selectivity is based on comparative susceptibility and varying responses to the chemicals of different plants. The effectiveness of selective herbicides depends on physical factors such as placement and application rate and biological factors such as plant physiology, morphology, and stage in growth cycle.

Selecting the most appropriate chemical requires an understanding of how the various herbicides inhibit or kill vegetation, as well as the target plants that the Airport would like to remove or preserve in the Lakes. The most problematic plants include milfoil and pondweed, because they can directly impact floatplane rudder movement. On the other hand, the Airport would like to keep the bulrush and spike weed which provide protection against shoreline erosion and sediment disruption, and do not impact floatplane operations. Table 6-1 presents information on whether or not the various aquatic herbicides harm these

plant species, providing a basis for narrowing down the appropriate herbicides for the Airport.

Additionally, the potential undesirable ramifications of herbicide use must be considered before making the decision to use chemicals in an aquatic system. Herbicide applications for controlling aquatic vegetation can result in direct effects on other organisms and on overall water chemistry. For example, controlling aquatic vegetation with herbicides can cause a release of nitrogen and phosphorus into the water column from the decaying plant material, which can contribute to algae and plant growth in the future (Hoyer and Canfield, 1997). Decaying plant material also consumes oxygen, and could contribute to depressed dissolved oxygen conditions.

Herbicides should not be toxic to birds, fish, and other aquatic organisms when they are used appropriately and according to specifications on the label. However, environmental conditions are highly variable and fish kills have occurred from herbicide applications (Hoyer and Canfield, 1997). Herbicides have short half-lives in water and are generally are not known to accumulate in plant and animal tissues. Herbicide residuals in water are removed by volatilization, absorption by plants and animals, and dissipation by microbial degradation, metabolism, or phytolysis (Table 6-1).

Seasonal timing of herbicide application can increase effectiveness and selectivity. Knowledge of the target plant's growth cycle will help target the appropriate species while leaving desirable species unharmed. Appropriate application timing can also reduce the required application rate. Specific plants controlled by each type of aquatic herbicide are listed in herbicide labels that are located in Appendix A.

TABLE 6-1

Summary of Common Aquatic Herbicide Characteristics, Half-Life, Species Effectiveness, and Approximate Cost

Herbicide	Description	Nuisance Species		Beneficial Species		Approximate Cost per acre <sup>a</sup>
		Pondweed	Milfoil	Spikerush	Bulrush	
2,4-D	Selective herbicide that works well for submersed, emersed, and floating plants. Effective for whole-lake or spot treatments. Half life: 10-50 days.	X	X			\$500
Diquat	Contact, nonselective herbicide used for submersed, floating, and filamentous algae. Diquat binds to sediment and is very persistent, but its half life in water column is 1-7 days.	X	X	X	X	\$300
Endothall	Water soluble, contact herbicide used mainly for submersed weeds. Does not adsorb to sediment or bioconcentrate. Half life: 4-7 days.	X	X			\$500 to \$800
Fluridone	Selective herbicide used mainly for broad-leaved submersed vegetation. Works well for entire-lake treatments, and should not be used in areas <10 acres. Half life: 20-90 days	X	X			\$100 to 700
Glyphosate	Broad spectrum herbicide that is used to control emersed vegetation.			X		\$250
Triclopyr	Selective, low toxicity herbicide that is most effective for spot treatment of emersed, submersed, and floating vegetation		X			\$600

<sup>a</sup> Western Aquatic Plant Management Society, 2004, <http://www.wapms.org>

## 6.2 2, 4-D

### 6.2.1 Description of Technique

2, 4-D is available in two different forms for aquatic use: a granular form that is known by trade names, AquaKleen® and Navigate®; and as a liquid marketed as DMA\*4IVM. Both forms of 2, 4-D herbicide are systemic and selective, and both are often used to control Eurasian milfoil and broad-leaved species of aquatic plants. 2, 4-D is slow acting and can be used as a growth regulator when applied in low concentrations.

2, 4-D can be sprayed over the water surface, or granules may be applied with a dry fertilizer spreader or broadcast in the treatment area. Application of 2, 4 -D should be made on a smooth surface so that the granules will settle to the bottom around roots and stems.

This herbicide is useful for treating water lily, spatterdock, watershield, pondweed, milfoil, and bladderwort.

### 6.2.2 Advantages and Disadvantages

The biggest advantage of using 2, 4-D for managing aquatic vegetation is that it is selective, and can be used to control numerous species of submersed and floating plants. 2, 4-D is released gradually, which enhances its systemic action. When 2, 4-D is applied in its granular formulation; the herbicide readily sinks to the bottom and is effective at reaching submerged root systems. 2, 4-D can kill target species while leaving other native species relatively unharmed when used according to its label. This herbicide would be able to achieve the Airport's goal of killing milfoil and pondweed while not harming spikerush and bulrush.

A potential disadvantage of 2, 4-D is that complete plant death occurs very slowly after chemical application, sometimes taking as long as five weeks. This could be an advantage in that the impacts of decaying vegetation are distributed over a longer period of time. This herbicide also has varying degrees of toxicity, depending on the formulation used.

### 6.2.3 Cost

The cost of 2, 4-D is approximately \$165 for 50 lbs. of the solid formulation of Navigate® (Lake Doctors, Inc., 2004). Operations and maintenance costs include the expense of purchasing the herbicide each year, shipping, and professional applicator fees.

### 6.2.4 Long-Term Effects and Impacts

2, 4-D can be slightly toxic to wild animals; however, toxicity is dependent on the formulation used (EXTOXNET, 1994). Varying formulations can have a range of toxicity and bioaccumulative properties. The formulations using 2, 4-D DMA have a much lower potential of bioaccumulation (MDAR, 1997). Microbial biodegradation is the predominant method of degradation of 2, 4-D, however it is also broken down to a lesser extent by hydrolysis and photolysis. Break down occurs more quickly in oxygenated waters; and breakdown rates increase as nutrient levels, sediment loads, and organic carbon loads increase. The half-life for 2, 4-D is estimated to be between 10 and 50 days, depending on water quality (HDSB, 1995).

Navigate® is advertised to control nuisance vegetation for one to two years; however, one herbicide application typically lasts only one growing season. Therefore, it is anticipated that the lakes would need to be treated with Navigate® annually to maintain adequate vegetation control.

### 6.2.5 Permit Requirements

The use of 2, 4-D in Lakes Hood and Spenard would require a permit from the ADEC Division of Environmental Health, Pesticide Program Services.

## 6.3 Diquat

### 6.3.1 Description of Technique

Diquat is more commonly known by its trade names Reward®, Reglox®, Aquacide®, or Weedtrine-D®. This herbicide is a very fast acting and nonselective chemical that destroys the vegetative part of submerged vegetation but does not harm the root systems. Diquat works well for spot treatments of both submerged and floating vegetation, as well as filamentous algae.

Water treatments of diquat are generally applied by injecting it below the surface or by pouring it from the container while moving slowly over the intended area via boat. Floating weeds can be treated by applying the herbicide directly onto the intended foliage.

Diquat is often used to control bladderwort, pondweed, duckweed, cattail, elodea, coontail, naiad, water hyacinth, and Eurasian milfoil.

### 6.3.2 Advantages and Disadvantages

Diquat works well for small, localized areas due to its fast-acting effectiveness. This chemical also works well on filamentous algae.

A potential disadvantage is that it only kills the vegetative part of the plant, and therefore the plants can re-propagate the following year. Additionally, turbidity interferes with the chemical's effectiveness because the chemical binds tightly to sediment. Its ability to bind to sediment means that it may be persistent in the environment. Diquat is not selective and is known to kill both undesirable and desirable species found in Lakes Hood and Spenard. This herbicide may work well for small spot treatment; however caution must be used to ensure that spikerush and bulrush are not impacted.

### 6.3.3 Cost

The estimated cost for a diquat treatment is \$300 per acre treated (Western Aquatic Plant Management, 2004). Reward®, the most common name brand of diquat, costs approximately \$160 per gallon and \$355 for 2.5 gallons (Aerators Aquatics 4 Lakes N Ponds, 2004).

Operations and maintenance costs include the expense of purchasing the herbicide each year, shipping, and professional applicator fees.

### 6.3.4 Long-term Effects and Impacts

Health effects of diquat are not thought to be long lasting. In an 8-week study, herbicide residual was not detected within one week of returning to a normal diet in humans. Diquat is not known to bioaccumulate in fish and other aquatic life and degrades quickly from open water when applied properly. While diquat degrades relatively quickly from water and is known to be completely gone from the water column within 7 to 14 days, it does persist in the sediment for a substantial length of time, over 160 days (MDAR, 1997).

As previously mentioned, the effects of diquat on aquatic vegetation are relatively short term, and the treatment needs to be reapplied on an annual basis for consistent control.

### 6.3.5 Permit Requirements

The use of this pesticide in Lakes Hood and Spenard would require a permit application by the regulatory authority of 18 AAC 90 to the ADEC Division of Environmental Health and Pesticide Program Services. Use of any herbicide would also require that the Airport complete a Coastal Project Questionnaire, which would be submitted to the Coastal Management Program. A copy of ADEC's pesticide permit application and a Coastal Project Questionnaire are located in Appendix C.

## 6.4 Endothall

### 6.4.1 Description of Technique

Endothall, or dipotassium salt (Aquathol-K®, Hydrothol 191®), is a fast-acting, nonselective contact herbicide that kills the vegetative portion of the plants but not the roots. This chemical can be applied in either granular or liquid form and is used primarily for submerged vegetation. Due to its ability to only kill the vegetative portion of plants, it works best for seasonal aquatic plant control in small areas. The active ingredient in endothall is comprised of carbon, hydrogen, and oxygen.

Endothall is often used to control aquatic vegetation such as bur reed, coontail, hydrilla, milfoil, naiad, pondweed, and star grasses. The Hydrothol 191 formulation is the only formulation to control Chara and Eloda.

### 6.4.2 Advantages and Disadvantages

Advantages of endothall include its ability to work quickly and its availability in both liquid and granular forms. This herbicide has low toxicity, and degrades comparatively quickly in the environment. Endothall is also effective for milfoil and pondweed, however when applied in lower doses, will not have a substantial impact on spikerush or bulrush.

A disadvantage of this chemical is its inability to kill plant root systems; therefore, it is effective for only one season. Additionally, there may be water-use restrictions associated with the use of endothall. Endothall herbicides tend to be more expensive than other chemicals, which may reduce their desirability as a treatment option.

### 6.4.3 Cost

Endothall treatment generally costs between \$600 and \$800 per acre for treatment (Western Aquatic Plant Management Society, 2004 and Minnesota Department of Natural Resources [MDNR] 2004). The brand name Aquathol K® costs around \$191 for 2.5 gallons, while another endothall formulation, Hydrothol 191®, costs \$146 for 40 lbs. and \$209 for 2.5 gallons (Aerators Aquatics 4 Lakes N Ponds, 2004).

### 6.4.4 Long-Term Effects and Impacts

There is no evidence that endothall is teratogenic, fetotoxic, mutagenic, or carcinogenic (MDAR, 1997). Endothall does not adsorb to sediment and when used appropriately according to the label, should not harm or bioaccumulate in fish, birds, and other aquatic life.

The effects of applying endothall are only likely to last one-growing season. Therefore, it is anticipated that the lakes would need to be treated with this chemical annually to maintain adequate vegetation control.

### 6.4.5 Permit Requirements

The use of endothall in Lakes Hood and Spenard would require a permit application by the regulatory authority of 18 AAC 90 to the ADEC Division of Environmental Health and Pesticide Program Services. Use of any herbicide would also require that the Airport complete a Coastal Project Questionnaire, which would be submitted to the Coastal Management Program. A copy of ADEC's pesticide permit application and a Coastal Project Questionnaire are located in Appendix C.

## 6.5 Fluridone

### 6.5.1 Description of Technique

Fluridone is often known by its trade names, Sonar® and Avast!®. Fluridone is a slow-acting, systemic, broad-spectrum herbicide that is used to control underwater plants such as milfoil. This herbicide can be applied to aquatic systems either in pellet or liquid form. Fluridone has the best results when water is calm, with an extended time for treatment for constant dosing, and in whole-lake or isolated areas greater than 10 acres where dilution is minimized (Sonar A.S. and SRP labels).

Fluridone can be applied by spraying it over the surface of the affected area, or by dispersing the chemical from a weighted hose near the bottom. Additionally, Fluridone can be applied in pellet form and physically broadcast over the surface of the intended area. This chemical is not effective for spot treatments.

This herbicide is commonly used for bladderwort, coontail, fanwort, elodea, hydrilla, naiad, pondweed, milfoil, duckweed, water lily, watermeal, and spatterdock.

### 6.5.2 Advantages and Disadvantages

An advantage of fluridone is the amount and duration of control that can be achieved in one dose, especially in slowly moving water. This chemical can also be used to affect specific plants with numerous low concentration doses without substantially harming native aquatic species.

The biggest disadvantage of fluridone is its limitation of only working well in areas larger than 10 acres. Another potential disadvantage is that fluridone is a slow-acting chemical, and it may take from 6 to 12 weeks before plants are completely dead and decomposing on the bottom sediment. As mentioned previously, this slow-acting effect may have advantages in terms of dissolved oxygen impacts from decaying vegetation.

### 6.5.3 Cost

The Western Aquatic Plant Management Society (WAPMS) estimates the cost of Fluridone treatment to be \$900 to \$1,000 per acre. One study completed in Florida showed that large-scale treatments provided up to five acres of control for each acre treated, with the

treatments lasting up to two seasons. The initial cost for these treatments was approximately \$750 per acre treated, but the cost for the entire area that was affected by the treatment turned out to be less than \$100 per acre (Schardt and Ludlow, 2004).

- Sonar AS®= \$545 - \$590 for 1 quart liquid (Aerators Aquatics 4 Lakes N Ponds, 2004, Aquatechnexx, LLC., 2004)
- Sonar SRP®= \$931 for 40 lbs. of pellet (Aerators Aquatics 4 Lakes N Ponds, 2004)
- Sonar PR®= \$781 - \$825 for 30 lbs. of pellet (Aerators Aquatics 4 Lakes N Ponds, 2004, Aquatechnexx, LLC., 2004)

### 6.5.4 Long-Term Effects and Impacts

Fluridone has an estimated half-life of 20 days in water and 90 days in the hydrosoil (Pesticide Management Education Program, 1986). As soon as entire amount of chemical has been removed from the system via photolysis, microbial degradation, or adsorption, the long-term effects should be minimal or nonexistent, if the chemical is used properly.

Fluridone does not bioaccumulate in zooplankton or fish and is not known to affect algae (Schardt and Ludlow, 2004). Sonar® has a 96 hour LC-50 of 14 parts per million for bluegill and 11 parts per million for rainbow trout.

As with most herbicides, the effects of applying fluridone are likely to last only one growing season. Therefore, it is anticipated that the lakes would need to be treated with this chemical annually to maintain adequate vegetation control.

### 6.5.5 Permit Requirements

The use of this pesticide in Lakes Hood and Spenard would require a permit application by the regulatory authority of 18 AAC 90 to the ADEC Division of Environmental Health and Pesticide Program Services. Use of any herbicide would also require that the Airport complete a Coastal Project Questionnaire, which would be submitted to the Coastal Management Program. A copy of ADEC's pesticide permit application and a Coastal Project Questionnaire are located in Appendix C.

## 6.6 Glyphosate

### 6.6.1 Description of Technique

Trade names for herbicides whose active ingredient is glyphosate include Rodeo®, AquaMaster®, and AquaPro®. Glyphosate is a systemic, broad-spectrum herbicide that is used mainly to control plants with floating leaves and shoreline plants. This chemical is usually applied as a liquid directly to the plant leaves. Leaves absorb the herbicide and it works its way into the root system. The effects of glyphosate treatment become visible within two to four days for annual plants and seven plus days for perennial plants. Although glyphosate operates within a broad spectrum, it can be used more selectively by targeting the spray directly onto specific leaves.

Glyphosate is effective on water lily, spatterdock, spikerush, water shield, cattail, arrowhead, loosestrife, and common reeds.



## 6.6.2 Advantages and Disadvantages

A benefit of glyphosate is its effectiveness for aquatic vegetation with floating leaves. Additionally, it is comparatively inexpensive compared to other chemical aquatic vegetation treatments.

The main disadvantage of glyphosate for use at the Airport is that it does not target nuisance species, and does target some species that are desirable, such as spikerush. Other disadvantages include the length of time that it often takes to remove all targeted plants. Generally, repeat applications are necessary to remove all intended plants. Another limitation of this herbicide is that it does not work well on submerged vegetation.

## 6.6.3 Costs

The approximate cost of glyphosate treatment is \$250 per acre (Western Aquatic Plant Management Society, 2004).

## 6.6.4 Long-Term Effects and Impacts

Glyphosate has an average half-life of 14 days but ranges from 12 days to 10 weeks in natural water (EXTOXNET, 1994). Data indicate that glyphosate is relatively low in toxicity to mammals and aquatic organisms (MDAR, 1997). Glyphosate is strongly adsorbed by organic matter and suspended minerals and is broken down by microorganisms.

As with most herbicides, the effects of applying glyphosate are likely to last only one growing season. Therefore, it is anticipated that the lakes would need to be treated annually to maintain adequate vegetation control.

## 6.6.5 Permit Requirements

The use of glyphosate in Lakes Hood and Spenard would require a permit application by the regulatory authority of 18 AAC 90 to the ADEC Division of Environmental Health and Pesticide Program Services. Use of any herbicide would also require that the Airport complete a Coastal Project Questionnaire, which would be submitted to the Coastal Management Program. A copy of ADEC's pesticide permit application and a Coastal Project Questionnaire are located in Appendix C.

# 6.7 Triclopyr

## 6.7.1 Description of Technique

Triclopyr is a fast-acting, systemic, and selective herbicide that is commonly known by its trade name, Renovate. This herbicide is most useful in smaller areas rather than whole lake treatments. Triclopyr has historically been used to control woody plants and broadleaf weeds. This herbicide is usually applied as a liquid, and is effective as a spot treatment. The recommended dosage of triclopyr is 1 to 2.5 parts per million (ppm) per acre.

## 6.7.2 Advantages and Disadvantages

Triclopyr works very quickly, and can target specific plants while leaving others unharmed, which offers flexibility in its use. It is known to be very effective for spot treatments.

Additionally, this compound has low toxicity to birds and aquatic organisms, and readily degrades from natural waters.

One disadvantage of triclopyr is that it is not known to control pondweed, which is one of the most common nuisance species at the Airport. The biggest disadvantage of Renovate is its cost. This product is substantially more expensive than most commonly used aquatic herbicides. The cost benefit analysis in Section 7 resulted in higher costs for this product for nearly all uses.

### 6.7.3 Cost

Renovate, the most commonly used name brand of triclopyr for aquatic purposes, costs approximately \$333 for 2.5 gallons (Aerators Aquatics 4 Lakes N Ponds, 2004).

### 6.7.4 Long-Term Effects and Impacts

Triclopyr has very low toxicity to birds and aquatic organisms, and is quickly eliminated from the human body. There are no anticipated long-term health effects from this herbicide on any organisms. Acute exposures may harm the liver and kidneys. Triclopyr does not have significant reproductive impacts, and is unlikely to be mutagenic, carcinogenic, or teratogenic (EXTOXNET, 1996).

As with most herbicides, the effects of applying triclopyr are likely to last only one growing season. Therefore, it is anticipated that the lakes would need to be treated annually to maintain adequate vegetation control.

### 6.7.5 Permit Requirements

The use of triclopyr in Lakes Hood and Spenard would require a permit application by the regulatory authority of 18 AAC 90 to the ADEC Division of Environmental Health and Pesticide Program Services. Use of any herbicide would also require that the Airport complete a Coastal Project Questionnaire, which would be submitted to the Coastal Management Program. A copy of ADEC's pesticide permit application and a Coastal Project Questionnaire are located in Appendix C

## 6.8 Aquashade®

### 6.8.1 Description of Technique

Aquashade® is a dye used to prevent portions of the light spectrum from reaching underwater plants and algae. It has been proven to inhibit growth in young, bottom-growth plants and planktonic algae. It is most effective at a depth of two feet or greater. The resulting tint is a clear aqua blue. Plants affected include elodea/hydrilla, milfoil (when treated early), parrot feather, leafy pondweed, chara, slender naiad, filamentous green and blue-green algae, and spirogyra (Applied Biochemists, 2004). The half-life of Aquashade® is estimated at about four weeks.

Recommended dosage is one gallon per acre with an average depth of four feet (Applied Biochemists, 2004).

## 6.8.2 Advantages and Disadvantages

When used at the proper dilution rate, Aquashade® is neither corrosive nor dangerous to humans, waterfowl, or fish. The effect of Aquashade® on water transparency is less than inorganic or algal-induced turbidity (Madsen et al., 1999).

The aqua blue tint may be seen as too artificial by the public. Aquashade® may not be effective for shoreline plants above the two foot depth. Multiple applications may be necessary if growth resumes after the initial treatment.

## 6.8.3 Costs

The cost of Aquashade® is approximately \$45 per gallon when purchased in bulk (Dunn's Fish Farm, 2004). It would take at least 208 gallons to color both lakes, which would cost roughly \$9,360.

## 6.8.4 Long-Term Effects and Impacts

Limited information is available on the fate and transport of Aquashade. The normal half-life listed by the manufacturer is four weeks. Color is slowly reduced by dilution, photodegradation, and some biodegradation over time (Applied Biochemists Inc., 1992). Aquatic plant growth may continue once the color dissipates. Toxicity studies are limited, and have only been performed by the manufacturer. Long term health effects are not known to be related to this product.

## 6.8.5 Permit Requirements

The use of Aquashade® in Lakes Hood and Spenard would require permission from ADEC and would also require that the Airport complete a Coastal Project Questionnaire, which would be submitted to the Coastal Management Program. A copy of a Coastal Project Questionnaire is located in Appendix C.



# Evaluation of Alternatives

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## 7.1 Vegetation Control Options Appropriate for the Airport

The vegetation control methods described in Chapters 4 through 6 were assessed based on cost, applicability, and effectiveness in addressing site specific issues and meeting the Airport goals. The suitability of these treatments for Lakes Hood and Spenard and a thorough cost analysis are discussed in the following sections. All potentially suitable methods were analyzed as potential options for ANC, many of which were subsequently eliminated as options due to high cost, permitting issues, or public perception.

### 7.1.1 Physical Methods

Hand raking and cutting are inexpensive techniques that are appropriate for management of vegetation in small areas including individual slips. This is a viable control method that some individual slip owners and, on a limited basis, the Airport maintenance staff currently practice. Bottom barriers are also an effective control method for smaller areas in the lakes such as individual slips. Some tenants currently employ this method by placing carpet material in their slips. This option was later omitted due to the risk of loose material getting in the way of safe floatplane operation. Mechanical harvesting is a realistic control option for nearly all areas of the lakes, with the exception of very shallow areas and narrow floatplane slips. Harvesters would also provide the benefit of aiding in erosion control by allowing plant roots to stay intact, thereby stabilizing sediment against wave action.

Water level drawdown was not considered as a practical option due to the necessity of maintaining a stable, elevated water level for operation of floatplanes at Lakes Hood and Spenard. Rotovation uproots plants from below the surface, and is likely to increase water column turbidity. Therefore, this option was not considered further. Diver dredging allows for selective removal of unwanted vegetation from the roots; however the cost and potential sediment disturbance made this option unattractive.

### 7.1.2 Biological Control Methods

The only biological control option that was initially considered as a potential option for the Airport was triploid grass carp. A potential problem for carp survival in Lakes Hood and Spenard is the seasonal use of urea for runway deicing, which causes occasional elevated ammonia concentrations in the lakes. In addition, permitting issues had to be explored due to the lack of their use in Alaska.

Success using grass carp has been varied among other users around the country; however it may be a viable option for the Airport in the future when ammonia concentrations are no longer a concern.

### 7.1.3 Chemical Control Methods

Fluridone and endothall are the only herbicides that can be used for whole-lake herbicide treatment; therefore, they were considered at the outset for the Airport as a whole lake treatment option.

Most approved aquatic herbicides can be used as a spot treatment in smaller areas such as individual slips, with the exception of fluridone, which is only recommended for areas greater than 10 acres. Glyphosate and Triclopyr have limited effectiveness for pondweed and other plants of concern to the Airport; therefore, these herbicides were omitted from further consideration. Diquat is nonselective and could be harmful to plant species that the Airport is trying to protect for erosion control purposes, but was maintained as a potential option due to its effective use for small areas. Endothall and 2, 4 -D are effective for both milfoil and pondweed, and were therefore considered as options for partial lake treatment and treatment of smaller areas such as float plane slips.

All chemical treatments were eventually eliminated from consideration by the Airport due to the potential permitting difficulties and to make sure the public is satisfied with the Airport's approach.

## 7.2 Vegetation Management Scenarios

Three management scenarios were devised that offer varying levels of control and effort for the Airport:

- Scenario 1: the Airport would perform all aquatic vegetation management at Lakes Hood and Spenard. The costs and associated 5-year implementation schedule for Scenario 1 is illustrated in Figure 7-1.
- Scenario 2: In this Scenario, individual slip owners would take care of their own slips. The Airport would be responsible for controlling vegetation outside of the slips in the open water. The costs and associated implementation schedule for Scenario 2 are shown in Figure 7-2.
- Scenario 3: the Airport would not maintain any responsibility for vegetation control, which would be left entirely to slip owners. The implementation schedule and costs associated with Scenario 3 for the slip owners are shown in Figure 7-3.

Aquatic vegetation control options and treatments can be implemented at various scales and areas within Lakes Hood and Spenard. Treatments that work well for small areas and spot treatments may be inefficient for large scale treatment. The three different scenarios could combine various treatment options. Treatment options available within each of the scenario components are described in Table 7-1.

Table 7-1  
Aquatic Vegetation Treatment Options

Whole Lake (the Airport)	10-foot deep Littoral Zone (the Airport)	5-foot deep Littoral Zone (the Airport)	Individual Slips (Slip owners or the Airport)
Herbicides	Small or Large Harvester	Small Harvester	Herbicides
Triploid Carp	Herbicides	Herbicides	Bottom Barrier
		Bottom Barrier	Weed Mower
		Weed Mower	Weed Cutter
			Hand Rake

## 7.3 Cost Analysis

Present worth cost analyses were performed using a four percent interest rate over a five year life cycle. Details of the assumptions and cost elements for analyzing cost of each potentially viable option are discussed in the following subsections. Estimated treatment costs for vegetation management options are listed in Table 7-2. Calculations and additional information are included in the detailed present worth cost analyses (Appendix B).

TABLE 7-2  
Summary of Treatment Option Costs

Treatment Description	Capital Costs	Annual O&M Costs	Present Worth Costs
<i>Whole Lake (208 acres)</i>			
Triploid Carp			
	\$70,912	\$800	\$74,616
Herbicides			
Sonar A.S (Fluridone) \$ -		\$30,886	\$143,000
Sonar SRP (Fluridone) \$ -		\$26,763	\$123,912
Aquathol K (Endothall) \$ -		\$184,157	\$852,630
Hydrothol 191 (Endothall) \$ -		\$285,037	\$1,319,693
<i>Deep Littoral Zone (to 10 ft deep, 134 acres)</i>			
Purchase Large Harvester			
	\$128,450	\$26,509	\$251,183

TABLE 7-2  
Summary of Treatment Option Costs

Treatment Description	Capital Costs	Annual O&M Costs	Present Worth Costs
Purchase Small Harvester	\$102,025	\$38,065	\$278,260
Contracted Harvester, 5-days per year	\$ -	\$11,000	\$50,929
Contracted Harvester, 134 Acres, 56-days per year	\$ -	\$122,833	\$568,705
Borrow Homer's Harvester	\$2,000	\$38,065	\$178,235
Herbicides			
Sonar A.S. (Fluridone) \$ -		\$30,648	\$141,899
Sonar SRP. (Fluridone) \$ -		\$38,678	\$179,074
Aquathol K (Endothall) \$ -		\$98,978	\$458,258
Hydrothol 191 (Endothall) \$ -		\$153,153	\$709,081
Reward (Diquat) \$ -		\$38,427	\$177,913
Navigate (2,4-D) \$ -		\$37,109	\$310,711
Bottom Barrier	\$5,515,866	\$7,000	\$5,548,276
<i>Shallow Littoral Zone (to 5 ft deep, 28.5 acres)</i>			
Small Harvester	\$102,025	\$8,039	\$139,246
Herbicides			
Sonar A.S. (Fluridone) \$ -		\$6,478	\$31,244
Sonar SRP (Fluridone) \$ -		\$8,456	\$39,151
Aquathol K (Endothall) \$ -		\$10,732	\$49,687
Hydrothol 191 (Endothall) \$ -		\$16,483	\$76,312
Reward (Diquat) \$ -		\$8,403	\$38,904
Navigate (2,4-D) \$ -		\$14,503	\$67,148
Weed Mower	\$2,095	\$4,275	\$22,448



TABLE 7-2  
Summary of Treatment Option Costs

Treatment Description	Capital Costs	Annual O&M Costs	Present Worth Costs
Bottom Barrier	\$1,173,127	\$4,000	\$1,191,647
<i>All Floatplane Slips (235 slips at 700 square feet each = 6 acres)</i>			
Weed Mower	\$1,948	\$1,800	\$10,282
Weed Cutter (10)	\$20,019	\$8,125	\$57,636
Hand Rake (10)	\$1,350	\$16,250	\$76,586
<i>Individual Floatplane Slips (700 square feet)</i>			
Bottom Barrier	\$ 694	\$400	\$2,546
Weed Cutter	\$2,064	\$25	\$2,180
Hand Rake	\$135	\$50	\$366
Herbicides			
Aquathol K (Endothall) \$ -		\$156	\$722
Hydrothol 191 (Endothall) \$ -		\$159	\$737
Reward (Diquat) \$ -		\$155	\$715
Navigate (2,4-D) \$ -		\$160	\$731

### 7.3.1 Aquatic Vegetation Harvesters

Larger harvesters would work well in deeper areas of the lakes, but only the smaller harvester would be suitable for shallow areas. Therefore, for the littoral zone out to 10-feet deep, both the larger and smaller harvesters were considered, but only the smaller harvester was considered for the littoral zone out to 5-feet deep.

The Airport has to decide whether to:

- Purchase their own harvester,
- Outsource the harvesting to a local contractor, or

- Borrow the harvester owned by Alaska Department of Transportation that is located in Homer Alaska.

This decision would have a great impact on the cost, frequency, and timing of operations. The Airport will also need to identify locations around the lake to operate the shore conveyor, as well as areas to unload the vegetation. Dump trucks would most likely be necessary to haul the harvested vegetation off site. If the Airport purchased its own harvester, a determination on which model and components to buy would need to be made, as well as determining a plan for the appropriate labor to operate and maintain the equipment each year.

Aquarius Systems harvesters were identified as good candidates for consideration. Aquarius is an established manufacturer of well known harvesters. Three Aquarius models have been compared, including one smaller harvester (EH-220), and two larger models (HM-320 and HM-420).

- The EH-220 can cover 0.30 acres per hour, with a 5 foot cutter width, and a storage capacity of 3,200 lbs.
- The HM-320 can cover 0.37 acres per hour, with a 6 foot cutter width, and a storage capacity of 7,025 lbs.
- The HM-420 can cover 0.43 acres per hour, with a 7 foot cutter width, and a storage capacity of 10,500 lbs.

#### *EH-220 Harvester*

The EH-220 Harvester is ideal for use in smaller bodies of water and for littoral zone work. It has a storage capacity of 3,200 pounds, hydraulic controls, and has complete engine instrumentation.

#### Capital Costs:

- EH-220 Harvester = \$63,650
- TR-12 Trailer = \$7,875
- SC-12 Shore Conveyor = \$20,500
- Shipping - \$10,000

Total capital costs for the EH-220 including the trailer, shore conveyor, and shipping would be \$102,025.

Operations and maintenance costs include labor (harvester operator, boat driver, maintenance, dump truck driver) at approximately \$50 per hour. Other maintenance for the EH-220 includes:

- Spare parts = \$0.60 per hour (spare part costs range from \$0.58-\$0.93 per hour operation) (Aquarius, 2004)
- Repairs = \$1.25 per hour (repair costs range from \$0.66-\$1.47 per hour operation) (Aquarius, 2004)
- Estimated Fuel Costs

- Fuel efficiency for harvester is approximately 1.5 gallons of diesel per hour operated, fuel cost = \$1.55 per gallon
- Estimated gas for dump truck per hour harvester operation is approximately \$0.60 (Aquarius, 2004)

The EH-220 was considered as an option for both the 5 and 10 foot deep littoral zones. For the larger littoral zone (134 acres), the present worth cost for the EH-220 over 5 years would be \$278,260, assuming 450 hours of harvester operation to cover the entire 134 acres of the littoral zone one time. The 5 foot deep littoral zone is 28.5 acres, which would take 95 hours each year for one harvest with the EH-220. The 5 year present worth costs for the small harvester, in the smaller littoral zone, would be \$139,246.

### *HM-320 and HM-420 Harvesters*

The HM-320 and HM-420 are small enough to work fairly close to the shoreline, but work best in the deeper open areas.

Capital Costs for the HM-320 and HM-420:

- HM-320 Harvester = \$81,100
- HM-420 Harvester = \$83,500
- TR-23 Trailer for either harvester = \$9,450
- SC-23 Shore Conveyor for either harvester = \$20,500
- Shipping = \$15,000

Total capital costs for the HM-320 are estimated to be \$126,050, while capital costs for the HM-420 are estimated to be \$128,450.

Operations and maintenance costs include labor (harvester operator, boat driver, maintenance, dump truck driver) at approximately \$50 per hour. Other maintenance for the HM-320 and the HM-420 include:

- Spare parts = \$0.60 per hour (spare part costs range from \$0.58-\$0.93 per hour operation) (Aquarius, 2004)
- Repairs = \$1.25 per hour (repair costs range from \$0.66-\$1.47 per hour operation) (Aquarius, 2004)
- Estimated Fuel Costs
  - Fuel efficiency for harvester is approximately 1.5 gallons of diesel per hour operated, fuel cost = \$1.55 per gallon
  - Estimated gas for dump truck per hour harvester operation is approximately \$0.60 (Aquarius, 2004)

The larger harvester was only considered for the littoral zone because it is too large to be effective in more shallow water. The present worth cost for the HM-420 over 5 years is \$251,183 assuming 315 hours of harvester operation to cover 134 acres of the deeper littoral zone one time.

The regular maintenance schedule for all Aquarius harvesters is listed in Table 7-3.

**Table 7-3**  
Typical Maintenance Schedule for Aquarius Harvesters

Fuel the machine	Daily
Check hydraulic oil	Daily
Check screen for tightness	Daily
Check cutting head	Daily
Grease all fittings	Once daily
Check engine oil	Twice daily
Check conveyor belting	Weekly
Oil chain couplings	Once per month
Change engine oil (gas)	Every 50 hours
Change oil (diesel)	Every 100 hours
Change hydraulic oil filter	Every 250 hours
Change hydraulic oil	Every 500 hours

Other options for the Airport include outsourcing the harvesting work to a local contractor or borrowing Homer's EH-220 harvester. A local contractor charges \$2,200 per day for his services, which includes all harvesting and vegetation removal. Assuming the contractor uses the EH-220 harvester, it would take approximately six weeks to cover 134 acres. There would not be any capital costs associated with this option, but it would cost approximately \$121,000 per year, for a five year present worth cost of \$560,217.

Borrowing Homer's harvester would not have any capital cost associated with it other than the cost of shipping the harvester to and from Homer each year. Operations and maintenance assumptions and costs were estimated be the same as if the Airport had purchased their own EH-220 harvester. Assuming \$2,000 each year for shipping and approximately 11-weeks of harvester use each summer, this option would cost \$38,064 each year, with a five year present worth cost of \$178,235.

### 7.3.2 Herbicides

Herbicide treatments would not have up front capital costs. Costs of purchasing and shipping herbicides, as well as applicator labor fees would be considered annual operations and maintenance costs. Labor for a whole lake application of any of the herbicides was estimated to be 16 hours. The 10 foot littoral zone treatment is anticipated to take 8 hours, while the 5 foot littoral zone application is anticipated to take 4 hours. Individual slip application was estimated to take one-quarter hour plus an additional half-hour for raking dead vegetation from the slip, two times per year. All labor costs for herbicide application were estimated to be \$100 per hour.

### *2, 4-D*

Because 2, 4-D is not usually recommended for whole lake treatments, it was only considered as a treatment for the littoral area and for individual floatplane slips. The Navigate® label recommends a dose of 100-200 pounds per acre (5-pounds per 2,000 square feet) for susceptible vegetation such as milfoil; and 150-200 pounds per acre (7.5 to 10 pounds per 2,000 square feet) for more resistant vegetation such as spatterdock and water shield.

For littoral and individual slip treatment, costs were analyzed using an application rate of 150 pounds per acre. Approximately 20,100 pounds of Navigate® would be needed to treat 134 acres out to 10 feet deep in Lakes Hood and Spenard. Navigate® is sold in 50 pound bags for \$165 each, and 402 bags would be needed (The Lake Doctors, 2004). The total cost for the littoral zone out to 10 feet would be approximately \$67,110 per treatment, with a present worth cost of \$310,712 over 5 years. For the littoral zone out to 5 feet deep, 4,275 pounds of Navigate® would be needed. Therefore 86 bags of Navigate® would be required, for a total cost of \$14,503 per treatment. Over a 5 year period, the present worth cost would be approximately \$67,148. An application of 2.5 pounds of Navigate® would be required to control vegetation in an individual slip. It was assumed that it will take 15 minutes to apply the herbicide and ½ hour to rake dead vegetation, two times each year. Therefore, it would cost approximately \$158 annually for herbicide cost and labor for treatment of 1 slip with Navigate®. The present worth cost over 5 years would be approximately \$731 per slip.

### *Fluridone*

Fluridone products are most effective for treatment of areas larger than 10 acres. Therefore, fluridone products were not considered for individual plane slips.

Literature and expert recommended dosages are as follows:

- 0.5 to 4.0 pounds per acre (Pesticide Management Education Program, 1986)
- 16 parts per billion (ppb) of Sonar (Dr. Bill Haller, 2004)
- 30-150 ppb for partial lake treatments with Sonar A.S. (Sonar A.S. Label)
- 45-150 ppb for partial lake treatments with Sonar A.S. (Sonar SRP Label)
- 0.16 to 1.25 quarts per acre for submerged and floating plants in water less than 5 feet deep (Penn State, 2004)
- 1.0 to 1.5 quarts per acre for submerged and floating plants in water greater than 5 feet deep (Penn State, 2004)

Sonar A.S. costs \$550 per quart, while Sonar SRP costs \$931 per 40 pound bag (Aerators Aquatics 4 Lakes N Ponds, 2004). A whole lake treatment of Sonar A.S. would require 53 quarts of herbicide, for a total cost of \$30,886. A whole lake treatment of Sonar SRP would require 5.2 pounds per acre to achieve 16 ppb. A total of twenty-seven 40 pound bags would be needed plus the labor for application. The total cost would of \$26,763. The present worth cost over 5 years, including labor, would be \$143,000 for Sonar A.S. and \$123,912 for Sonar SRP.

Sonar labels recommend higher doses of herbicide for partial lake treatment due to drift, between 30 and 150 ppb. The amount of Sonar A.S. required for each acre to achieve 30 ppb is calculated by taking = (Average water depth of treatment site) x (Desired ppb concentration of active ingredient equivalents) x (0.0027), while the pounds of Sonar SRP required for each acre is calculated by taking = (Average water depth of treatment site) x (Desired ppb concentration of active ingredient equivalents) x (0.054). One treatment of the 10-foot littoral zone would cost \$30,648 for Sonar A.S and \$38,678 for Sonar SRP. The 5 year present worth cost for Sonar A.S and Sonar SRP for the 10 foot deep littoral zone would be \$141,900 and \$179,074 respectively. Treating the 5 foot littoral zone would cost \$6,748 for Sonar A.S and \$8,456 for Sonar SRP. The 5-year present worth cost for Sonar A.S and Sonar SRP for the 5 foot deep littoral zone would be \$31,244 and \$39,151 respectively.

### ***Endothall***

Endothall was considered as a whole lake treatment and as a littoral and individual slip treatment. The literature-recommended dosage is 0.6 to 1.9 gallons per acre-foot for submerged plants (Penn State, 2004).

A dose of 3.0 ppm was chosen to analyze Aquathol's cost based on the target vegetation species in Lakes Hood and Spenard (potamogeton: 0.5 – 3.0 ppm, milfoil: 2.0 – 3.0 ppm). Hydrothol 191's label recommends a dose of 2.0 ppm for target species. Based on this guidance, 2,392 gallons of Aquathol K or 3,390 gallons of Hydrothol 191 would be needed for a whole-lake treatment. Whole-lake treatment would cost a total of \$184,157 for Aquathol K and \$285,037 for Hydrothol 191, including labor. The 5 year present worth costs of a whole-lake treatment would be \$852,630 for Aquathol K and \$1,319,693 for Hydrothol 191. Treatment of the 10 foot littoral zone with Aquathol K would cost \$98,978 including labor for the first year, with the 5 year present worth costs totaling \$458,258. Treatment of the 10 foot littoral zone with Hydrothol 191 would cost \$153,153, and the 5 year present worth costs would be \$709,081. Treatment of the 5 foot littoral zone using Aquathol K would cost \$10,732, and the 5 year present worth costs would be \$49,687. Treatment of the 5 foot littoral zone using Hydrothol 191 would cost \$16,453 with 5 year present worth costs adding up to \$76,312. Both Aquathol K and Hydrothol 191 would work well for individual slip owners, and both herbicides would require less than one container to treat each slip. This estimate includes 15 minutes to apply the herbicide and one-half hour to rake dead vegetation, two times each year. Therefore, it would cost approximately \$156 annually for the herbicide and labor for treatment of one slip with Aquathol K, and \$159 to treat one slip with Hydrothol 191. The present worth costs over 5-years would be approximately \$722 for Aquathol K and \$737 for Hydrothol 191.

### ***Diquat***

Diquat products are not usually recommended for whole lake treatment, and therefore were only considered for the littoral zone and individual slips. Reward's label suggests application dosages based on whether vegetation species are present, as well as whether you are placing it below the surface or spraying it on the surface of the water. Examples of vegetation controlled by Reward® and the appropriate application rates are listed on the product label (Appendix A). For most species present in Lakes Hood and Spenard, 2 gallons per surface acre would be sufficient for application of Reward® on the bottom, subsurface, or surface of the lakes.

Treatment of the 10-foot deep littoral zone would require 268 gallons of Reward®, which would cost \$38,427 including labor for the first year. The 5 year present worth costs for treatment of the 10 foot littoral zone using Reward® would be \$177,914. Treatment of the 5 foot deep littoral zone would require 57 gallons of Reward®, costing \$8,400 including labor. The 5-year present worth costs would be \$38,904. Less than 1-gallon of Reward® would be needed to treat vegetation in an individual floatplane slip, which would cost approximately \$155 per year, including labor. This estimate includes 15 minutes to apply the herbicide and ½ hour to rake dead vegetation, two times each year. The present worth costs over 5-years would be approximately \$715 for one slip.

### 7.3.3 Triploid Carp

Stocking the lakes with triploid carp is a whole lake treatment option. The main capital costs consist of purchasing the fish and shipping. There is also labor for stocking the lakes. Washington State Ecological Services recommends 9 to 25 fish per vegetated acre, while the Missouri Department of Conservation recommends 5 to 10 fish per acre of water for 40 to 60 percent plant cover. Nisqually Fish Farm in Washington State charges \$12 per fish, which is the most likely supplier for Alaska. A stocking rate of 10 fish per vegetated acre was used to estimate the capital cost. Using a high estimate of 134 acres of the lakes being vegetated, an estimated 1,380 fish would be needed to have the desired result. Therefore, the total cost for the fish would be \$16,560. Approximately 10 fish fit in each box, and shipping for each box is estimated to cost \$104 based on weight (Federal Express, 2004). The total cost for shipping 1,380 fish is estimated to be \$14,352. Two fish gates would also be required for this option to prevent the stocked exotic fish from escaping to natural systems. A similar fish gate built in Washington State cost \$22,000. The fish gates for the Airport are estimated to cost \$20,000 each. Therefore, the total capital cost of stocking Lakes Hood and Spenard with triploid carp, including two fish gates, is approximately \$71,000. Labor for this option was estimated to be 16 hours each year for initial stocking and subsequent annual surveys and analyses. The 5 year present worth of stocking the lakes with carp is \$74,616.

### 7.3.4 Bottom Barrier

Bottom barriers are mainly used for small, easy to manage areas. Barriers could be employed on a larger scale, but material costs and the difficulty of maintaining a large barrier could be prohibitive. Bottom barriers could also come loose, and get in the way of float plane operation.

Reported costs for building bottom barriers range from \$0.22 to \$1.25 per square foot. Based on case studies conducted in Washington State, it costs approximately \$750 to have 1,000 square feet of bottom screen installed. The same study estimated maintenance costs for a waterfront lot at about \$120 each year (Washington Department of Ecology, 2004).

Commercial installation costs vary depending on sediment characteristics and type of bottom screen selected.

Materials needed to build bottom barriers include a barrier material, sand bags, 2-inch by 2-inch boards, nails, marine plywood, and staple guns. A variety of tarp materials have been used for barriers, including polyethylene, polypropylene, synthetic rubber, burlap, fiberglass screens, woven polyester, and nylon film. Synthetic fabrics or burlap are the two most commonly used materials. Bottom barriers can be used at any depth; however, divers

are often needed to build the barriers in deep waters. Labor includes installation and maintenance on a regular basis to make sure the edges of the barrier are secure and that vegetation is not growing up and over the barrier.

Cost assumptions for bottom barriers at the Airport:

Nails: Two, 6d- 11½ gauge nails are needed for each 2-inch by 2-inch board. There are approximately 181 nails per pound. Lowe's hardware price = \$1.69 per pound of nails.

Staple Guns: Ace hardware staple gun = \$24.99, Lowe's staple gun \$16.97

Marine Plywood: 12 square feet, or 48 gussets, are needed for each frame. Marine plywood costs approximately \$2.13 per square foot at Westwind Hardwood (2004).

Labor costs are estimated to be \$50 per hour. If divers were needed for deep waters, their labor costs are estimated to be \$100 per hour.

Bottom barriers were considered for the 10 and 5 foot deep littoral zones, and for individual slips. Synthetic bottom barrier materials were chosen due to their superior durability. The entire area of the 10 foot deep littoral zone is 134 acres, which is 5,827,040 square feet, and would require 40,535 12-foot by 12-foot barrier frames to cover the area. Using an estimate of \$0.75 per square foot for the synthetic material, the total cost for the barrier material would be \$4,277,780. The total capital cost for the 10 foot littoral zone would be \$7,336,080. With maintenance labor and replacement materials factored in, the 5 year present worth value would be \$7,368,490. This option is obviously cost prohibitive, and is not a realistic option for the Airport. The 5 foot littoral zone encompasses 28.5 acres, or 1,241,460 square feet. Therefore, 8,622 12 foot by 12 foot frames would be needed at a total capital cost of \$1,560,285, and the 5 year present worth cost would be \$1,578,804. Scuba divers would not be needed for the 5 foot littoral zone or the slips, which would reduce labor costs. The most realistic use of bottom barriers at the Airport would be for individual floatplane slips. To cover the average slip area of 700 square feet, 5, 12 foot by 12 foot frames would be needed for a total capital cost of approximately \$900 per slip including installation labor. The 5 year present worth cost would be \$2,756, estimating that each slip would require 8 hours of maintenance each year.

### 7.3.5 Weed Mower

The basic weed mower only cuts down to three feet deep; however, extenders can be purchased to allow cutting two or four feet deeper. Due to the depth limitation, weed mowers were only considered as an option for floatplane slips. The mowers fit on the front, side, or back of any small boat. The Jensen Weed Mower with 1/10 horse power (hp) engine, which can cover 1 acre in 3 hours, costs \$1,735. The mower also requires a 12-volt deep cycle marine battery, which costs approximately \$144 (Optima Batteries, 2004). For this cost estimate, we assumed the Airport currently owned a boat adequate for this purpose.

The weed mower was considered as an option for the Airport to use at all slips if Scenario 1 were implemented. This option was not considered for individual slip owners because each individual would need a boat and the mower attachment, which was considered to be cost prohibitive. The labor is estimated to be one-fourth of an hour for each slip. The total capital costs for the weed mower, including a 2-foot extender and shipping is \$2,095. If the mower was used at each of the 235 slips two times per year, the five year present worth cost estimate would be \$10,282. The weed mower was also considered as an option for the



littoral zone out to 5 feet deep. The extender would need to be purchased for this area in order to reach 5 feet deep, which costs an additional \$159. Using the advertised rate of 1 acre in 3 hours, it would take 85.5 hours to cover 28.5 acres, which would cost \$4,275 per year in operations and maintenance. The 5 year present value of this option would be \$21,888.

### 7.3.6 Weed Cutter

Weed cutters are a relatively inexpensive and easy method of removing vegetation from smaller areas. This option was considered for individual slips only. The Swordfish Weed Cutter works like a self-propelled lawn mower, and is sold with two re-chargeable batteries and a charger for \$1,995, plus \$69 for shipping.

The weed cutter could be implemented by the Airport in Scenario 1 if they took responsibility for maintaining all slips. Weed cutters were also considered in Scenarios 2 and 3 where slip owners maintained their own slip areas. It is estimated that it would take 15 minutes per slip, two times per year. If the Airport purchased 10 weed cutters, the capital costs including shipping would be \$20,019. The 5 year present worth cost would be \$57,636 for this option. If the weed cutter was used by an individual slip owner who purchased their own cutter, the 5 year present worth cost would be \$2,180. This cost analysis assumes a cost of \$50 per hour in order to assign value to the slip owner's time (or hired help time), and that owners dispose cut weeds by either composting them on their property or throwing them away as trash.

### 7.3.7 Hand Rake

Hand rakes are the least expensive, but one of the more labor intensive methods of removing vegetation from individual slips. One popular commercial rake is the Deluxe Lake Rake by Pond Supply for \$95 to \$125. For purposes of this cost estimate, the \$105 model was chosen, and shipping for that model would be approximately \$30, for a total capital cost of \$135.

Hand rakes could be implemented by the Airport in Scenario 1 if they took responsibility for maintaining all slips. Hand rakes were also considered in Scenarios 2 and 3 where slip owners maintained their own slip areas. It is estimated that it would take 30 minutes per slip. If the Airport purchased 10 weed rakes, the capital costs including shipping would be \$1,350. The 5 year present worth cost would be \$76,586 for hand rakes including labor. For the individual slip owner, the 5 year present worth cost would be \$366, assuming one-half hour was spent, two times per year removing vegetation from one slip. This analysis used a \$50 estimate per hour in order to assign value to the slip owner's time (or hired help time). This cost analysis assumes that slip owners dispose cut weeds by either composting them on their property or throwing them away as trash.









# Integrated Management Plan

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All potential vegetation control options were evaluated, and an integrated management strategy was developed considering cost, environmental issues, and effectiveness. The chosen strategy is scientifically sound, and addresses specific issues in the lakes.

## 8.1 Selected Vegetation Management Scenario

Scenario 2 was chosen for implementation at the Airport based on its flexibility and appropriateness of treatment options. In the selected Scenario, the Airport is responsible for controlling vegetation outside of the slips in the open water, while individual slip owners take care of their own slips with the Airport's guidance.

An implementation schedule that outlines the cost of the selected scenario and options is shown in Figure 8-1. Five year present worth costs associated with the selected management plan options are summarized in Table 8-1. Harvesters were selected as the main method of controlling vegetation in the open water. Harvesters achieve the desired goal of reducing vegetation, yet they leave vegetation on the shoreline intact which helps protect against erosion. Additionally, harvesters cause minimal environmental concern, and would likely be the most attractive option to the public. For the summer of 2005, the Airport plans to use the harvester owned by the Alaska Department of Transportation and Public Facilities that resides in Homer most of the year. It will cost approximately \$2,000 to ship the harvester back and forth from Homer, and will cost \$38,065 for operations and maintenance costs for one year. Because the Airport will be sharing the harvester with Homer during 2005, the Airport maintains the use of a contracted harvester for no more than five days per year on an as-needed basis, which will cost approximately \$11,000. The Airport will work on ordering and procuring a new harvester for use starting in the summer of 2006. This is expected to cost approximately \$102,025 in capital costs, with annual operating and maintenance costs of \$38,065.

Individual slip owners will have the option of using weed rakes to maintain their float plane slips. Weed cutters are another option that the Airport supports. Hand rakes are the preferred method because they are inexpensive and can be used by slip owners on an as-needed basis. Labor costs were included in the cost estimates, which included the owner raking his or her slip two times each year. Five-year present worth costs for this option are shown in Table 8-1 and Figure 8-1.

TABLE 8-1  
 Selected Vegetation Management Options and 5-Year Present Worth Value

<b>Responsible Party</b>	<b>Cost</b>
<b><u>The Airport</u></b>	
Borrow Homer's EH-220 Vegetation Harvester (2005 only)	\$40,065 (Summer of 2005 only)
Contract Harvester on as-needed basis for 5-days (2005 only)	\$11,000 (Summer of 2005 only)
Purchase EH-220 Vegetation Harvester (2006 on)	\$278,260 (5-year present worth value)
<b><u>Individual Slip Owners</u></b>	
Weed Rakes	\$366 (5-year present worth value)





## SECTION 9

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# **Appendix A**

## **Herbicide Labels**

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# NAVIGATE®

A SELECTIVE HERBICIDE FOR CONTROLLING CERTAIN UNWANTED AQUATIC PLANTS

**ACTIVE INGREDIENTS:**

Butoxyethyl ester, 2,4-Dichlorophenoxyacetic acid, .....27.6%

**INERT INGREDIENTS:** .....72.4%

**TOTAL 100.0%**

\*Isomer specific by AOAC Method, Equivalent to 2,4-Dichlorophenoxyacetic Acid 19%

EPA Reg. No. 228-378-8959

EPA Est. No. 228-IL-1

**KEEP OUT OF REACH OF CHILDREN  
CAUTION**

For Chemical Emergency, Spill, Leak, Fire, Exposure or Accident call Chemtrec Day or Night 1-800-424-9300

**PRECAUTIONARY STATEMENTS**

**HAZARDS TO HUMANS AND DOMESTIC ANIMALS**

**CAUTION**

Harmful if swallowed, absorbed through skin, or inhaled. Causes eye irritation. Avoid contact with skin, eyes or clothing. Avoid breathing dust. When handling this product, wear chemical resistant gloves. Wash thoroughly with soap and water after handling. When mixing, loading, or applying this product or repairing or cleaning equipment used with this product, wear eye protection (face shield or safety glasses), chemical resistant gloves, long-sleeved shirt, long pants, socks and shoes. It is recommended that safety glasses include front, brow and temple protection. Wash hands, face and arms with soap and water as soon as possible after mixing, loading, or applying this product. Wash hands, face and hands with soap and water before eating, smoking or drinking. Wash hands and arms before using toilet. After work, remove all clothing and shower using soap and water. Do not reuse clothing worn during the previous day's mixing and loading or application of this product without cleaning first. Clothing must be kept and washed separately from other household laundry. Remove saturated clothing as soon as possible and shower.

**STATEMENT OF PRACTICAL TREATMENT**

**IF SWALLOWED:** Call a physician or Poison Control Center. Drink 1 or 2 glasses of water and induce vomiting by touching back of throat with finger. If person is unconscious, do not give anything by mouth and do not induce vomiting.

**IF ON SKIN:** Wash with plenty of soap and water. Get medical attention.

**IF INHALED:** Remove victim to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. Get medical attention.

**IF IN EYES:** Flush eyes with plenty of water. Call a physician if irritation persists.

**ENVIRONMENTAL HAZARDS**

This product is toxic to fish. Drift or runoff may adversely affect fish and non-target plants. Do not apply to water except as specified on this label. Do not contaminate water when disposing of equipment washwaters. Unless an approved assay indicates the 2,4-D concentration is 100 ppb (0.1 ppm) or less, or, only growing crops and non-crop areas labeled for direct treatment with 2,4-D will be affected, do not use water from treated areas for irrigating plants or mixing sprays for agricultural or ornamental plants. Unless an approved assay indicates the 2,4-D concentration is 70 ppb (0.07 ppm) or less, do not use water from treated areas for potable water (drinking water).

Clean spreader equipment thoroughly before using it for any other purposes. Vapors from this product may injure susceptible plants.

Most cases of ground water contamination involving phenoxy herbicides such as 2,4-D have been associated with mixing/loading and disposal sites. Caution should be exercised when handling 2,4-D pesticides at such sites to prevent contamination of ground water supplies. Use of closed systems for mixing or transferring this pesticide will reduce the probability of spills. Placement of the mixing/loading equipment on an impervious pad to contain spills will help prevent ground water contamination.

**STORAGE AND DISPOSAL**

**STORAGE**

Always use original container to store pesticides in a secure warehouse or building. Do not store near seeds, fertilizers, insecticides or fungicides. Do not stack more than two pallets high. Do not contaminate water, food or feed by storage or disposal. It is recommended that a SARA Title III emergency response plan be created for storage facilities. Do not transport in passenger compartment of any vehicle.

**PESTICIDE DISPOSAL**

Pesticide wastes are toxic. If container is damaged or if pesticide has leaked, clean up spilled material. Improper disposal of excess pesticide is a violation of Federal law and may contaminate ground water. 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.

**CONTAINER DISPOSAL**

Do not reuse empty bag. Completely empty bag into application equipment. Then dispose of empty bag in a sanitary landfill or by incineration, or, if allowed by State and local authorities, by burning. If bag is burned, stay out of smoke.

MANUFACTURED FOR:



SEE ADDITIONAL PRECAUTIONS AND DIRECTIONS ON BACK

www.appliedbiochemists.com

NAVIGATE is a trademark of Applied Biochemists

**NET WT. 50 LBS. (22.68 KG)**

**13529**

## DIRECTIONS FOR USE

IT IS A VIOLATION OF FEDERAL LAW TO USE THIS PRODUCT IN A MANNER INCONSISTENT WITH ITS LABELING.

READ THIS ENTIRE LABEL BEFORE USING THIS PRODUCT

### GENERAL PRECAUTIONS AND RESTRICTIONS

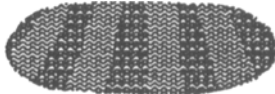
Do not use in or near a greenhouse.

### OXYGEN RATIO

Fish breathe oxygen in the water and a water-oxygen ratio must be maintained. Decaying weeds use up oxygen, but during the period when NAVIGATE® should be used, the weed mass is fairly sparse and the weed decomposition rate is slow enough so that the water-oxygen ratio is not disturbed by treating the entire area at one time.

If treatments must be applied later in the season when the weed mass is dense and repeat treatments are needed spread granules in lanes, leaving buffer strips which can then be treated when vegetation in treated lanes has disintegrated. During the growing season, weeds decompose in a 2 to 3 week period following treatment.

Buffer lanes should be 50 to 100 feet wide. Treated lanes should be as wide as the buffer strips. (See illustration below)



### WATER pH

Best results are generally obtained if the water to be treated has a pH less than 8. A pH of 8 or higher may reduce weed control. If regrowth occurs within a period of 6 to 8 weeks, a second application may be needed.

### PERMIT TO USE CHEMICALS IN WATER

In many states, permits are required to control weeds by chemical means in public water. If permits are required, they may be obtained from the Chief, Fish Division, State Department of Conservation or the State Department of Public Health.

### GENERAL INFORMATION

NAVIGATE® is formulated on special heat treated attaclay granules that resist rapid decomposition in water, sink quickly to lake or pond bottoms and release the weed killing chemical in the critical root zone area. This product is designed to selectively control the weeds listed on the label. While certain other weeds may be suppressed, control may be incomplete. Reduced control may occur in lakes where water replacement comes from bottom springs.

### WHEN TO APPLY

For best results, spread NAVIGATE® in the spring and early summer, during the time weeds start to grow. If desired, this timing can be checked by sampling the lake bottom in areas heavily infested with weeds the year before. If treatments are delayed until weeds form a dense mat or reach the surface, two treatments may be necessary. Make the second treatment when weeds show signs of recovery. Treatments made after September may be less effective depending upon water temperatures and weed growth. Occasionally, a second application will be necessary if heavy regrowth occurs or weeds reinfest from untreated areas.

### HOW TO APPLY

**FOR LARGE AREAS:** Use a fertilizer spreader or mechanical seeder such as the Gerber or Gandy or other equipment capable of uniformly applying this product. Before spreading any chemical, calibrate your method of application to be sure of spreading the proper amount. When using boats and power equipment, you must determine the proper combination of (1) boat speed (2) rate of delivery from the spreader, and (3) width of swath covered by the granules.

**FOR SMALL AREAS:** (Around Docks or Isolated Patches of Weeds): Use a portable spreader such as the Cyclone seeder or other equipment capable of uniformly applying this product. Estimate or measure out the area you want to treat. Weight out the amount of material needed and spread this uniformly over the area. More uniform coverage is obtained by dividing the required amount in two and covering the area twice, applying the second half at right angles to the first.

Use the following formula to calibrate your spreader's delivery in pounds of NAVIGATE PER MINUTE:

$$\frac{\text{Miles per hour} \times \text{spreader width} \times \text{pounds per acre}}{495} = \text{pounds per minute}$$

Example: To apply 100 pounds of NAVIGATE per acre using a spreader that covers a 20 foot swath from a boat traveling at 4 miles per hour, set the spreader to deliver 16 pounds of NAVIGATE granules per minute.

$$\frac{4 \text{ mph} \times 20 \text{ feet} \times 100 \text{ Lbs./A}}{495} = 16 \text{ Lbs./Min.}$$

### AMOUNTS TO USE

Rates of application vary with resistance of weed species to the chemical, density of weed mass at time of treatment, stage of growth, water depth, and rate of water flow through the treated area. Use the higher rate for dense weeds, when water is more than 8 feet deep and where there is a large volume turnover.

	NAVIGATE POUNDS PER ACRE	NAVIGATE POUNDS PER 2000 SQ. FT.
<b>SUSCEPTIBLE WEEDS</b>		
Water Milfoil (Myriophyllum spp.) Water stargrass (Heteranthera dubia)	100 TO 200	5
<b>SLIGHTLY TO MODERATELY RESISTANT WEEDS</b>		
Bladderwort (Utricularia spp.) White water Lily (Nymphaea spp.) Yellow water lily (Nuphar spp.) Or spatterdock* Water shield (Brasenia spp.) Water chestnut (Trapa natans) Coontail* (Ceratophyllum Demersum)	150 to 200	7-1/2 to 10
*Repeat treatments may be needed		

### LIMITED WARRANTY AND DISCLAIMER

The manufacturer warrants that this material conforms to its chemical description and is reasonably fit for the purposes stated on the label when used in accordance with directions under normal conditions of use and Buyer assumes all risk of any use contrary to such directions. SELLER MAKES NO OTHER WARRANTY EXPRESSED OR IMPLIED AS TO FITNESS OR MERCHANTABILITY, AND NO AGENT OF SELLER IS AUTHORIZED TO DO SO EXCEPT IN WRITING WITH SPECIFIC REFERENCE TO THIS WARRANTY. In no event shall the Seller's liability for any breach of warranty exceed the purchase price of the material as to which a claim is made.

# AQUASHADE®

## AQUATIC PLANT GROWTH CONTROL

U.S. Pat. No. 4,042,367

EPA Reg. No. 33068-1

EPA Est. No. 42291-GA-1

**AQUASHADE FILTERS WAVELENGTHS OF SUNLIGHT  
TO CONTROL UNWANTED AQUATIC WEEDS AND ALGAE  
IN NATURAL AND MANMADE CONTAINED LAKES AND PONDS  
..INCLUDING ORNAMENTAL, RECREATIONAL, FISH REARING &  
FISH FARMING BODIES OF WATER WITH LITTLE OR NO OUTFLOW.  
ALSO COLORS WATER A PLEASING AQUA-BLUE AND  
ENHANCES THE AESTHETIC QUALITIES OF A WATER BODY.**

### ACTIVE INGREDIENTS:

Acid Blue 9 .....	23.63%
Acid Yellow 23 .....	2.39%
INERT INGREDIENTS .....	73.98%
TOTAL .....	100.00%

**KEEP OUT OF REACH OF CHILDREN**

## CAUTION

### STATEMENT OF PRACTICAL TREATMENT:

Avoid contact with skin, eyes, and clothing. Wash after handling.

**See other cautions below.**

### DIRECTIONS FOR USE

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

### GENERAL CLASSIFICATION

#### RE-ENTRY STATEMENT

May be used for swimming AFTER COMPLETE DISPERSAL

### WHERE TO APPLY

Natural and manmade contained Ponds & Lakes with little or no overflow.

Do not apply directly to streams, other natural bodies of water or any body of water not under total control of the user.

Do not apply to water that will be used for human consumption.

### WHEN TO APPLY

For best results, apply before the growing season starts, or when growth is on the bottom. Less effective when growth is near surface (2 ft.). In that case, physical removal or chemical killing of growth already near or above surface may be done before **AQUASHADE** is applied. When using an aquatic herbicide, follow label restrictions, precautions and directions for use.

### RECOMMENDED DOSAGE RATES

Apply one gallon (1 ppm) per acre of water with 4 foot average depth (one half deepest point).

1 ppm – When submersed weeds and algae are growing at depths greater than 2 feet, such as: Leafy Pondweed, Chara, Slender Naiad; Filamentous Green and Bluegreen algae; Spirogyra, Watermilfoil (treat early).

2 ppm – to PREVENT "Tuber" production of HYDRILLA.

### HOW TO APPLY

Pour from the container near shoreline into water. It will mix throughout. For early control, pour onto the ICE in a meter diameter circle. It will melt a hole and disperse underneath.

### PRECAUTIONARY STATEMENTS

#### CAUTION

### HAZARDS TO HUMANS AND DOMESTIC ANIMALS

Do not apply to water that will be used for human consumption.

### ENVIRONMENTAL HAZARDS

Shoreline non-target plants (cattails, water lilies) may suffer contact burn if material is accidentally poured on them.

Do not contaminate water when disposing of equipment washwaters.

Do not apply directly to streams, other natural bodies of water or any body of water not under total control of the user.

### PHYSICAL or CHEMICAL HAZARDS

Do not apply to water for swimming pools if chlorine is used, as this will cause the color to be lost.

### STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage or disposal.

Store in original container in a cool dry place. Keep from freezing.

Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by other procedures approved by State and Local authorities.

Waste resulting from this product may be disposed of onsite or at an approved waste disposal facility.

### NOTICE

Neither the manufacturer nor the seller makes any warranty, expressed or implied, concerning the use of this product other than indicated on the label. Buyer assumes all risk of use of this material when such use is contrary to label instructions. Read and follow the label directions carefully.

### AQUASHADE

A BRAND OF applied biochemists



PULL HERE TO OPEN ►



## **Landscape and Aquatic Herbicide**

**TO PREVENT ACCIDENTAL POISONING, NEVER PUT INTO FOOD, DRINK, OR OTHER CONTAINERS, AND USE STRICTLY IN ACCORDANCE WITH ENTIRE LABEL.**

**DO NOT USE THIS PRODUCT FOR REFORMULATION.**

*Active Ingredient:*

Diquat dibromide [6,7-dihydrodipyrido (1,2-a:2',1'-c) pyrazinediium dibromide] . . . . . 37.3%

*Other Ingredients:* . . . . . 62.7%

*Total:* . . . . . 100.0%

*Contains 2 lbs. diquat cation per gal. as 3.73 lbs. salt per gal.*

**KEEP OUT OF REACH OF CHILDREN.**

### **WARNING/AVISO**

*Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)*

*See additional precautionary statements and directions for use inside booklet.*

*EPA Reg. No. 100-1091*

*EPA Est. 100-TX-001*

*Product of United Kingdom*

*Formulated in the USA*

**SCP 1091A-L2 0901**

**154290**

## **2.5 gallons**

**U.S. Standard  
Measure**



## Reward®

FIRST AID	
<b>If swallowed</b>	<ul style="list-style-type: none"><li>• Call a Poison Control Center or doctor immediately for treatment advice.</li><li>• Immediately give water or milk to drink and induce vomiting by inserting finger in throat.</li><li>• Do not induce vomiting or give anything by mouth to an unconscious person.</li><li>• Take person and product container to the nearest hospital or physician fast.</li><li>• PROMPT TREATMENT IS ESSENTIAL TO COUNTERACT POISONING and should be initiated before signs and symptoms of injury appear.</li></ul>
<b>If on skin or clothing</b>	<ul style="list-style-type: none"><li>• Take off contaminated clothing.</li><li>• Rinse skin immediately with plenty of water for 15-20 minutes.</li><li>• Call a Poison Control Center or doctor for treatment advice.</li></ul>
<b>If in eyes</b>	<ul style="list-style-type: none"><li>• Hold eye open and rinse slowly and gently with water for 15-20 minutes.</li><li>• Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.</li><li>• Call a Poison Control Center or doctor for treatment advice.</li></ul>
<b>If inhaled</b>	<ul style="list-style-type: none"><li>• Move person to fresh air.</li><li>• If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth, if possible.</li><li>• Call a Poison Control Center or doctor for further treatment advice.</li></ul>
<b>NOTE TO PHYSICIAN</b> CALL SYNGENTA MEDICAL EMERGENCY ASSISTANCE 1-800-888-8372 at any hour to obtain toxicology information and a diquat analysis. To be effective, treatment for diquat poisoning must begin <b>IMMEDIATELY</b> . Treatment consists of binding diquat in the gut with suspensions of activated charcoal or bentonite clay, administration of cathartics to enhance elimination, and removal of diquat from the blood by charcoal hemoperfusion or continuous hemodialysis.	
Have the product container or label with you when calling a poison control center or doctor, or going for treatment.	
<b>HOT LINE NUMBER</b> For 24-Hour Medical Emergency Assistance (Human or Animal) or Chemical Emergency Assistance (Spill, Leak, Fire, or Accident), Call <b>1-800-888-8372</b>	

## PRECAUTIONARY STATEMENTS

### Hazards to Humans and Domestic Animals

#### WARNING/AVISO

May be fatal if absorbed through skin. Harmful if swallowed or inhaled. Causes substantial, but temporary, eye injury. Causes skin irritation. Contact with irritated skin, or a cut, or repeated contact with intact skin may result in poisoning. Do not get in eyes, on skin, or on clothing. Avoid breathing vapor or spray mist. Do not feed forage from treated crops to livestock. Keep livestock and pets out of treated fields and crop areas.

#### Personal Protective Equipment (PPE)

##### Applicators and other handlers must wear:

- Coveralls over short-sleeved shirt and short pants or coveralls over long-sleeved shirt and long pants
- Waterproof gloves
- Chemical-resistant footwear plus socks
- Protective eyewear
- Chemical-resistant headgear for overhead exposure
- Chemical-resistant apron when cleaning equipment, mixing, or loading

**Exception:** After this product has been diluted with at least 50 gallons of water, applicators for AQUATIC SURFACE APPLICATIONS must, at a minimum, wear (Note – Mixers and Loaders for this application method must still wear the Personal Protective Equipment (PPE) as described in the above section):

- Long-sleeved shirt and long pants
- Shoes plus socks
- Waterproof gloves
- Protective eyewear

**Exception:** At a minimum, applicators for AQUATIC SUBSURFACE APPLICATIONS must wear (Note – Mixers and Loaders for this application method must still wear the Personal Protective Equipment (PPE) as described in the above section):

## Reward®

- Short-sleeved shirt and short pants
- Waterproof gloves
- Chemical-resistant footwear plus socks

Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them. Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

### Engineering Control Statements

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240(d)(4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS. Mixers, loaders, and applicators using closed systems who meet these requirements may wear: long-sleeved shirt and long pants, protective eyewear, waterproof gloves, shoes plus socks, and a chemical-resistant apron when mixing, loading, or cleaning equipment. If handling tasks are performed from inside an enclosed cab or aircraft with enclosed cockpits that meet these requirements may wear: long-sleeved shirt, long pants, shoes and socks for the labeling-specified PPE. All labeling-specified PPE must be immediately available for use in an emergency. All applicable requirements as specified in 40 CFR 170.240(d)(4-6) must be followed.

### User Safety Recommendations

#### Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

### Environmental Hazards (Terrestrial and Aquatic Uses)

This pesticide is toxic to aquatic invertebrates. **For Terrestrial Uses**, do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment wash waters. **For Aquatic Uses**, do not apply directly to water except as specified on this label. Treatment of dense weed areas may result in oxygen loss from decomposition of dead weeds. This loss of oxygen may cause fish suffocation. Therefore, treat only 1/3-1/2 of the water body area at one time, especially if dense areas of weeds and/or algae exist, and wait 14 days between treatments.

Necessary approval and/or permits should be obtained prior to application if required. Consult the responsible State Agencies (i.e., Fish and Game Agencies or Department of Natural Resources) before making applications to public waters.

## CONDITIONS OF SALE AND LIMITATION OF WARRANTY AND LIABILITY

**NOTICE:** Read the entire Directions for Use and Conditions of Sale and Limitation of Warranty and Liability before buying or using this product. If the terms are not acceptable, return the product at once, unopened, and the purchase price will be refunded.

The Directions for Use of this product should be followed carefully. It is impossible to eliminate all risks inherently associated with the use of this product. Crop injury, ineffectiveness or other unintended consequences may result because of such factors as manner of use or application, weather or crop conditions, presence of other materials or other influencing factors in the use of the product, which are beyond the control of SYNGENTA CROP PROTECTION, Inc. or Seller. All such risks shall be assumed by Buyer and User, and Buyer and User agree to hold SYNGENTA and Seller harmless for any claims relating to such factors.

SYNGENTA warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated in the Directions for Use, subject to the inherent risks referred to above, when used in accordance with directions under normal use conditions. This warranty does not extend to the use of the product contrary to label instructions, or under abnormal conditions or under conditions not reasonably foreseeable to or beyond the control of Seller or SYNGENTA, and Buyer and User assume the risk of any such use. SYNGENTA MAKES NO WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE NOR ANY OTHER EXPRESS OR IMPLIED WARRANTY EXCEPT AS STATED ABOVE.

In no event shall SYNGENTA or Seller be liable for any incidental, consequential or special damages resulting from the use or handling of this product. **THE EXCLUSIVE REMEDY OF THE USER OR BUYER, AND THE EXCLUSIVE LIABILITY OF SYNGENTA AND SELLER FOR ANY AND ALL CLAIMS, LOSSES, INJURIES OR DAMAGES (INCLUDING CLAIMS BASED ON BREACH OF WARRANTY, CONTRACT, NEGLIGENCE, TORT, STRICT LIABILITY OR OTHERWISE) RESULTING FROM THE USE OR HANDLING OF THIS PRODUCT, SHALL BE THE RETURN OF THE PURCHASE PRICE OF THE PRODUCT OR, AT THE ELECTION OF SYNGENTA OR SELLER, THE REPLACEMENT OF THE PRODUCT.**

SYNGENTA and Seller offer this product, and Buyer and User accept it, subject to the foregoing Conditions of Sale and Limitations of Warranty and of Liability, which may not be modified except by written agreement signed by a duly authorized representative of SYNGENTA.

## DIRECTIONS FOR USE

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

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

**READ ENTIRE LABEL. USE STRICTLY IN ACCORDANCE WITH PRECAUTIONARY STATEMENTS AND DIRECTIONS, AND WITH APPLICABLE STATE AND FEDERAL REGULATIONS.**

**DO NOT APPLY THIS PRODUCT THROUGH ANY TYPE OF IRRIGATION SYSTEM.**

### AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for 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. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

**Do not enter or allow worker entry into treated areas during the restricted-entry 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 over short-sleeved shirt and short pants, or coveralls over long-sleeved shirt and long pants
- Waterproof gloves
- Chemical-resistant footwear plus socks
- Protective eyewear
- Chemical-resistant headgear for overhead exposure

### NON-AGRICULTURAL USE REQUIREMENTS

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard for agricultural pesticides (40 CFR part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses.

**Keep all unprotected persons out of operating areas or vicinity where there may be drift.**

**For terrestrial uses,** do not enter or allow entry of maintenance workers into treated areas, or allow contact with treated vegetation wet with spray, dew, or rain, without appropriate protective clothing until spray has dried.

**For aquatic uses,** do not enter treated areas while treatments are in progress.

## STORAGE AND DISPOSAL

### Prohibitions

Do not contaminate water, food, or feed by storage, disposal, or cleaning of equipment. Open dumping is prohibited.

### Storage

Keep pesticide in original container. Do not put concentrate or dilute into food or drink containers. Do not contaminate feed, foodstuffs, or drinking water. Do not store or transport near feed or food. Store at temperatures above 32°F. For help with any spill, leak, fire, or exposure involving this material, call **1-800-888-8372**.

### Pesticide Disposal

Pesticide wastes are toxic. 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.

### Container Disposal

Do not reuse container. Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or incineration, or if allowed by State and local authorities, by burning. If burned, stay out of smoke.

**CONTAINER IS NOT SAFE FOR FOOD, FEED, OR DRINKING WATER!**

## DIRECTIONS

Reward Landscape and Aquatic Herbicide is a nonvolatile herbicidal chemical for use as a general herbicide to control weeds in noncrop and aquatic areas. Absorption and herbicidal action is usually quite rapid with effects visible in a few days. Reward Landscape and Aquatic Herbicide controls weeds by interfering with photosynthesis within green plant tissue. Weed plants should be succulent and actively growing for best results. Rinse all spray equipment thoroughly with water after use. Avoid Spray Drift to crops, ornamentals, and other desirable plants during application, as injury may result. Application to muddy water may result in reduced control. Minimize creating muddy water during application. Use of dirty or muddy water for Reward Landscape and Aquatic Herbicide dilution may result in reduced herbicidal activity. Avoid applying under conditions of high wind, water flow, or wave action.

### Spray Drift Management

Avoiding spray drift at the application site is the responsibility of the applicator and the grower.

The interaction of many equipment- and weather-related factors determine the potential for spray drift. The applicator and the grower are responsible for considering all these factors when making decisions.

The following drift management requirements must be followed to avoid off-target movement from aerial applications to agricultural field crops. These requirements do not apply to forestry applications, public health uses, or to applications using dry formulations.

The distance of the outermost nozzles on the boom must not exceed  $\frac{3}{4}$  the length of the wingspan or rotor.

Nozzles must always point backward parallel with the air stream and never be pointed downward more than 45 degrees.

Where states have more stringent regulations, they should be observed.

### Droplet Size

The most effective way to reduce drift potential is to apply large droplets. The best drift management strategy is to apply the largest droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential, but will not prevent drift if applications are made improperly, or under unfavorable environmental conditions (See **Wind, Temperature and Humidity**, and **Temperature Inversions**).

### Controlling Droplet Size

- **Volume** – Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows produce larger droplets.
- **Pressure** – Do not exceed the nozzle manufacturer's recommended pressures. For many nozzle types, lower pressure produces larger droplets. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.
- **Number of Nozzles** – Use the minimum number of nozzles that provide uniform coverage.
- **Nozzle Orientation** – Orienting nozzles so that the spray is released parallel to the airstream produces larger droplets than other orientations and is the recommended practice. Significant deflection from horizontal will reduce droplet size and increase drift potential.
- **Nozzle Type** – Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles. Solid stream nozzles oriented straight back produce the largest droplets and the lowest drift.

### Boom Length

For some use patterns, reducing the effective boom length to less than  $\frac{3}{4}$  of the wingspan or rotor length may further reduce drift without reducing swath width.

### Application Height

Applications should not be made at a height greater than 10 ft. above the top of the target plants, unless a greater height is required for aircraft safety. Making applications at the lowest height that is safe reduces exposure of droplets to evaporation and wind.

### Swath Adjustment

When applications are made with a crosswind, the swath will be displaced downwind. Therefore, on the up and downwind edges of the field, the applicator must compensate for this displacement by adjusting the path of the aircraft upwind. Swath adjustment distance should increase with increasing drift potential (higher wind, smaller drops, etc.).

### Wind

Drift potential is lowest between wind speeds of 2-10 mph. However, many factors, including droplet size and equipment type, determine drift potential at any given speed. Application should be avoided below 2 mph due to variable wind direction and high inversion potential.

**Note:** Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect spray drift.

### Temperature and Humidity

When making applications in low relative humidity, set up equipment to produce larger droplets to compensate for evaporation. Droplet evaporation is most severe when conditions are both hot and dry.

### Temperature Inversions

Applications should not occur during a temperature inversion because drift potential is high. Temperature inversions restrict vertical air mixing, which causes small suspended droplets to remain in a concentrated cloud. This cloud can move in unpredictable directions due to the light variable winds common during inversions. Temperature inversions are characterized by increasing temperatures with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a concentrated cloud (under low wind conditions) indicates an inversion, while smoke that moves upward and rapidly dissipates indicates good vertical air mixing.

### Sensitive Areas

The pesticide should only be applied when the wind is blowing away from adjacent sensitive areas (e.g., residential areas, bodies of water, known habitat for threatened or endangered species, non-target crops).

### Commercial Greenhouses And Nurseries

For general weed control in commercial greenhouses (beneath benches), (field grown and container stock), and other similar areas, Reward Landscape and Aquatic Herbicide may be applied preplant or postplant preemergence in field grown ornamental nursery plantings or postemergence as a directed spray. Reward Landscape and Aquatic Herbicide may also be applied preemergence in ornamental seed crops (U.S., except CA). Avoid contact with desirable foliage as injury may occur. Do not use on food or feed crops.

**Spot spray:** 1-2 qts. Reward Landscape and Aquatic Herbicide plus the labeled rate of a 75% or greater nonionic surfactant per 100 gals. of water, or 0.75 oz. (22 mls.) Reward Landscape and Aquatic Herbicide plus the labeled rate of a 75% or greater nonionic surfactant per 1 gal. of water.

**Broadcast:** 1-2 pts. Reward Landscape and Aquatic Herbicide in a minimum of 15 gals. of water per acre. Add the labeled rate of a 75% or greater nonionic surfactant per 100 gals. of spray mixture. Use an adequate spray volume to insure good coverage.

### Ornamental Seed Crops (Flowers, Bulbs, Etc.) U.S., Except CA

For preharvest desiccation of ornamental seed crops. NOT FOR FOOD OR FIBER CROPS.

**Broadcast (Air or Ground):** 1.5-2 pts. Reward Landscape and Aquatic Herbicide plus the labeled rate of a 75% or greater nonionic surfactant per acre in sufficient water (minimum of 5 gals. by air; 15 gals. by ground) for desiccation and weed burndown. Repeat as needed at no less than 5-day intervals up to three applications. Do not use seed, screenings, or waste as feed or for consumption.

### Directions For Landscape, Industrial, Recreational, Commercial, Residential, and Public Areas

Reward Landscape and Aquatic Herbicide provides fast control of broadleaf and grassy weeds in industrial, recreational, golf course, commercial, residential, and public areas.

Reward Landscape and Aquatic Herbicide is a nonselective herbicide that rapidly kills undesirable above ground weed growth in 24-36 hours. Avoid application of Reward Landscape and Aquatic Herbicide to desirable plants.

Reward Landscape and Aquatic Herbicide is a contact/desiccant herbicide; it is essential to obtain complete coverage of the target weeds to get good control. Improper application technique and/or application to stressed weeds may result in unacceptable weed control. For best results, apply to actively growing, young weeds.

Difficult weeds (such as perennial or deeply-rooted weeds) can often be controlled by tank mixing Reward Landscape and Aquatic Herbicide with other systemic-type herbicides. Refer to other product labels for specific application directions.

For residual weed control, tank mix Reward Landscape and Aquatic Herbicide with a pre-emergent herbicide labeled for the intended use site. When mixing Reward Landscape and Aquatic Herbicide with another herbicide, it is recommended to mix just a small amount first to determine if the mixture is physically compatible before proceeding with larger volumes.

Syngenta has not tested all possible tank mixtures with other herbicides for compatibility, efficacy or other adverse effects. Before mixing with other herbicides Syngenta recommends you first consult your state experimental station, state university or extension agent.

**Grounds maintenance weed control:** Reward Landscape and Aquatic Herbicide can be used as a spot or broadcast spray to control weeds in public, commercial and residential landscapes, including landscape beds, lawns, golf courses and roadsides. Reward Landscape and Aquatic Herbicide can also be used for weed control around the edges and nonflooded portions of ponds, lakes and ditches.

**Trim and edge weed control:** Reward Landscape and Aquatic Herbicide can be used to eliminate undesired grass and broadleaf plant growth in a narrow band along driveways, walkways, patios, cart paths, fence lines, and around trees, ornamental gardens, buildings, other structures, and beneath noncommercial greenhouse benches. Vegetation control with Reward Landscape and Aquatic Herbicide is limited to the spray application width. Do not exceed the labeled rate of Reward Landscape and Aquatic Herbicide as excessive rates may result in staining of concrete-based materials.

Reward Landscape and Aquatic Herbicide, since it does not translocate systemically, can be used as an edging or pruning tool when precisely applied to select areas of grass or to undesirable growth on desirable ornamental bedding plants, ground covers, etc.

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**Industrial weed control:** Reward Landscape and Aquatic Herbicide can be used as a spot or broadcast spray either alone or in combination with other herbicides as a fast burndown or control weeds in rights-of-ways, railroad beds/yards, highways, roads, dividers and medians, parking lots, pipelines, pumping stations, public utility lines, transformer stations and substations, electric utilities, storage yards, and other noncrop areas.

**Spot spray:** 1-2 qts. of Reward Landscape and Aquatic Herbicide plus the labeled rate of a 75% or greater nonionic surfactant per 100 gals. Water, or 0.75 oz. (22 mls) Reward Landscape and Aquatic Herbicide plus the labeled rate of a 75% or greater nonionic surfactant per 1 gal. of water.

**Broadcast:** 1-2 pts. Reward Landscape and Aquatic Herbicide in a minimum of 15 gals. of water per acre. Add the labeled rate of 75% or greater nonionic surfactant per 100 gals. spray mixture. Use an adequate spray volume to insure good coverage. Greater water volumes are necessary if the target plants are tall and/or dense. It is recommended that 60 gals. or greater water volume be used to obtain good coverage of dense weeds.

### **Turf Renovation (All Turf Areas Except Commercial Sod Farms)**

To desiccate golf course turf and other turf areas prior to renovation, apply 1-2 pts. of Reward Landscape and Aquatic Herbicide per acre plus the labeled rate of a 75% or greater nonionic surfactant in 20-100 gals. of water (4 teaspoons of Reward Landscape and Aquatic Herbicide plus the labeled rate of a 75% or greater nonionic surfactant per 1 gal. of water) using ground spray equipment. Apply for full coverage and thorough contact with the turfgrass. Apply only when the turf is dry, free from dew and incidental moisture. For enhanced turf desiccation, especially in the case of thick turfgrass, water volumes should approach 100 gals. of water per acre.

For **suppression** of regrowth and quick desiccation of treated turfgrass, Reward Landscape and Aquatic Herbicide may be mixed with other systemic nonselective or systemic postemergence grassy weed herbicides. Refer to other product labels for specific application directions and restrictions.

Avoid spray contact with, or spray drift to, foliage of ornamental plants or food crops.

Do not graze livestock on treated turf or feed treated thatch to livestock.

### **Dormant Established Turfgrass (Bermudagrass, Zoysiagrass), Nonfood or Feed Crop**

For control of emerged annual broadleaf and grass weeds, including Little Barley\*, Annual Bluegrass, Bromes including Rescuegrass, Sixweeks fescue, Henbit, Buttercup, and Carolina Geranium in established dormant bermudagrass lawns, parks, golf courses, etc.

Apply 1-2 pts. Reward Landscape and Aquatic Herbicide per acre in 20-100 gals. of spray mix by ground as a broadcast application. Add the labeled rate of a 75% or greater nonionic surfactant per 100 gals. of spray mixture.

Bermudagrass must be dormant at application. Application to actively growing bermudagrass may cause delay or permanent injury. Users in the extreme Southern areas should be attentive to the extent of dormancy at the time of application.

\*For control of Little Barley, apply Reward Landscape and Aquatic Herbicide prior to the mid-boot stage.

### **Aquatic Use Directions**

#### **New York – Not for Sale or Use in New York State without Supplemental Special Local Needs Labeling.**

Necessary approval and/or permits should be obtained prior to application if required. Consult the responsible State Agencies (i.e., Fish and Game Agencies or Department of Natural Resources). Treatment of dense weed areas may result in oxygen loss from decomposition of dead weeds. This loss of oxygen may cause fish suffocation. Therefore, treat only 1/3-1/2 of the water body area at one time and wait 14 days between treatments.

For application only to **still water** (i.e. ponds, lakes, and drainage ditches) where there is minimal or no outflow to public waters.

and/or

For applications to **public waters** in ponds, lakes, reservoirs, marshes, bayous, drainage ditches, canals, streams, rivers, and other slow-moving or quiescent bodies of water for control of aquatic weeds. For use by:

- Corps of Engineers; or
- Federal or State Public Agencies (i.e., Water Management District personnel, municipal officials); or
- Applicators and/or Licensees (certified for aquatic pest control) that are authorized by the State or Local government.

## Reward®

Treated water may be used according to the following table or until such time as an approved assay (example: PAM II Spectromatic Method) shows that the water does not contain more than the designated maximum contaminant level goal (MCLG) of 0.02 mg./l. (ppm) of diquat dibromide (calculated as the cation):

### Water Use Restrictions Following Applications With Reward Landscape And Aquatic Herbicide (Days)

Application Rate	Drinking	Fishing and Swimming	Livestock Consumption	Spray Tank Applications** and Irrigation to Turf and Ornamentals	Spray Tank Applications** and Irrigation to Food Crops
2 gals./surface acre	3 days	0	1 day	3 days	5 days
1 gal./surface acre	2 days	0	1 day	2 days	5 days
0.75 gal./surface acre	2 days	0	1 day	2 days	5 days
0.50 gal./surface acre	1 day	0	1 day	1 day	5 days
Spot Spray* (< 0.5 gal./surface acre)	1 day	0	1 day	1 day	5 days

\*Rates refer to total surface area.

\*\*For preparing agricultural sprays for food crops, turf or ornamentals (to prevent phytotoxicity), do not use water treated with Reward Landscape and Aquatic Herbicide before the specified time period.

When the contents of more than one spray tank is necessary to complete a single aquatic application, no water holding restrictions apply between the consecutive spray tanks.

No applications are to be made in areas where commercial processing of fish, resulting in the production of fish protein concentrate or fish meal, is practiced. Before application, coordination and approval of local and/or State authorities must be obtained.

### Apply Reward Landscape and Aquatic Herbicide in Accordance With the Following Table

Weed Species	Subsurface or Bottom Placement Gals./Surface Acre*	Surface Gals./Surface Acre*
Bladderwort ( <i>Utricularia</i> spp.)	1-2	2
Coontail ( <i>Ceratophyllum demersum</i> )	2	2
Eloдея ( <i>Elodea</i> spp.)	2	2
Naiad ( <i>Najas</i> spp.)	1-2	2
Pondweeds <sup>1</sup> ( <i>Potamogeton</i> spp.)	2	2
Watermilfoils ( <i>Myriophyllum</i> spp.)	1-2	2
Hydrilla ( <i>Hydrilla verticillata</i> )	2	2
Waterlettuce <sup>2</sup> ( <i>Pistia Stratiotes</i> )	NA	0.5 - 0.75
Waterhyacinth <sup>2</sup> ( <i>Eichhornia crassipes</i> )	NA	0.5 - 0.75
Pennywort <sup>3</sup> ( <i>Hydrocotyle</i> spp.)	NA	0.5 - 0.75
Frog's Bit <sup>6</sup> ( <i>Limnobium spongia</i> )	NA	0.5 - 0.75
Salvinia <sup>2</sup> ( <i>Salvinia</i> spp.)	NA	0.5 - 0.75
Duckweed <sup>4</sup> ( <i>Lemna</i> spp.)	NA	1
Cattails <sup>3</sup> ( <i>Typha</i> spp.)	NA	1-2
Algae <sup>5</sup> ( <i>Spirogyra</i> spp. & <i>Pithophora</i> spp.)	1-2	2

\*For water less than or equal to 2 ft. in average depth of treatment area, use a maximum of 1 gal. Reward Landscape and Aquatic Herbicide per surface acre. Lowest rates should be used in shallow areas where the water depth is considerably less than the average depth of the entire treatment area, for example, shallow shoreline areas. At water temperatures below 50°-60°F, efficacy and immediacy of results may be reduced.

<sup>1</sup>Reward Landscape and Aquatic Herbicide controls *Potamogeton* species except Richardson's pondweed (*P. richardsonii*). For control of *P. robbinsii*, applications must be made when the plants are in the early stages of growth such as in Spring and early Summer.

<sup>2</sup>For salvinia, waterlettuce, and water hyacinth, use the labeled rate of Reward Landscape and Aquatic Herbicide in 75-200 gals. water plus the labeled rate of a 75% or greater nonionic surfactant per acre for surface sprays, and for aerial application for waterlettuce and water hyacinth control, apply the labeled rate of Reward Landscape and Aquatic Herbicide in 10-24 gals. of water plus the labeled rate of a 75% or greater nonionic surfactant per acre.

<sup>3</sup>For Pennywort and cattail control, apply in 50-150 gals. of water plus the labeled rate of a 75% or greater nonionic surfactant per acre for full coverage and thorough weed contact. Repeat treatments may be necessary to control regrowth. For best results, apply before flowering (cattail).



## Reward®

<sup>4</sup>For duckweed control, apply as an overall spray in 50-150 gals. of water plus the labeled rate of a 75% or greater nonionic surfactant per acre. Retreatment may be necessary for plants missed in previous applications and regrowth.

<sup>5</sup>For suppression of certain filamentous algae species including *Spirogyra* and *Pithophora*, apply according to the submersed use directions.

<sup>6</sup>Not for use in California.

**Application:** In mixed weed populations, use the high rate of application as indicated by weeds present.

**Subsurface Applications:** Where the submersed weed growth, especially Hydrilla, has reached the water surface, apply either in a water carrier or an invert emulsion through boom trailing hoses carrying nozzle tips to apply the dilute spray below the water surface to insure adequate coverage.

**Bottom Placement:** Where the submersed weeds, especially Hydrilla, Bladderwort, and Coontail growth, have reached the water surface or where water is slowly moving through the submersed weed growth that has reached the water surface, especially Hydrilla, Bladderwort, and Coontail, control may be enhanced when applied in an invert emulsion carrier injecting diluted Reward Landscape and Aquatic Herbicide near the bottom with weighted hoses. The addition of a copper-based algaeicide will improve control. Where algae are present along with the submersed weeds, pretreatment with copper-based algaeicide at recommended rates is advised for best results.

**Surface Application:** For submersed aquatic weeds, apply Reward Landscape and Aquatic Herbicide either as concentrate slowly poured directly from the container in strips or as a spray in sufficient carrier. Applications should be made to ensure complete coverage of the weed areas. In mixed weed populations, use the high rate of application as indicated by weeds present.

**If posting is required by your state or tribe – consult the agency responsible for pesticide regulations for specific details.**

### General Recommendations for "Posting Notification"\*

- **Flowing water:** "post" the restricted area (within/at 1,600 ft. downstream of treatment) for the duration of the water use restriction.
- **Standing water:** "post" the restricted area (within/at 1/4 mile of treatment) for the duration of the water use restriction.
- **No "posting" is necessary where water use is greater than 1,600 feet downstream of treated water in flowing water bodies or where water use is greater than 1/4 mile from treated water in standing water bodies.**

\*"Posting" should be removed at the end of the restriction period.

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For non-emergency (e.g., current product information), call Syngenta Crop Protection at 1-800-334-9481.
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Product of United Kingdom  
Formulated in the USA

Syngenta Crop Protection, Inc.  
Greensboro, North Carolina 27409  
www.syngenta-us.com

**SCP 1091A-L2 0901  
154290**



## Landscape and Aquatic Herbicide

**TO PREVENT ACCIDENTAL POISONING, NEVER PUT INTO FOOD, DRINK, OR OTHER CONTAINERS, AND USE STRICTLY IN ACCORDANCE WITH ENTIRE LABEL.**

**DO NOT USE THIS PRODUCT FOR REFORMULATION.**

Active Ingredient:  
Diquat dibromide [6,7-dihydrodipyrdo (1,2-a:2',1'-c)pyrazinediium dibromide] . . . . . 37.3%

Other Ingredients: . . . . . 62.7%

Total: . . . . . 100.0%

Contains 2 lbs. diquat cation per gal. as 3.73 lbs. salt per gal.

See directions for use in attached booklet.

### AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. Refer to supplemental labeling under "Agricultural Use Requirements" in the Directions for Use section for information about this standard.

EPA Reg. No. 100-1091  
EPA Est. 100-TX-001

Product of United Kingdom  
Formulated in the USA

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Syngenta Crop Protection, Inc.  
Greensboro, North Carolina 27409  
www.syngenta-us.com

**SCP 1091A-L2 0901  
154290**

**2.5 gallons**  
U.S. Standard Measure

## KEEP OUT OF REACH OF CHILDREN. WARNING/AVISO

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

### Precautionary Statements

#### Hazards to Humans and Domestic Animals

May be fatal if absorbed through skin. Harmful if swallowed or inhaled. Causes substantial, but temporary, eye injury. Causes skin irritation. Contact with irritated skin, or a cut, or repeated contact with intact skin may result in poisoning. Do not get in eyes, on skin, or on clothing. Avoid breathing vapor or spray mist. Do not feed forage from treated crops to livestock. Keep livestock and pets out of treated fields and crop areas.

#### FIRST AID

**If swallowed:** Call a Poison Control Center or doctor immediately for treatment advice. Immediately give water or milk to drink and induce vomiting by inserting finger in throat. Do not induce vomiting or give anything by mouth to an unconscious person. Take person and product container to the nearest hospital or physician fast. **PROMPT TREATMENT IS ESSENTIAL TO COUNTERACT POISONING** and should be initiated before signs and symptoms of injury appear.

**If on skin or clothing:** Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a Poison Control Center or doctor for treatment advice.

**If in 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 rinsing eye. 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 mouth-to-mouth, if possible. Call a Poison Control Center or doctor for further treatment advice.

**NOTE TO PHYSICIAN: CALL SYNGENTA MEDICAL EMERGENCY ASSISTANCE 1-800-888-8372** at any hour to obtain toxicology information and a diquat analysis. To be effective, treatment for diquat poisoning must begin **IMMEDIATELY**. Treatment consists of binding diquat in the gut with suspensions of activated charcoal or bentonite clay, administration of cathartics to enhance elimination, and removal of diquat from the blood by charcoal hemoperfusion or continuous hemodialysis.

Have the product container or label with you when calling a poison control center or doctor, or going for treatment.

**HOT LINE NUMBER:** For 24-Hour Medical Emergency Assistance (Human or Animal) or Chemical Emergency Assistance (Spill, Leak, Fire, or Accident), Call **1-800-888-8372**

### Environmental Hazards (Terrestrial and Aquatic Uses)

This pesticide is toxic to aquatic invertebrates. For **Terrestrial Uses**, do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment wash waters. For **Aquatic Uses**, do not apply directly to water except as specified on this label. Treatment of dense weed areas may result in oxygen loss from decomposition of dead weeds. This loss of oxygen may cause fish suffocation. Therefore, treat only 1/3-1/2 of the water body area at one time, especially if dense areas of weeds and/or algae exist, and wait 14 days between treatments.

Necessary approval and/or permits should be obtained prior to application if required. Consult the responsible State Agencies (i.e., Fish and Game Agencies or Department of Natural Resources) before making applications to public waters.

## STORAGE AND DISPOSAL

### Prohibitions

Do not contaminate water, food, or feed by storage, disposal, or cleaning of equipment. Open dumping is prohibited.

### Container Disposal

Do not reuse container. Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or incineration, or if allowed by State and local authorities, by burning. If burned, stay out of smoke.

**CONTAINER IS NOT SAFE FOR FOOD, FEED, OR DRINKING WATER!**



# Specimen Label



## Herbicide

A herbicide for management of aquatic vegetation in fresh water ponds, lakes, reservoirs, potable water sources, drainage canals, irrigation canals and rivers.

### Active ingredient:

fluridone: 1-methyl-3-phenyl-5-[3-(trifluoromethyl)phenyl]-4(1H)-pyridinone..... 5.0%

Inert ingredients..... 95.0%  
Total..... 100.0%

Contains 2 pounds active ingredient per 40 pound container.

EPA Reg. No. 67690-3 EPA Est. No. 39578-TX-1  
FPL 072902 SC-73-3260

## Precautionary Statements

### Hazards to Humans and Domestic Animals

Keep Out of Reach of Children

## CAUTION PRECAUTION

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted no detalle. (If you do not understand this label, find someone to explain it to you in detail).

**Harmful if Swallowed, Absorbed Through Skin, or if Inhaled**

**Avoid breathing of dust or contact with skin, eyes or clothing. Wash thoroughly with soap and water after handling. Remove contaminated clothing and wash before reuse.**

In case of emergency endangering health or the environment involving this product, call INFOTRAC at 1-800-535-5053.

## Statement of Practical Treatments

	First Aid
<b>If in eyes</b>	<ul style="list-style-type: none"><li>• 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 rinsing eye.</li><li>• Call poison control center or doctor for treatment advice.</li></ul>
<b>If on skin or Clothing</b>	<ul style="list-style-type: none"><li>• Take off contaminated clothing.</li><li>• Rinse skin immediately with plenty of water for 15 - 20 minutes.</li><li>• Call a poison control center or doctor for treatment advice.</li></ul>
<b>If swallowed</b>	<ul style="list-style-type: none"><li>• Call a poison control center or doctor for treatment advice.</li><li>• Have person sip a glass of water if able to swallow.</li><li>• Do not induce vomiting unless told to do so by a poison control center or doctor.</li><li>• Do not give anything by mouth to a unconscious person.</li></ul>
<b>If inhaled</b>	<ul style="list-style-type: none"><li>• Move person to fresh air.</li><li>• If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible.</li><li>• Call a poison control center or doctor for further treatment advice.</li></ul>
Have the product container or label with you when calling a poison control center or doctor, or going for treatment.	

## STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.

**Storage:** Store in original container only. Do not store near feed or foodstuffs. In case of leak or spill, contain material and dispose as waste.

**Pesticide Disposal:** Wastes resulting from use of this product may be used according to label directions or disposed of at an approved waste disposal facility.

**Container Disposal:** Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by incineration, or if allowed by State and Local authorities, by burning. If burned, stay out of smoke.

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SePRO Corporation • Carmel, IN 46032, U.S.A.

Sonar\* SRP Herbicide

## Environmental Hazards

Follow use directions carefully so as to minimize adverse effects on nontarget organisms. In order to avoid impact on threatened or endangered aquatic plant or animal species, users must consult their State Fish and Game Agency or the U.S. Fish and Wildlife Service before making applications.

Do not contaminate untreated water when disposing of equipment washwaters. Trees and shrubs growing in water treated with Sonar SRP may occasionally develop chlorosis. Do not apply in tidewater/brackish water.

Lowest rates should be used in shallow areas where the water depth is considerably less than the average depth of the entire treatment site, for example, shallow shoreline areas.

## Directions for Use

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

Read all Directions Carefully Before Applying Sonar SRP.

### General Information

Sonar SRP herbicide is a selective systemic aquatic herbicide for management of aquatic vegetation in fresh water ponds, lakes, reservoirs, drainage canals, irrigation canals, and rivers. Sonar SRP is a pelleted formulation containing 5% fluridone. Sonar is absorbed from water by plant shoots and from hydrosol by the roots of aquatic vascular plants. It is important to maintain Sonar in contact with the target plants for as long as possible. Rapid water movement or any condition which results in rapid dilution of Sonar in treated water will reduce its effectiveness. In susceptible plants, Sonar inhibits the formation of carotene. In the absence of carotene, chlorophyll is rapidly degraded by sunlight. Herbicidal symptoms of Sonar appear in seven to ten days and appear as white (chlorotic) or pink growing points. Under optimum conditions 30 to 90 days are required before the desired level of aquatic weed management is achieved with Sonar. Species susceptibility to Sonar SRP may vary depending on time of year, stage of growth and water movement. For best results, apply Sonar SRP prior to initiation of

weed growth or when weeds begin active growth. Application to mature target plants may require higher application rates and may take longer to control.

Sonar SRP is not corrosive to application equipment.

The label provides recommendations on the use of a chemical analysis for the active ingredient. SePRO Corporation recommends the use of an Enzyme-Linked

Immunoassay (ELISA Test) for the determination of the active ingredient concentration in the water. Contact SePRO Corporation for the utilization of this test, known as FasTEST, for the incorporation of this analysis in your treatment program. Other proven chemical analyses for the active ingredient may also be used. The chemical analysis, FasTEST, is referenced in this label as the preferred method for the rapid determination of the concentration of the active ingredient in the water.

Application rates are provided in pounds of Sonar SRP to achieve a desired concentration of the active ingredient in part per billion (ppb). The maximum application rate or sum of all application rates is 90 ppb in ponds and 150 ppb in lakes and reservoirs per annual growth cycle. This maximum concentration is the amount of product calculated as the target application rate, NOT determined by testing the residues of the active ingredient in the treated water.

### General Use Precautions

- **Obtain Required Permits:** Consult with appropriate state or local water authorities before applying this product. Permits may be required by state or local public agencies.
- **NEW YORK STATE:** Application of Sonar SRP is not permitted in waters less than two (2) feet deep.
- **Hydroponic Farming:** Do not use Sonar SRP treated water for hydroponic farming.
- **Greenhouse and Nursery Plants:** Do not use Sonar SRP treated water for irrigating greenhouse or nursery plants. Use of an approved assay should confirm that residues are <1 ppb.
- **WATER USE RESTRICTIONS FOLLOWING APPLICATIONS WITH SONAR SRP (DAYS)**

Application Rate	Drinking†	Fishing	Swimming	Livestock/Pet Consumption	Irrigation††
Maximum Rate (150 ppb) or less	0	0	0	0	See irrigation instructions below

† Note below, under Potable Water Intakes, the information for application of Sonar S.R.P. within 1/4 miles (1320) feet of a functioning potable water intake.

†† Note below, under Irrigation, the specific time frames for fluridone residues that provide the widest safety margin for irrigating with fluridone treated water.

- **Potable Water Intakes:** Concentrations of the active ingredient fluridone up to 150 ppb are allowed in potable water sources; however, in lakes and reservoirs or other sources of potable water, **DO NOT APPLY** Sonar SRP at application rates greater than 20 ppb within one-fourth mile (1320 feet) of any functioning potable water intake. At application rates of 8-20 ppb, Sonar SRP **MAY BE APPLIED** where functioning potable water intakes are present. **Note: Existing potable water intakes which are no longer in use, such as those replaced by connections to potable water wells or a municipal water system, are not considered to be functioning potable water intakes.**

- **Irrigation:** Irrigation with Sonar SRP treated water may result in injury to the irrigated vegetation. SePRO Corporation recommends following these precautions and informing those who irrigate from areas treated with Sonar SRP of the irrigation time frames or water assay requirements presented in the table below. These time frames and assay recommendations are suggestions which should be followed to reduce the potential for injury to vegetation irrigated with water treated with Sonar SRP. Greater potential for crop injury occurs where Sonar SRP treated water is applied to crops grown on low organic and sandy soils.

Application Site	Days After Application		
	Established Tree Crops	Established Row Crops Turf/Plants	Newly Seeded Crops/Seedbeds or Areas to be Planted Including Overseeded Golf Course Greens
† Ponds and Static Canals	7	30	Assay required
Canals	7	7	Assay required
Rivers	7	7	Assay required
† † Lakes and Reservoirs	7	7	Assay required

† For purposes of Sonar SRP labeling, a pond is defined as a body of water 10 acres or less in size. A lake or reservoir is greater than 10 acres.

† † In lakes and reservoirs where one-half or greater of the body of water is treated, use the pond and static canal irrigation precautions.

Where the use of Sonar SRP treated water is desired for irrigating crops prior to the time frames established above, the use of FasTEST assay is recommended to measure the concentration in the treated water. Where FasTEST has determined that concentrations are less than 10 parts per billion, there are no irrigation precautions for irrigating established tree crops, established row crops or turf. **For tobacco, tomatoes, peppers or other plants within the Solanaceae Family and newly seeded crops or newly seeded grasses such as overseeded golf course greens, do not use Sonar SRP treated water if concentration are greater than 5 ppb.**

Furthermore, when rotating crops, do not plant members of the Solanaceae family in land that has been previously irrigated with fluridone concentrations in excess of 5 ppb. It is recommended that an aquatic specialist be consulted prior to commencing irrigation of these sites

### Plant Control Information

Sonar SRP selectivity is dependent upon dosage, time of year, stage of growth, method of application, and water movement. The following categories, controlled, partially controlled, and not controlled are provided to describe expected efficacy under ideal treatment conditions using higher to maximum label rates. Use of lower rates will increase selectivity of some species listed as controlled or partially controlled. Additional aquatic plants may be controlled, partially controlled, or tolerant to Sonar SRP. Consult an aquatic specialist prior to application of Sonar SRP to determine a plant's susceptibility to Sonar SRP.

#### Vascular Aquatic Plants Controlled by Sonar SRP†

##### Submersed Plants:

bladderwort (*Utricularia* spp.)  
 common coontail (*Ceratophyllum demersum*)\*  
 common Elodea (*Elodea canadensis*)\*  
 egeria, Brazilian Elodea (*Egeria densa*)  
 fanwort, Cabomba (*Cabomba caroliniana*)  
 hydrilla (*Hydrilla verticillata*)  
 naiad (*Najas* spp.)\*  
 pondweed (*Potamogeton* spp., except Illinois pondweed)\*  
 watermilfoil (*Myriophyllum* spp. except variable-leaf milfoil)

##### Shoreline Grasses:

paragrass (*Urochloa mutica*)

† Species denoted by an asterisk are native plants that are often tolerant to Sonar at lower use rates. Please consult an aquatic specialist for recommended Sonar

SRP use rates when selective control of exotic species is desired.

#### Vascular Aquatic Plants Partially Controlled by Sonar SRP:

##### Floating Plants:

Salvinia (*Salvinia* spp.)

##### Emerged Plants:

alligatorweed (*Alternanthera philoxeroides*)  
 American lotus (*Nelumbo lutea*)  
 cattail (*Typha* spp.)  
 creeping waterprimrose (*Ludwigia peploides*)  
 parrotfeather (*Myriophyllum aquaticum*)  
 smartweed (*Polygonum* spp.)  
 spatterdock (*Nuphar luteum*)  
 spikerush (*Eleocharis* spp.)  
 waterlily (*Nymphaea* spp.)  
 waterpurslane (*Ludwigia palustris*)  
 watershield (*Brasenia schreber*)

##### Submersed Plants:

Illinois pondweed (*Potamogeton illinoensis*)  
 limnophila (*Limnophila sessiliflora*)  
 tapegrass, American eelgrass (*Vallisneria americana*)  
 watermilfoil—variable-leaf (*Myriophyllum heterophyllum*)

##### Shoreline Grasses:

barnyardgrass (*Echinochloa crusgalli*)  
 giant cutgrass (*Zizaniopsis miliacea*)  
 reed canarygrass (*Phalaris arundinaceae*)  
 southern watergrass (*Hydrochloa caroliniensis*)  
 torpedograss (*Panicum repens*)

#### Vascular Aquatic Plants Not Controlled by Sonar SRP:

##### Floating Plants:

floating waterhyacinth (*Eichhornia crassipes*)  
 waterlettuce (*Pistia stratiotes*)

**Emerald Plants:**

- American frogbit (*Limnobium spongia*)
- arrowhead (*Sagittaria* spp.)
- bacopa (*Bacopa* spp.)
- big floatingheart, banana lily (*Nymphoides aquatica*)
- bulrush (*Scirpus* spp.)
- pickerelweed, lanceleaf (*Pontederia* spp.)
- rush (*Juncus* spp.)
- water pennywort (*Hydrocotyle* spp.)

**Shoreline Grasses:**

- maidenhair (*Panicum hemitomon*)

Note: algae (chara, nitella, and filamentous species are not controlled by Sonar SRP)

**Application Directions**

The aquatic plants present in the treatment site should be identified prior to application to determine their susceptibility to Sonar SRP. It is important to determine the area (acres) to be treated and the average depth in order to select the proper application rate. Do not exceed the maximum labeled rate for a given treatment site per annual growth cycle.

**Application to Ponds**

Sonar SRP may be applied to the entire surface area of a pond. For single applications, rates may be selected to provide 45 to 90 ppb to the treated water, although actual concentrations in treated water may be substantially lower at any point in time due to the slow-release formulation of this product. When treating for optimum selective control, lower rates may be applied for sensitive target species. Use the higher rate within the rate range where there is a dense weed mass, when treating more difficult to control species, and for ponds less than 5 acres in size with an average depth less than 4 feet. Application rates necessary to obtain these concentrations in treated water are shown in the following table. For additional application rate calculations, refer to page 5—Application Rate Calculations-Ponds, Lakes and Reservoirs. Split or multiple applications are recommended where dilution of treated water is anticipated; however, the sum of all applications should total 45 to 90 ppb and must not exceed a total of 90 ppb per annual growth cycle.

Average Water Depth of Treatment Site (feet)	Pounds of Sonar SRP per Treated Surface Acre 45 ppb to 90 ppb	
1	2.5	5
2	5	10
3	7.5	15
4	10	20
5	12.5	25
6	15	30
7	17	34
8	19.5	39
9	22	44
10	24.5	49

**Application to Lakes and Reservoirs**

The following treatments are recommended for treating both whole lakes or reservoirs and partial areas of lakes or reservoirs (bays, etc.). For best results in treating partial lakes and reservoirs, Sonar SRP treatment areas should be a minimum of 5 acres in size. Treatment of areas smaller than 5 acres or treatment of narrow strips such as boat lanes or shorelines may not produce satisfactory results due to dilution by untreated water. Rate ranges are provided as a guide to include a wide range of environmental factors, such as target species, plant susceptibility, selectivity and other aquatic plant management objectives. Application rates and methods should be selected to meet the specific lake/reservoir aquatic plant management goals.

**A. Whole Lake or Reservoir Treatments (Limited or No Water Discharge)**

**1. Single Application to Whole Lakes or Reservoirs**

Where single applications to whole lakes or reservoirs are desired, apply Sonar SRP at an application rate of 16 to 90 ppb. Application rates necessary to obtain these concentrations in treated water are shown in the following table. For additional rate calculations, refer to page 5—Application Rate Calculation-Ponds, Lakes and Reservoirs. Choose an application rate to meet the aquatic plant management objective. **Where greater plant selectivity is desired such as when controlling Eurasian watermilfoil and curlyleaf pondweed, choose an application rate lower in the rate range.** For other plant species, SePRO recommends contacting an aquatic specialist in determining when to choose application rates lower in the rate range to meet specific plant management goals. Use the higher rate within the rate range where there is a dense weed mass or when treating more difficult to control plant species or in the event of a heavy rainfall event where dilution has occurred. In these cases, a second application or more may be required; however, the sum of all applications cannot exceed 150 ppb per annual growth cycle. Refer to the following Section (No. 2) Split or Multiple Applications for guidelines and maximum rate allowed.

Average Water Depth of Treatment Site (feet)	Pounds of Sonar SRP Per Treated Surface Acre 16 ppb to 90 ppb	
1	0.9	5
2	1.7	10
3	2.6	15
4	3.5	20
5	4.3	25
6	5.2	30
7	6.0	34
8	6.9	39
9	7.8	44
10	8.6	49
11	9.5	54
12	10.4	59
13	11.2	64
14	12.1	68
15	13.0	73
16	13.8	78
17	14.7	83
18	15.6	88
19	16.4	93
20	17.3	98

## 2. Split or Multiple Applications to Whole Lakes or Reservoirs

To meet certain plant management objectives, split or multiple applications may be desired in making whole lake treatments. Split or multiple application programs are desirable when the objective is to use the minimum effective dose and to maintain this lower dose for the sufficient time to ensure efficacy and enhance selectivity. Under these situations, use the lower rates (16 to 75 ppb) within the rate range. **In controlling Eurasian watermilfoil and curlyleaf pondweed and where greater plant selectivity is desired, choose an application rate lower in the rate range.** For other plant species, SePRO recommends contacting an aquatic specialist in determining when to choose application rates lower in the rate range to meet specific plant management goals. For split or repeated applications, the sum of all applications must not exceed 150 ppb per annual growth cycle.

Note: In treating lakes or reservoirs that contain potable water intakes and the application requires treating within 1/4 mile of a potable water intake, no single application can exceed 20 ppb. Additionally, the sum of all applications cannot exceed 150 ppb per annual growth cycle.

### B. Partial Lake or Reservoir Treatments

Where dilution of Sonar SRP with untreated water is anticipated, such as in partial lake or reservoir treatments, split or multiple applications may be used to extend the contact time to the target plants. The application rate and use frequency of Sonar SRP in a partial lake is highly dependent upon the treatment area. Higher application rates may be required and frequency of applications will vary depending upon the potential of untreated water

diluting the Sonar SRP concentration in the treatment area. Use higher rates where greater dilution with untreated water is anticipated.

#### 1. Application Sites Greater Than 1/4 Mile from a Functioning Potable Water Intake

For single applications, apply Sonar SRP at application rates from 45 to 150 ppb. Split or multiple applications may be made, however, the sum of all applications cannot exceed 150 ppb per annual growth cycle. Split applications should be conducted to maintain a sufficient concentration in the target area for a period of 45 days or longer. The use of FasTEST is recommended to maintain the desired concentration in the target area over time.

#### 2. Application Sites Within 1/4 Mile of a Functioning Potable Water Intake

In treatment areas that are within 1/4 mile of a potable water intake, no single application can exceed 20 ppb. When utilizing split or repeated applications of Sonar SRP for sites which contain a potable water intake, FasTEST is required to determine the actual concentration in the water. Additionally, the sum of all applications cannot exceed 150 ppb per annual growth cycle.

### Application Rate Calculation - Ponds, Lakes and Reservoirs

The amount of Sonar SRP to be applied to provide the desired ppb concentration of active ingredient equivalents in treated water may be calculated as follows:

- Pounds of Sonar SRP required per treated acre = Average water depth of treatment site x Desired ppb concentration of active ingredient equivalents x 0.054

For example, the pounds per acre of Sonar SRP required to provide a concentration of 25 ppb of active ingredient equivalents in water with an average depth of 5 feet is calculated as follows:

$$5 \times 25 \times 0.054 = 6.75 \text{ pounds per treated surface acre.}$$

**Note:** Calculated rates should not exceed the maximum allowable rate in pounds per treated surface acre for the water depth listed in the application rate table for the site to be treated.

### Application to Drainage Canals, Irrigation Canals and Rivers

#### Static Canals:

In static drainage and irrigation canals, Sonar SRP should be applied at the rate of 20 to 40 pounds per surface acre.

### Moving Water Canals and Rivers:

The performance of Sonar SRP will be enhanced by restricting or reducing water flow. In slow moving bodies of water use an application technique that maintains a concentration of 10 to 40 ppb in the applied area for a minimum of 45 days. Sonar SRP can be applied by split or multiple broadcast applications or by metering in the product to provide a uniform concentration of the herbicide based upon the flow pattern. The use of FasTEST is recommended to maintain the desired concentration in the target area over time.

### Static or Moving Water Canals or Rivers Containing a Functioning Potable Water Intake

In treating a static or moving water canal or river which contains a functioning potable water intake, applications of Sonar SRP greater than 20 ppb must be made more than 1/4 mile from a functioning potable water intake. Applications less than 20 ppb may be applied within 1/4 mile from a functioning potable water intake; however, if applications of Sonar SRP are made within 1/4 mile from a functioning water intake, the FasTEST must be utilized to demonstrate that concentrations do not exceed 150 ppb at the potable water intake.

### **Application Rate Calculation – Drainage Canals, Irrigation Canals and Rivers**

The amount of Sonar SRP to be applied through a metering system to provide the desired ppb concentration of active ingredient in treated water may be calculated as follows:

1. Average flow rate (feet per second) x average width (ft.) x average depth (ft.) x 0.9 = CFS (cubic feet per second)
2. CFS x 1.98 = acre feet per day (water movement)
3. Acre feet per day x desired ppb x 0.054 = pounds Sonar SRP required per day

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### **WARRANTY DISCLAIMER**

SePRO Corporation warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated on the label when used in strict accordance with the directions, subject to the inherent risks set forth below. **SePRO Corporation makes no other express or implied warranty of merchantability or fitness for a particular purpose or any other express or implied warranty.**

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### **INHERENT RISKS OF USE**

It is impossible to eliminate all risks associated with use of this product. Plant injury, lack of performance, or other unintended consequences may result because of such factors as use of the product contrary to the label instructions (including conditions noted on the label, such as unfavorable temperatures, soil conditions, etc.), abnormal conditions (such as excessive rainfall, drought, torna-

does, hurricanes), presence of other materials, the manner of application, or other factors, all of which are beyond the control of SePRO Corporation or the seller. All such risks shall be assumed by the buyer.

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### **LIMITATION OF REMEDIES**

The exclusive remedy for losses or damages resulting from this product (including claims based on contract, negligence, strict liability, or other legal theories), shall be limited to, at SePRO Corporations election, one of the following:

- (1) Refund of purchase price paid by buyer or user for product bought, or
- (2) Replacement of amount of product used.

SePRO Corporation shall not be liable for losses or damages resulting from handling or use of this product unless SePRO Corporation is promptly notified of such losses or damages in writing. In no case shall SePRO Corporation be liable for consequential or incidental damages or losses.

The terms of the Warranty Disclaimer above and this Limitation of Remedies cannot be varied by any written or verbal statements or agreements. No employee or sales agent of SePRO Corporation or the seller is authorized to vary or exceed the terms of the Warranty Disclaimer or this Limitation of Remedies in any manner.

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# Specimen Label



# Rodeo®

## Herbicide

For aquatic weed and brush control. For control of annual and perennial weeds and woody plants in and around aquatic and other noncrop sites; also for use in wildlife habitat areas, for perennial grass release, and grass growth suppression.

Avoid contact of herbicide with foliage, green stems, exposed non-woody roots or fruit of crops, desirable plants and trees, because severe injury or destruction may result.

Active Ingredient(s):	
glyphosate <sup>†</sup> : N-(phosphonomethyl)glycine, isopropylamine salt .....	53.8%
Inert Ingredients .....	46.2%
Total Ingredients.....	100.0%

<sup>†</sup> Contains 5.4 pounds per gallon glyphosate, isopropylamine salt (4 pounds per gallon glyphosate acid).

EPA Reg. No. 62719-324

### Keep Out of Reach of Children

## CAUTION PRECAUCION

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

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### Precautionary Statements

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#### Hazards to Humans and Domestic Animals

#### Harmful If Inhaled

Avoid breathing spray mist. Remove contaminated clothing and wash before reuse. Wash thoroughly with soap and water after handling.

### Personal Protective Equipment (PPE)

Applicators and other handlers must wear:

- Long-sleeved shirt and long pants
- Shoes plus socks.

Follow manufacturer's instructions for cleaning/maintaining PPE (Personal Protective Equipment). If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

### Engineering Controls

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240 (d) (4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

### User Safety Recommendations

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

### First Aid

If inhaled: Remove individual to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. Get medical attention.

### Environmental Hazards

Do not contaminate water when disposing of equipment washwaters. Treatment of aquatic weeds can result in oxygen depletion or loss due to decomposition of dead plants. This oxygen loss can cause fish suffocation.

In case of leak or spill, soak up and remove to a landfill.

### Physical or Chemical Hazards

Spray solutions of this product should be mixed, stored and applied using only stainless steel, aluminum, fiberglass, plastic or plastic-lined steel containers.

**Do not mix, store or apply this product or spray solutions of this product in galvanized steel or unlined steel (except stainless steel) containers or spray tanks.** This product or spray solutions of this product react with such containers and tanks to produce hydrogen gas, which may form a highly combustible gas mixture. This gas mixture could flash or explode, causing serious personal injury, if ignited by open flame, spark, welder's torch, lighted cigarette or other ignition source.

**Notice:** Read the entire label. Use only according to label directions. **Before buying or using this product, read "Warranty Disclaimer" and "Limitation of Remedies" elsewhere on this label.**

In case of emergency endangering health or the environment involving this product, call 1-800-992-5994. If you wish to obtain additional product information, visit our web site at [www.dowagro.com](http://www.dowagro.com).

Agricultural Chemical: Do not ship or store with food, feeds, drugs or clothing.

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## Directions for Use

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

Read all Directions for Use carefully before applying.

**This is an end-use product. Dow AgroSciences does not intend and has not registered it for reformulation. See individual container label for repackaging limitations.**

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your state or tribe, consult the agency responsible for pesticide regulation.

### Agricultural Use Requirements

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for 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. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 4 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
- Chemical resistant gloves made of any waterproof material
- Shoes plus socks

### Storage and Disposal

Do not contaminate water, food, feed or seed by storage or disposal.

**Storage: Store above 10°F (-12°C) to keep product from crystallizing.**

Crystals will settle to the bottom. If allowed to crystallize, place in a warm room 68°F (20°C) for several days to redissolve and roll or shake container or recirculate in mini-bulk containers to mix well before using.

**Pesticide Disposal:** Wastes resulting from use of this product that cannot be used or chemically reprocessed should be disposed of in a landfill approved for pesticide disposal or in accordance with applicable Federal, state or local procedures.

**Container Disposal:** Emptied container retains vapor and product residue. Observe all labeled safeguards until container is cleaned, reconditioned or destroyed. Do not reuse this container. Triple rinse (or equivalent). Then puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

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## General Information

### (How this product works)

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This product herbicide is a water-soluble liquid which mixes readily with water and nonionic surfactant to be applied as a foliar spray for the control or destruction of many herbaceous and woody plants. Rodeo is intended for control of annual and perennial weeds and woody plants in and around aquatic and other noncrop sites; also for use in wildlife habitat areas, for perennial grass release, and grass growth suppression.

The active ingredient in Rodeo moves through the plant from the point of foliage contact to and into the root system. Visible effects on most annual weeds occur within 2 to 4 days, 7 days or more on most perennial weeds, and 30 days or more on most woody plants. Extremely cool or cloudy weather following treatment may slow the activity of this product and delay visual effects of control. Visible effects include gradual wilting and yellowing of the plant which advances to complete browning of above-ground growth and deterioration of underground plant parts.

Unless otherwise directed on this label, delay application until vegetation has emerged and reached the stages described for control of such vegetation under the "Weeds Controlled" section of this label.

Unemerged plants arising from unattached underground rhizomes or root stocks of perennials or brush will not be affected by the spray and will continue to grow. For this reason best control of most perennial weeds or brush is obtained when treatment is made at late growth stages approaching maturity.

Always use the higher rate of Rodeo and surfactant within the recommended range when vegetation is heavy or dense.

Do not treat weeds, brush or trees under poor growing conditions such as drought stress, disease or insect damage, as reduced control may result. Reduced control of target vegetation may also occur if foliage is heavily covered with dust at the time of treatment.

Reduced control may result when applications are made to woody plants or weeds following site disturbance or plant top growth removal from grazing, mowing, logging or mechanical brush control. For best results, delay treatment of such areas until resprouting and foliar growth has restored the target vegetation to the recommended stage of growth for optimum herbicidal exposure and control.

Rainfall or irrigation occurring within 6 hours after application may reduce effectiveness. Heavy rainfall or irrigation within 2 hours after application may wash the product off the foliage and a repeat treatment may be required.

Rodeo does not provide residual weed control. For subsequent residual weed control, follow a label-approved herbicide program. Read and carefully observe the cautionary statements and all other information appearing on the labels of all herbicides used.

**NOTE:** Use of this product in any manner not consistent with this label may result in injury to persons, animals or crops, or other unintended consequences. When not in use, keep container closed to prevent spills and contamination.

Buyer and all users are responsible for all loss or damage in connection with the use or handling of mixtures of this product or other materials that are not expressly recommended in this label. Mixing this product with herbicides or other materials not recommended in this label may result in reduced performance.

**ATTENTION: Avoid drift. Extreme care must be used when applying this product to prevent injury to desirable plants and crops.**

Do not allow the herbicide solution to mist, drip, drift or splash onto desirable vegetation since minute quantities of this product can cause severe damage or destruction to the crop, plants or other areas on which treatment was not intended. The likelihood of plant or crop injury occurring from the use of this product is greatest when winds are gusty or in excess of 5 miles per hour or when other conditions, including lesser wind velocities, will allow spray drift to occur. When spraying, avoid combinations of pressure and nozzle type that will result in splatter or fine particles (mist) which are likely to drift. **Avoid applying at excessive speed or pressure.**

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## Mixing and Application Instructions

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**Clean sprayer and parts immediately after using this product by thoroughly flushing with water and dispose of rinsate according to labeled use or disposal instructions.**

**Apply these spray solutions in properly maintained and calibrated equipment capable of delivering desired volumes. Hand-gun applications should be properly directed to avoid spraying desirable plants. Note: reduced results may occur if water containing soil is used, such as water from ponds and unlined ditches.**

### Mixing

Rodeo mixes readily with water. Mix spray solutions of this product as follows:

1. Fill the mixing or spray tank with the required amount of water while adding the required amount of this product (see "Directions for Use" and "Weeds Controlled" sections of this label).
2. Near the end of the filling process, add the required surfactant and mix well. Remove hose from tank immediately after filling to avoid siphoning back into the water source.

**Note:** If tank mixing with Garlon® 3A herbicide, ensure that Garlon 3A is well mixed with at least 75 percent of the total spray volume before adding Rodeo to the spray tank to avoid incompatibility.

During mixing and application, foaming of the spray solution may occur. To prevent or minimize foam, avoid the use of mechanical agitators, place the filling hose below the surface of the spray solution (only during filling), terminate by-pass and return lines at the bottom of the tank, and, if needed, use an approved anti-foam or defoaming agent.

Keep by-pass line on or near bottom of tank to minimize foaming. Screen size in nozzle or line strainers should be no finer than 50 mesh. Carefully select correct nozzle to avoid spraying a fine mist. For best results with conventional ground application equipment, use flat fan nozzles. Check for even distribution of spray droplets.

**IMPORTANT:** When using this product, unless otherwise specified, mix 2 or more quarts of a nonionic surfactant per 100 gallons of spray solution. Use a nonionic surfactant labeled for use with herbicides. The surfactant must contain 50 percent or more active ingredient.

Always read and follow the manufacturer's surfactant label recommendations for best results.

These surfactants should not be used in excess of 1 quart per acre when making **broadcast** applications.

Carefully observe all cautionary statements and other information appearing in the surfactant label.

**Colorants or marking dyes** approved for use with herbicides may be added to spray mixtures of this product. Colorants or dyes used in spray solutions of this product may reduce performance, especially at lower rates or dilutions. Use colorants or dyes according to the manufacturer's label recommendations.

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## Application Equipment and Techniques

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**ATTENTION: AVOID DRIFT. EXTREME CARE MUST BE EXERCISED WHEN APPLYING THIS PRODUCT TO PREVENT INJURY TO DESIRABLE PLANTS AND CROPS.**

Do not allow the herbicide solution to mist, drip, drift, or splash onto desirable vegetation since minute quantities of this product can cause severe damage or destruction to crops, plants, or other areas on which the treatment was not intended. The likelihood of plant or crop injury occurring from the use of this product is greatest when winds are gusty or in excess of 5 miles per hour or when other conditions, including lesser wind velocities, will allow spray drift to occur. When spraying, avoid combinations of pressure and nozzle type that will result in splatter or fine particles (mist) which are likely to drift. **AVOID APPLYING AT EXCESSIVE SPEED OR PRESSURE.**

**Note:** Use of this product in a manner not consistent with this label may result in injury to persons, animals, or crops, or other unintended consequences. When not in use, keep container closed to prevent spills and contamination.

### Spray Drift Management

Avoiding spray drift at the application site is the responsibility of the applicator. The interaction of many equipment-and-weather-related factors determine the potential for spray drift. The applicator and the grower are responsible for considering all these factors when making decisions. The following drift management requirements must be followed to avoid off-target drift movement from aerial applications to agricultural field crops. These requirements do not apply to forestry applications, public health uses or to applications using dry formulations.

1. The distance of the outer most nozzles on the boom must not exceed 3/4 the length of the wingspan or rotor.
2. Nozzles must always point backward parallel with the air stream and never be pointed downwards more than 45 degrees. Where states have more stringent regulations, they should be observed.

The applicator should be familiar with and take into account the information covered in the following **Aerial Drift Reduction Advisory Information:**

**Importance of Droplet Size:** The most effective way to reduce drift potential is to apply large droplets. The best drift management strategy is to apply the largest droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential, but will not prevent drift if applications are made improperly, or under unfavorable environmental conditions (see Wind, Temperature and Humidity, and Temperature Inversion section of this label).

**Controlling Droplet Size:** Volume-Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows produce larger droplets.

Pressure-Use the lower spray pressures recommended for the nozzle. Higher pressure reduces droplet size and does not improve canopy penetration. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.

Number of nozzles-Use the minimum number of nozzles that provide uniform coverage.

Nozzle Orientation-Orienting nozzles so that the spray is released backwards, parallel to the airstream will produce larger droplets than other orientations. Significant deflection from the horizontal will reduce droplet size and increase drift potential.

Nozzle Type-Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles. Solid stream nozzles oriented straight back produce larger droplets than other nozzle types.

Boom Length-For some use patterns, reducing the effective boom length to less than  $\frac{3}{4}$  of the wingspan or rotor length may further reduce drift without reducing swath width.

Application-Applications should not be made at a height greater than 10 feet above the top of the largest plants unless a greater height is required for aircraft safety. Making applications at the lowest height that is safe reduces exposure of droplets to evaporation and wind.

**Swath Adjustment:** When applications are made with a cross-wind, the swath will be displaced downwind. Therefore, on the up and downwind edges of the field, the applicator must compensate for this displacement by adjusting the path of the aircraft upwind. Swath adjustment distance should increase, with increasing drift potential (higher wind, smaller drops, etc.).

**Wind:** Drift potential is lowest between wind speeds of 2-10 mph. However, many factors, including droplet size and equipment type determine drift potential at any given speed. Application should be avoided below 2 mph due to variable wind direction and high inversion potential. Note: Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect drift.

**Temperature and Humidity:** When making applications in low relative humidity, set up equipment to produce larger droplets to compensate for evaporation. Droplet evaporation is most severe when conditions are both hot and dry.

**Temperature Inversions:** Applications should not occur during a temperature inversion, because drift potential is high. Temperature inversions restrict vertical air mixing, which causes small suspended droplets to remain in a concentrated cloud. This cloud can move in unpredictable directions due to the light variable winds common during inversions. Temperature inversions are characterized by increasing temperatures with altitude and are common on nights with limited cloud

cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a connected cloud (under low wind conditions) indicates an inversion, while smoke that moves upwards and rapidly dissipates indicates good vertical air mixing.

**Sensitive Areas:** The pesticide should only be applied when the potential for drift to adjacent sensitive areas (e.g., residential areas, bodies of water, known habitat for threatened or endangered species, non-target crops) is minimal (e.g., when wind is blowing away from the sensitive areas).

## Aerial Equipment

**For aerial application of this product in California, refer to Federal supplemental label for Rodeo herbicide entitled "For Aerial Application in California Only".** In California, aerial application may be made in aquatic sites and noncrop areas, including aquatic sites present in noncrop areas that are part of the intended treatment.

**For control of weed or brush species listed in this label using aerial application equipment:** For aerial broadcast application, unless otherwise specified, apply the rates of Rodeo and surfactant recommended for broadcast application in a spray volume of 3 to 20 gallons of water per acre. See the "Weeds Controlled" section of this label for labeled annual and herbaceous weeds and woody plants and broadcast rate recommendations. Aerial applications of this product may only be made as specifically recommended in this label.

**AVOID DRIFT. Do not apply during inversion conditions, when winds are gusty or under any other condition which will allow drift. Drift may cause damage to any vegetation contacted to which treatment is not intended. To prevent injury to adjacent desirable vegetation, appropriate buffer zones must be maintained.**

Coarse sprays are less likely to drift; therefore, do not use nozzles or nozzle configurations which dispense spray as fine spray droplets. Do not angle nozzles forward into the airstream and do not increase spray volume by increasing nozzle pressure.

Drift control additives may be used. When a drift control additive is used, read and carefully observe the cautionary statements and all other information appearing in the additive label. The use of a drift control agent for conifer and herbaceous release applications may result in conifer injury and is not recommended.

**Ensure uniform application.** To avoid streaked, uneven or overlapped application, use appropriate marking devices.

Thoroughly wash aircraft, especially landing gear, after each day of spraying to remove residues of this product accumulated during spraying or from spills. **Prolonged exposure of this product to uncoated steel surfaces may result in corrosion and possible failure of the part. Landing gear are most susceptible.** The maintenance of an organic coating (paint) which meets aerospace specification MIL-C-38413 may prevent corrosion.

## Ground Broadcast Equipment

**For control of weed or brush species listed in this label using conventional boom equipment:** For ground broadcast application, unless otherwise specified, apply the rates of Rodeo and surfactant recommended for broadcast application in a spray volume of 3 to 30 gallons of water per acre. See the "Weeds Controlled" section of this label for labeled annual and herbaceous weeds and woody plants and broadcast rate recommendations. As density of vegetation increases, spray volume should be increased within the recommended range to ensure complete coverage. Carefully select correct nozzle to avoid spraying a fine mist. For best results with ground application equipment, use flat fan nozzles. Check for even distribution of spray droplets.

## Hand-Held and High-Volume Equipment (Use Coarse Sprays Only)

**For control of weeds listed in this label using knapsack sprayers or high-volume spraying equipment utilizing handguns or other suitable nozzle arrangements:**

**High volume sprays:** Prepare a **3/4 to 2 percent solution** of this product in water, add a nonionic surfactant and apply to foliage of vegetation to be controlled. For specific rates of application and instructions for control of various annual and perennial weeds, see the "Weeds Controlled" section in this label.

Applications should be made on a spray-to-wet basis. Spray coverage should be uniform and complete. Do not spray to point of runoff.

**Low volume directed sprays:** Rodeo may be used as a **5 to 8 percent solution** in low-volume directed sprays for spot treatment of trees and brush. This treatment method is most effective in areas where there is a low density of undesirable trees or brush. If a straight stream nozzle is used, start the application at the top of the targeted vegetation and spray from top to bottom in a lateral zig-zag motion. Ensure that at least 50 percent of the leaves are contacted by the spray solution. For flat fan and cone nozzles and with hand-directed mist blowers, mist the application over the foliage of the targeted vegetation. Small, open-branched trees need only be treated from one side. If the foliage is thick or there are multiple root sprouts, applications must be made from several sides to ensure adequate spray coverage.

Prepare the desired volume of spray solution by mixing the amount of this product in water, shown in the following table:

### Spray Solution

Desired Volume	Amount of Rodeo						
	3/4%	1%	1 1/4%	1 1/2%	2%	5%	8%
1 gal	1 fl oz	1 1/3 fl oz	1 2/3 fl oz	2 fl oz	2 2/3 fl oz	6 1/2 fl oz	10 1/4 fl oz
25 gal	1 1/2 pt	1 qt	1 1/4 qt	1 1/2 qt	2 qt	5 qt	2 gal
100 gal	3 qt	1 gal	1 1/4 gal	1 1/2 gal	2 gal	5 gal	8 gal

2 tablespoons = 1 fluid ounce

For use in knapsack sprayers, it is suggested that the recommended amount of this product be mixed with water in a larger container. Fill the knapsack sprayer with the mixed solution and add the correct amount of surfactant.

### Wiper Applications

For wick or wiper applications, mix 1 gallon of this product with 2 gallons of clean water to make a 33 percent solution. Addition of a nonionic surfactant at a rate of 10 percent by volume of total herbicide solution is recommended.

Wiper applications can be used to control or suppress annual and perennial weeds listed on this label. In heavy weed stands, a double application in opposite directions may improve results. See the "Weed Controlled" section in this label for recommended timing, growth stage and other instructions for achieving optimum results

## Aquatic and Other Noncrop Sites

Apply Rodeo as directed and under conditions described to control or partially control weeds and woody plants listed in the "Weeds Controlled" section in industrial, recreational and public areas or other similar aquatic or terrestrial sites on this label.

### Aquatic Sites

**Rodeo may be applied to emerged weeds in all bodies of fresh and brackish water which may be flowing, nonflowing or transient. This includes lakes, rivers, streams, ponds, estuaries, rice levees, seeps, irrigation and drainage ditches, canals, reservoirs, wastewater treatment facilities, wildlife habitat restoration and management areas, and similar sites.**

**If aquatic sites are present in the noncrop area and are part of the intended treatment, read and observe the following directions:**

- **Rodeo does not control plants which are completely submerged or have a majority of their foliage under water.**
- There is no restriction on the use of treated water for irrigation, recreation or domestic purposes.
- Consult local state fish and game agency and water control authorities before applying this product to public water. Permits may be required to treat such water.

- **NOTE:** Do not apply this product directly to water within 1/2 mile upstream of an active potable water intake in flowing water (i.e., river, stream, etc.) or within 1/2 mile of an active potable water intake in a standing body of water such as lake, pond or reservoir. To make aquatic applications around and within 1/2 mile of active potable water intakes, the water intake must be turned off for a minimum period of 48 hours after the application. The water intake may be turned on prior to 48 hours if the glyphosate level in the intake water is below 0.7 parts per million as determined by laboratory analysis. These aquatic applications may be made **only** in those cases where there are alternative water sources or holding ponds which would permit the turning off of an active potable water intake for a minimum period of 48 hours after the applications. This restriction does not apply to intermittent inadvertent overspray of water in terrestrial use sites.
- For treatments after drawdown of water or in dry ditches, allow 7 or more days after treatment before reintroduction of water to achieve maximum weed control. Apply this product within 1 day after drawdown to ensure application to actively growing weeds.
- Floating mats of vegetation may require retreatment. Avoid wash-off of sprayed foliage by spray boat or recreational boat backwash or by rainfall within 6 hours of application. Do not re-treat within 24 hours following the initial treatment.
- Applications made to moving bodies of water must be made while traveling upstream to prevent concentration of this herbicide in water. When making any bankside applications, do not overlap more than 1 foot into open water. Do not spray in bodies of water where weeds do not exist. The maximum application rate of 7 1/2 pints per acre must not be exceeded in any single broadcast application that is being made over water.
- When emerged infestations require treatment of the total surface area of impounded water, treating the area in strips may avoid oxygen depletion due to decaying vegetation. Oxygen depletion may result in fish kill.

### Other Noncrop Sites

Rodeo may be used to control the listed weeds in the following terrestrial noncrop sites and/or in aquatic sites within these areas:

Habitat Restoration & Management Areas  
 Highways & Roadsides  
 Industrial Plant Sites  
 Petroleum Tank Farms  
 Pipeline, Power, Telephone & Utility Rights-of-Way  
 Pumping Installations  
 Railroads  
 Similar Sites

### Cut Stump Application

Woody vegetation may be controlled by treating freshly cut stumps of trees and resprouts with this product. Apply this product using suitable equipment to ensure coverage of the entire cambium. Cut vegetation close to the soil surface. **Apply a 50 to 100 percent solution of this product to freshly cut surface immediately after cutting.** Delay in applying this product may result in reduced performance. For best results, trees should be cut during periods of active growth and full leaf expansion.

When used according to directions for cut stump application, this product will **control, partially control or suppress** most woody brush and tree species, some of which are listed below:

Common Name	Scientific Name
Alder	<i>Alnus spp.</i>
Coyote brush †	<i>Baccharis consanguinea</i>
Dogwood †	<i>Cornus spp.</i>
Eucalyptus	<i>Eucalyptus spp.</i>
Hickory †	<i>Carya spp.</i>
Madrone	<i>Arbutus menziesii</i>
Maple †	<i>Acer spp.</i>
Oak	<i>Quercus spp.</i>
Poplar †	<i>Populus spp.</i>
Reed, giant	<i>Arundo donax</i>
Salt cedar	<i>Tamarix spp.</i>
Sweet gum †	<i>Liquidambar styraciflua</i>
Sycamore †	<i>Platanus occidentalis</i>
Tan oak	<i>Lithocarpus densiflorus</i>
Willow	<i>Salix spp.</i>

† Rodeo is not approved for this use on these species in the state of California.

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## Wildlife Habitat Restoration and Management Areas

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Rodeo is recommended for the restoration and/or maintenance of native habitat and in wildlife management areas.

**Habitat Restoration and Maintenance:** When applied as directed, exotic and other undesirable vegetation may be controlled in habitat management areas. Applications may be made to allow recovery of native plant species, to open up water to attract waterfowl, and for similar broad-spectrum vegetation control requirements in habitat management areas. Spot treatments may be made to selectively remove unwanted plants for habitat enhancement. For spot treatments, care should be exercised to keep spray off of desirable plants.

**Wildlife Food Plots:** Rodeo may be used as a site preparation treatment prior to planting wildlife food plots. Apply as directed to control vegetation in the plot area. Any wildlife food species may be planted after applying this product, or native species may be allowed to reinfest the area. If tillage is needed to prepare a seedbed, wait 7 days after applying this product before tilling to allow for maximum effectiveness.

### Injection and Frill Applications

Woody vegetation may be controlled by injection or frill application of this product. Apply this product using suitable equipment which must penetrate into living tissue. Apply the equivalent of 1 ml of this product per 2 to 3 inches of trunk diameter. This is best achieved by applying 25 to 100 percent concentration of this product either to a continuous frill around the tree or as cuts evenly spaced around the tree below all branches. As tree diameter increases in size, better results are achieved by applying dilute material to a continuous frill or more closely spaced cuttings. Avoid application techniques that allow runoff to occur from frill or cut areas in species that exude sap freely after frills or cutting. In species such as these, make frill or cut at an oblique angle so as to produce a cupping effect and use undiluted material. For best results, applications should be made during periods of active growth and full leaf expansion.

This treatment will control the following woody species:

Common Name	Scientific Name
Oak	<i>Quercus spp.</i>
Poplar	<i>Populus spp.</i>
Sweet gum	<i>Liquidambar styraciflua</i>
Sycamore	<i>Platanus occidentalis</i>

This treatment will suppress the following woody species:

Common Name	Scientific Name
Black gum †	<i>Nyssa sylvatica</i>
Dogwood	<i>Cornus spp.</i>
Hickory	<i>Carya spp.</i>
Maple, red	<i>Acer rubrum</i>

† Rodeo is not approved for this use on this species in the state of California.

### Release of Bermudagrass or Bahiagrass on Noncrop Sites

#### Release Of Dormant Bermudagrass and Bahiagrass

When applied as directed, this product will provide control or suppression of many winter annual weeds and tall fescue for effective release of dormant bermudagrass or bahiagrass. Make applications to dormant bermudagrass or bahiagrass.

For best results on winter annuals, treat when weeds are in an early growth stage (below 6 inches in height) after most have germinated. For best results on tall fescue, treat when fescue is in or beyond the 4 to 6-leaf stage.

#### Weeds Controlled

Rate recommendations for control or suppression of winter annuals and tall fescue are listed below.

Apply the recommended rates of this product in 10 to 25 gallons of water per acre plus 2 quarts nonionic surfactant per 100 gallons of total spray volume.

Weeds Controlled or Suppressed †

Note: C = Controlled; S = Suppressed

Weed Species	Rate of Rodeo (Fluid Ounces Per Acre)					
	6	9	12	18	24	48
<b>Barley, little</b> <i>Hordeum pusillum</i>	S	C	C	C	C	C
<b>Bedstraw, catchweed</b> <i>Galium aparine</i>	S	C	C	C	C	C
<b>Bluegrass, annual</b> <i>Poa annua</i>	S	C	C	C	C	C
<b>Chervil</b> <i>Chaerophyllum tainturieri</i>	S	C	C	C	C	C
<b>Chickweed, common</b> <i>Stellaria media</i>	S	C	C	C	C	
<b>Clover, crimson</b> <i>Trifolium incarnatum</i>	•	S	S	C	C	C
<b>Clover, large hop</b> <i>Trifolium campestre</i>	•	S	S	C	C	C
<b>Speedwell, corn</b> <i>Veronica arvensis</i>	S	C	C	C	C	C
<b>Fescue, tall</b> <i>Festuca arundinacea</i>	•	•	•	•	S	S
<b>Geranium, Carolina</b> <i>Geranium carolinianum</i>	•	•	S	S	C	C
<b>Henbit</b> <i>Lamium amplexicaule</i>	•	S	C	C	C	C
<b>Ryegrass, Italian</b> <i>Lolium multiflorum</i>	•	•	S	C	C	C
<b>Vetch, common</b> <i>Vicia sativa</i>	•	•	S	C	C	C

† These rates apply only to sites where an established competitive turf is present.

#### Release of Actively Growing Bermudagrass

**NOTE: Use only on sites where bahiagrass or bermudagrass are desired for ground cover and some temporary injury or yellowing of the grasses can be tolerated.**

When applied as directed, this product will aid in the release of bermudagrass by providing control of annual species listed in the "Weeds Controlled" section in this label, and suppression or partial control of certain perennial weeds.

For control or suppression of those annual species listed in this label, use 3/4 to 2 1/4 pints of this product as a broadcast spray in 10 to 25 gallons of spray solution per acre, plus 2 quarts of a nonionic surfactant per 100 gallons of total spray volume. Use the lower rate when treating annual weeds below 6 inches in height (or length of runner in annual vines). Use the higher rate as size of plants increases or as they approach flower or seedhead formation.

Use the higher rate for partial control or longer-term suppression of the following perennial species. Use lower rates for shorter-term suppression of growth.

Bahiagrass	Johnsongrass †
Dallisgrass	Trumpet creeper ††
Fescue (tall)	Vaseygrass

† Johnsongrass is controlled at the higher rate.

†† Suppression at the higher rate only.

Use only on well-established bermudagrass. Bermudagrass injury may result from the treatment but regrowth will occur under moist conditions. Repeat applications in the same season are not recommended, since severe injury may result.

### Bahiagrass Seedhead and Vegetative Suppression

When applied as directed in the “Noncrop Sites” section in this label, this product will provide significant inhibition of seedhead emergence and will suppress vegetative growth for a period of approximately 45 days with single applications and approximately 120 days with sequential applications.

Apply this product 1 to 2 weeks after full green-up of bahiagrass or after the bahiagrass has been mowed to a uniform height of 3 to 4 inches. Applications must be made prior to seedhead emergence. Apply 5 fluid ounces per acre of this product, plus 2 quarts of an approved nonionic surfactant per 100 gallons of total spray volume in 10 to 25 gallons of water per acre.

Sequential applications of this product plus nonionic surfactant may be made at approximately 45-day intervals to extend the period of seedhead and vegetative growth suppression. For continued vegetative growth suppression, sequential applications must be made prior to seedhead emergence.

Apply no more than 2 sequential applications per year. As a first sequential application, apply 3 fluid ounces of this product per acre plus nonionic surfactant. A second sequential application of 2 to 3 fluid ounces per acre plus nonionic surfactant may be made approximately 45 days after the last application.

### Annual Grass Growth Suppression

For growth suppression of some annual grasses, such as annual ryegrass, wild barley and wild oats growing in coarse turf on roadsides or other industrial areas, apply 3 to 4 ounces of this product in 10 to 40 gallons of spray solution per acre. Mix 2 quarts of a nonionic surfactant per 100 gallons of spray solution. Applications should be made when annual grasses are actively growing and before the seedheads are in the boot stage of development. Treatments made after seedhead emergence may cause injury to the desired grasses.

## Weeds Controlled

### Annual Weeds

Apply to actively growing annual grasses and broadleaf weeds.

Allow at least 3 days after application before disturbing treated vegetation. After this period the weeds may be mowed, tilled or burned. See “Directions for Use,” “General Information” and “Mixing

and Application Instructions” for labeled uses and specific application instructions.

**Broadcast Application Rates:** Use 1 1/2 pints of this product per acre plus 2 or more quarts of a nonionic surfactant per 100 gallons of spray solution if weeds are less than 6 inches tall. If weeds are greater than 6 inches tall, use 2 1/2 pints of this product per acre plus 2 or more quarts of an approved nonionic surfactant per 100 gallons of spray solution.

**Hand-Held, High-Volume Application Rates:** Use a 3/4 percent solution of this product in water plus 2 or more quarts of a nonionic surfactant per 100 gallons of spray solution and apply to foliage of vegetation to be controlled.

**When applied as directed, Rodeo plus nonionic surfactant will control the following annual weeds:**

Common Name	Scientific Name
Balsamapple †	<i>Momordica charantia</i>
Barley	<i>Hordeum vulgare</i>
Barnyardgrass	<i>Echinochloa crus-galli</i>
Bassia, fivehook	<i>Bassia hyssopifolia</i>
Bluegrass, annual	<i>Poa annua</i>
Bluegrass, bulbous	<i>Poa bulbosa</i>
Brome	<i>Bromus spp.</i>
Buttercup	<i>Ranunculus spp.</i>
Cheat	<i>Bromus secalinus</i>
Chickweed, mouseear	<i>Cerastium vulgatum</i>
Cocklebur	<i>Xanthium strumarium</i>
Corn, volunteer	<i>Zea mays</i>
Crabgrass	<i>Digitaria spp.</i>
Dwarf dandelion	<i>Krigia cespitosa</i>
Falseflax, smallseed	<i>Camelina microcarpa</i>
Fiddleneck	<i>Amsinckia spp.</i>
Flaxleaf fleabane	<i>Conyza bonariensis</i>
Fleabane	<i>Erigeron spp.</i>
Foxtail	<i>Setaria spp.</i>
Foxtail, Carolina	<i>Alopecurus carolinianus</i>
Groundsel, common	<i>Senecio vulgaris</i>
Horseweed/Marestail	<i>Conyza canadensis</i>
Kochia	<i>Kochia scoparia</i>
Lambsquarters, common	<i>Chenopodium album</i>
Lettuce, prickly	<i>Lactuca serriola</i>
Morningglory	<i>Ipomoea spp.</i>
Mustard, blue	<i>Chorispora tenella</i>
Mustard, tansy	<i>Descurainia pinnata</i>
Mustard, tumble	<i>Sisymbrium altissimum</i>
Mustard, wild	<i>Sinapis arvensis</i>
Oats, wild	<i>Avena fatua</i>
Panicum	<i>Panicum spp.</i>
Pennycress, field	<i>Thlaspi arvense</i>
Pigweed, redroot	<i>Amaranthus retroflexus</i>
Pigweed, smooth	<i>Amaranthus hybridus</i>
Ragweed, common	<i>Ambrosia artemisiifolia</i>
Ragweed, giant	<i>Ambrosia trifida</i>
Rocket, London	<i>Sisymbrium irio</i>
Rye	<i>Secale cereale</i>
Ryegrass, Italian ††	<i>Lolium multiflorum</i>
Sandbur, field	<i>Cenchrus spp.</i>
Shattercane	<i>Sorghum bicolor</i>
Shepherd's-purse	<i>Capsella bursa-pastoris</i>
Signalgrass, broadleaf	<i>Brachiaria platyphylla</i>
Smartweed, Pennsylvania	<i>Polygonum pennsylvanicum</i>
Sowthistle, annual	<i>Sonchus oleraceus</i>



Spanishneedles ††	<i>Bidens bipinnata</i>
Stinkgrass	<i>Eragrostis ciliaris</i>
Sunflower	<i>Helianthus annuus</i>
Thistle, Russian	<i>Salsola kali</i>
Spurry, umbrella	<i>Holosteum umbellatum</i>
Velvetleaf	<i>Abutilon theophrasti</i>
Wheat	<i>Triticum aestivum</i>
Witchgrass	<i>Panicum capillare</i>

† Apply with hand-held equipment only.

†† Apply 3 pints of this product per acre.

Annual weeds will generally continue to germinate from seed throughout the growing season. Repeat treatments will be necessary to control later germinating weeds.

## Perennial Weeds

Apply Rodeo to control most vigorously growing perennial weeds. Unless otherwise directed, apply when target plants are actively growing and most have reached early head or early bud stage of growth. Unless otherwise directed, allow at least 7 days after application before disturbing vegetation.

**NOTE:** If weeds have been mowed or tilled, do not treat until regrowth has reached the recommended stages. Fall treatments must be applied before a killing frost.

Repeat treatments may be necessary to control weeds regenerating from underground parts or seed.

**Specific Weed Control Recommendations:** For perennial weeds, apply the recommended rate plus 2 or more quarts of a nonionic surfactant per 100 gallons of spray solution. See the “General Information”, “Directions for Use” and “Mixing and Application” sections in this label for specific uses and application instructions.

**When applied as directed, Rodeo plus nonionic surfactant will control the following perennial weeds:** (Numbers in parentheses “(-)” following common name of a listed weed species refer to “Specific Perennial Weed Control Recommendations” for that weed which follow the species listing.)

Common Name	Scientific Name
Alfalfa (31)	<i>Medicago sativa</i>
Alligatorweed † (1)	<i>Alternanthera philoxeroides</i>
Anise/Fennel (31)	<i>Foeniculum vulgare</i>
Artichoke, Jerusalem (31)	<i>Helianthus tuberosus</i>
Bahiagrass (31)	<i>Paspalum notatum</i>
Bermudagrass (2)	<i>Cynodon dactylon</i>
Bindweed, field (3)	<i>Convolvulus arvensis</i>
Bluegrass, Kentucky (12)	<i>Poa pratensis</i>
Blueweed, Texas (3)	<i>Helianthus ciliaris</i>
Brackenfern (4)	<i>Pteridium spp.</i>
Bromegrass, smooth (12)	<i>Bromus inermis</i>
Canarygrass, reed (12)	<i>Phalaris arundinacea</i>
Cattail (5)	<i>Typha spp.</i>

Clover, red (31)	<i>Trifolium pratense</i>
Clover, white (31)	<i>Trifolium repens</i>
Cogongrass (6)	<i>Imperata cylindrica</i>
Cordgrass (7)	<i>Spartina spp.</i>
Cutgrass, giant † (8)	<i>Zizaniopsis miliacea</i>
Dallisgrass (31)	<i>Paspalum dilatatum</i>
Dandelion (31)	<i>Taraxacum officinale</i>
Dock, curly (31)	<i>Rumex crispus</i>
Dogbane, hemp (9)	<i>Apocynum cannabinum</i>
Fescue (31)	<i>Festuca spp.</i>
Fescue, tall (10)	<i>Festuca arundinacea</i>
Guineagrass (11)	<i>Panicum maximum</i>
Hemlock, poison (31)	<i>Conium maculatum</i>
Horsenettle (31)	<i>Solanum carolinense</i>
Horseradish (9)	<i>Armoracia rusticana</i>
Ice Plant (22)	<i>Mesembryanthemum crystallinum</i>
Johnsongrass (12)	<i>Sorghum halepense</i>
Kikuyugrass (21)	<i>Pennisetum clandestinum</i>
Knapweed (9)	<i>Centaurea repens</i>
Lantana (13)	<i>Lantana camara</i>
Lespedeza, common (31)	<i>Lespedeza striata</i>
Lespedeza, sericea (31)	<i>Lespedeza cuneata</i>
Loosestrife, purple (14)	<i>Lythrum salicaria</i>
Lotus, American (15)	<i>Nelumbo lutea</i>
Maidencane (16)	<i>Panicum hematomon</i>
Milkweed (17)	<i>Asclepias spp.</i>
Muhly, wirestem (21)	<i>Muhlenbergia frondosa</i>
Mullein, common (31)	<i>Mesembryanthemum thapsus</i>
Napiergrass (31)	<i>Pennisetum purpureum</i>
Nightshade, silverleaf (3)	<i>Solanum elaeagnifolium</i>
Nutsedge, purple (18)	<i>Cyperus rotundus</i>
Nutsedge, yellow (18)	<i>Cyperus esculentus</i>
Orchardgrass (12)	<i>Dactylis glomerata</i>
Pampasgrass (19)	<i>Cortaderia jubata</i>
Paragrass (16)	<i>Brachiaria mutica</i>
Phragmites†† (20)	<i>Phragmites spp.</i>
Quackgrass (21)	<i>Agropyron repens</i>
Reed, giant (22)	<i>Arundo donax</i>
Ryegrass, perennial (12)	<i>Lolium perenne</i>
Smartweed, swamp (31)	<i>Polygonum coccineum</i>
Spatterdock (23)	<i>Nuphar luteum</i>
Starthistle, yellow (31)	<i>Centaurea solstitialis</i>
Sweet potato, wild † (24)	<i>Ipomoea pandurata</i>
Thistle, artichoke (25)	<i>Cynara cardunculus</i>
Thistle, Canada (25)	<i>Cirsium arvense</i>
Timothy (12)	<i>Phleum pratense</i>
Torpedograss † (26)	<i>Panicum repens</i>
Tules, common (27)	<i>Scirpus acutus</i>
Vaseygrass (31)	<i>Paspalum urvillei</i>
Velvetgrass (31)	<i>Holcus spp.</i>
Waterhyacinth (28)	<i>Eichornia crassipes</i>
Waterlettuce (29)	<i>Pistia stratiotes</i>
Waterprimrose (30)	<i>Ludwigia spp.</i>
Wheatgrass, western (12)	<i>Agropyron smithii</i>

† Partial control.

†† Partial control in southeastern states. See “Specific Weed Control Recommendations” below.

### Specific Perennial Weed Control Recommendations:

1. **Alligatorweed:** Apply 6 pints of this product per acre as a broadcast spray or as a 1 1/4 percent solution with hand-held equipment to provide partial control of alligatorweed. Apply when most of the target plants are in bloom. Repeat applications will be required to maintain such control.
2. **Bermudagrass:** Apply 7 1/2 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Apply when target plants are actively growing and when seedheads appear.
3. **Bindweed, field / Silverleaf Nightshade / Texas Blueweed:** Apply 6 to 7 1/2 pints of this product per acre as a broadcast spray west of the Mississippi River and 4 1/2 to 6 pints of this product per acre east of the Mississippi River. With hand-held equipment, use a 1 1/2 percent solution. Apply when target plants are actively growing and are at or beyond full bloom. For silverleaf nightshade, best results can be obtained when application is made after berries are formed. Do not treat when weeds are under drought stress. New leaf development indicates active growth. For best results apply in late summer or fall.
4. **Brackenfern:** Apply 4 1/2 to 6 pints of this product per acre as a broadcast spray or as a 3/4 to 1 percent solution with hand-held equipment. Apply to fully expanded fronds which are at least 18 inches long.
5. **Cattail:** Apply 4 1/2 to 6 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Apply when target plants are actively growing and are at or beyond the early-to-full bloom stage of growth. Best results are achieved when application is made during the summer or fall months.
6. **Cogongrass:** Apply 4 1/2 to 7 1/2 pints of this product per acre as a broadcast spray. Apply when cogongrass is at least 18 inches tall and actively growing in late summer or fall. Allow 7 or more days after application before tillage or mowing. Due to uneven stages of growth and the dense nature of vegetation preventing good spray coverage, repeat treatments may be necessary to maintain control.
7. **Cordgrass:** Apply 4 1/2 to 7 1/2 pints of this product per acre as a broadcast spray or as a 1 to 2 percent solution with hand-held equipment. Schedule applications in order to allow 6 hours before treated plants are covered by tidewater. The presence of debris and silt on the cordgrass plants will reduce performance. It may be necessary to wash targeted plants prior to application to improve uptake of this product into the plant.
8. **Cutgrass, giant:** Apply 6 pints of this product per acre as a broadcast spray or as a 1 percent solution with hand-held equipment to provide partial control of giant cutgrass. Repeat applications will be required to maintain such control, especially where vegetation is partially submerged in water. Allow for substantial regrowth to the 7 to 10-leaf stage prior to retreatment.
9. **Dogbane, hemp / Knapweed / Horseradish:** Apply 6 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the late bud-to-flower stage of growth. For best results, apply in late summer or fall.
10. **Fescue, tall:** Apply 4 1/2 pints of this product per acre as a broadcast spray or as a 1 percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the boot-to-head stage of growth. When applied prior to the boot stage, less desirable control may be obtained.
11. **Guineagrass:** Apply 4 1/2 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Apply when target plants are actively growing and when most have reached at least the 7-leaf stage of growth.
12. **Johnsongrass / Bluegrass, Kentucky / Bromegrass, smooth / Canarygrass, reed / Orchardgrass / Ryegrass, perennial / Timothy / Wheatgrass, western:** Apply 3 to 4 1/2 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the boot-to-head stage of growth. When applied prior to the boot stage, less desirable control may be obtained. In the fall, apply before plants have turned brown.
13. **Lantana:** Apply this product as a 3/4 to 1 percent solution with hand-held equipment. Apply to actively growing lantana at or beyond the bloom stage of growth. Use the higher application rate for plants that have reached the woody stage of growth.
14. **Loosestrife, purple:** Apply 4 pints of this product per acre as a broadcast spray or as a 1 to 1 1/2 percent solution using hand-held equipment. Treat when plants are actively growing at or beyond the bloom stage of growth. Best results are achieved when application is made during summer or fall months. Fall treatments must be applied before a killing frost.
15. **Lotus, American:** Apply 4 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Treat when plants are actively growing at or beyond the bloom stage of growth. Best results are achieved when application is made during summer or fall months. Fall treatments must be applied before a killing frost. Repeat treatment may be necessary to control regrowth from underground parts and seeds.
16. **Maidencane / Paragrass:** Apply 6 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Repeat treatments will be required, especially to vegetation partially submerged in water. Under these conditions, allow for regrowth to the 7 to 10-leaf stage prior to retreatment.
17. **Milkweed, common:** Apply 4 1/2 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the late bud-to-flower stage of growth.
18. **Nutsedge, purple, yellow:** Apply 4 1/2 pints of this product per acre as a broadcast spray, or as a 3/4 percent solution with hand-held equipment to control existing nutsedge plants and immature nutlets attached to treated plants. Apply when target plants are in flower or when new nutlets can be found at rhizome tips. Nutlets which have not germinated will not be controlled and may germinate following treatment. Repeat treatments will be required for long-term control.
19. **Pampasgrass:** Apply a 1 1/2 percent solution of this product with hand-held equipment when plants are actively growing.
20. **Phragmites:** For partial control of phragmites in Florida and the counties of other states bordering the Gulf of Mexico, apply 7 1/2 pints per acre as a broadcast spray or apply a 1 1/2 percent solution with hand-held equipment. In other areas of the U.S., apply 4 to 6 pints per acre as a broadcast spray or apply a 3/4 percent solution with hand-held equipment for partial control. For best results, treat during late summer or fall months when plants are actively growing and in full bloom. Due to the dense nature of the vegetation, which may prevent good spray coverage and uneven stages of growth, repeat treatments may be necessary to maintain control. Visual control symptoms will be slow to develop.
21. **Quackgrass / Kikuyugrass / Muhly, wirestem:** Apply 3 to 4 1/2 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment when most quackgrass or wirestem muhly is at least 8 inches in height (3 to 4-leaf stage of growth) and actively growing. Allow 3 or more days after application before tillage.
22. **Reed, giant / ice plant:** For control of giant reed and ice plant, apply a 1 1/2 percent solution of this product with hand-held equipment when plants are actively growing. For giant reed, best results are obtained when applications are made in late summer to fall.

23. **Spatterdock:** Apply 6 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Apply when most plants are in full bloom. For best results, apply during the summer or fall months.
24. **Sweet potato, wild:** Apply this product as a 1 1/2 percent solution using hand-held equipment. Apply to actively growing weeds that are at or beyond the bloom stage of growth. Repeat applications will be required. Allow the plant to reach the recommended stage of growth before retreatment.
25. **Thistle, Canada / artichoke:** Apply 3 to 4 1/2 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment for Canada thistle. To control artichoke thistle, apply a 2 percent solution as a spray-to-wet application. Apply when target plants are actively growing and are at or beyond the bud stage of growth.
26. **Torpedograss:** Apply 6 to 7 1/2 pints of this product per acre as a broadcast spray or as a 3/4 to 1 1/2 percent solution with hand-held equipment to provide partial control of torpedograss. Use the lower rates under terrestrial conditions, and the higher rates under partially submerged or a floating mat condition. Repeat treatments will be required to maintain such control.
27. **Tules, common:** Apply this product as a 1 1/2 percent solution with hand-held equipment. Apply to actively growing plants at or beyond the seedhead stage of growth. After application, visual symptoms will be slow to appear and may not occur for 3 or more weeks.
28. **Waterhyacinth:** Apply 5 to 6 pints of this product per acre as a broadcast spray or apply a 3/4 to 1 percent solution with hand-held equipment. Apply when target plants are actively growing and at or beyond the early bloom stage of growth. After application, visual symptoms may require 3 or more weeks to appear with complete necrosis and decomposition usually occurring within 60 to 90 days. Use the higher rates when more rapid visual effects are desired.
29. **Waterlettuce:** For control, apply a 3/4 to 1 percent solution of this product with hand-held equipment to actively growing plants. Use higher rates where infestations are heavy. Best results are obtained from mid-summer through winter applications. Spring applications may require retreatment.
30. **Waterprimrose:** Apply this product as a 3/4 percent solution using hand-held equipment. Apply to plants that are actively growing at or beyond the bloom stage of growth, but before fall color changes occur. Thorough coverage is necessary for best control.
31. **Other perennial weeds listed above:** Apply 4 1/2 to 7 1/2 pints of Rodeo per acre as a broadcast spray or apply as a 3/4 to 1 1/2 percent solution with hand-held equipment.

## Woody Brush and Trees

**NOTE:** If brush has been mowed or tilled or trees have been cut, do not treat until regrowth has reached the recommended stage of growth.

### Application Rates and Timing

When applied as a 5 to 8 percent solution as a directed application as described in the "Hand-Held and High-Volume Equipment" section, this product will control or partially control all wood brush and tree species listed in this section of this label. Use the higher rate of application for dense stands and larger woody brush and trees.

**Specific Brush or Tree Control Recommendations:** Numbers in parentheses "(-)" following the common name of a listed brush or tree species refer to "Specific Brush or Tree Control Recommendations" which follow the species listing. See this section for specific application rates and timing for listed species.

For woody brush and trees, apply the recommended rate plus 2 or more quarts of a nonionic surfactant per 100 gallons of spray solution when plants are actively growing and, unless otherwise directed, after full-leaf expansion. Use the higher rate for larger plants and/or dense areas of growth. On vines, use the higher rate for plants that have reached the woody stage of growth. Best results are obtained when application is made in late summer or fall after fruit formation.

In arid areas, best results are obtained when application is made in the spring or early summer when brush species are at high moisture content and are flowering. Ensure thorough coverage when using hand-held equipment. Symptoms may not appear prior to frost or senescence with fall treatments.

Allow 7 or more days after application before tillage, mowing or removal. Repeat treatments may be necessary to control plants regenerating from underground parts or seed. Some autumn colors on undesirable deciduous species are acceptable provided no major leaf drop has occurred. Reduced performance may result if fall treatments are made following a frost.

See the "Directions for Use" and "Mixing and Application Instructions" sections in this label for labeled use and specific application instructions. **When applied as directed, Rodeo plus nonionic surfactant will control the following woody brush plants and trees:** (Numbers in parentheses "(-)" following common name of a listed brush or tree species refer to "Specific Brush or Tree Control Recommendations" for that species which follow the species listing.)

Common Name	Scientific Name
Alder (1)	<i>Alnus spp.</i>
Ash † (20)	<i>Fraxinus spp.</i>
Aspen, quaking (2)	<i>Populus tremuloides</i>
Bearclover, Bearmat (20)	<i>Chamaebatia foliolosa</i>
Birch (3)	<i>Betula spp.</i>
Blackberry (1)	<i>Rubus spp.</i>
Broom, French (4)	<i>Cytisus monspessulanus</i>
Broom, Scotch (4)	<i>Cytisus scoparius</i>
Buckwheat, California † (5)	<i>Eriogonum fasciculatum</i>
Cascara † (20)	<i>Rhamnus purshiana</i>
Catsclaw † (6)	<i>Acacia greggi</i>
Ceanothus (20)	<i>Ceanothus spp.</i>
Chamise (17)	<i>Adenostoma fasciculatum</i>
Cherry, bitter (7)	<i>Prunus emarginata</i>
Cherry, black (7)	<i>Prunus serotina</i>
Cherry, pin (7)	<i>Prunus pensylvanica</i>
Coyote brush (8)	<i>Baccharis consanguinea</i>
Creeper, Virginia † (20)	<i>Parthenocissus quinquefolia</i>
Dewberry (1)	<i>Rubus trivialis</i>
Dogwood (9)	<i>Cornus spp.</i>
Elderberry (3)	<i>Sambucus spp.</i>
Elm † (20)	<i>Ulmus spp.</i>
Eucalyptus, bluegum (10)	<i>Eucalyptus globulus</i>
Hasardia † (5)	<i>Haplopappus squamosus</i>
Hawthorn (2)	<i>Crataegus spp.</i>
Hazel (3)	<i>Corylus spp.</i>
Hickory (9)	<i>Carya spp.</i>
Holly, Florida (11)	<i>Schinus terebinthifolius</i>
(Brazilian peppertree)	
Honeysuckle (1)	<i>Lonicera spp.</i>
Hornbeam, American (20)	<i>Carpinus caroliniana</i>
Kudzu (12)	<i>Pueraria lobata</i>
Locust, black † (20)	<i>Robinia pseudoacacia</i>
Manzanita (20)	<i>Arctostaphylos spp.</i>

Maple, red <sup>†</sup> (13)	<i>Acer rubrum</i>
Maple, sugar (14)	<i>Acer saccharum</i>
Maple, vine <sup>†</sup> (20)	<i>Acer circinatum</i>
Monkey flower <sup>†</sup> (5)	<i>Mimulus guttatus</i>
Oak, black <sup>†</sup> (20)	<i>Quercus velutina</i>
Oak, northern pin (14)	<i>Quercus palustris</i>
Oak, post (1)	<i>Quercus stellata</i>
Oak, red (14)	<i>Quercus rubra</i>
Oak, southern red (7)	<i>Quercus falcata</i>
Oak, white <sup>†</sup> (20)	<i>Quercus alba</i>
Persimmon <sup>†</sup> (20)	<i>Diospyros spp.</i>
Poison-ivy (15)	<i>Rhus radicans</i>
Poison-oak (15)	<i>Rhus toxicodendron</i>
Poplar, yellow <sup>†</sup> (20)	<i>Liriodendron tulipifera</i>
Prunus (7)	<i>Prunus spp.</i>
Raspberry (1)	<i>Rubus spp.</i>
Redbud, eastern (20)	<i>Cercis canadensis</i>
Rose, multiflora (16)	<i>Rosa multiflora</i>
Russian-olive (20)	<i>Elaeagnus angustifolia</i>
Sage: black (17), white	<i>Salvia spp.</i>
Sagebrush, California (17)	<i>Artemisia californica</i>
Salmonberry (3)	<i>Rubus spectabilis</i>
Salt cedar <sup>†</sup> (9)	<i>Tamarix spp.</i>
Saltbush, sea myrtle (18)	<i>Baccharis halimifolia</i>
Sassafras (20)	<i>Sassafras albidum</i>
Sourwood <sup>†</sup> (20)	<i>Oxydendrum arboreum</i>
Sumac, poison <sup>†</sup> (20)	<i>Rhus vernix</i>
Sumac, smooth <sup>†</sup> (20)	<i>Rhus glabra</i>
Sumac, winged <sup>†</sup> (20)	<i>Rhus copallina</i>
Sweetgum (7)	<i>Liquidambar styraciflua</i>
Swordfern <sup>†</sup> (20)	<i>Polystichum munitum</i>
Tallowtree, Chinese (17)	<i>Sapium sebiferum</i>
Thimbleberry (3)	<i>Rubus parviflorus</i>
Tobacco, tree <sup>†</sup> (5)	<i>Nicotiana glauca</i>
Trumpet creeper (2)	<i>Campsis radicans</i>
Waxmyrtle, southern <sup>†</sup> (11)	<i>Myrica cerifera</i>
Willow (19)	<i>Salix spp.</i>

<sup>†</sup>Partial control (See below for control or partial control instructions.)

#### Specific Brush or Tree Control Recommendations:

- Alder / Blackberry / Dewberry / Honeysuckle / Oak, Post / Raspberry:** For control, apply 4 1/2 to 6 pints per acre as a broadcast spray or as a 3/4 to 1 1/4 percent solution with hand-held equipment.
- Aspen, Quaking / Hawthorn / Trumpet creeper:** For control, apply 3 to 4 1/4 pints of this product per acre as a broadcast spray or as a 3/4 to 1 1/4 percent solution with hand-held equipment.
- Birch / Elderberry / Hazel / Salmonberry / Thimbleberry:** For control, apply 3 pints per acre of this product as a broadcast spray or as a 3/4 percent solution with hand-held equipment.
- Broom, French / Broom, Scotch:** For control, apply a 1 1/4 to 1 1/2 percent solution with hand-held equipment.
- Buckwheat, California / Hasardia / Monkey flower / Tobacco, tree:** For partial control of these species, apply a 3/4 to 1 1/2 percent solution of this product as a foliar spray with hand-held equipment. Thorough coverage of foliage is necessary for best results.
- Catsclaw:** For partial control, apply a 1 1/4 to 1 1/2 percent solution with hand-held equipment when at least 50 percent of the new leaves are fully developed.
- Cherry, bitter / Cherry, black / Cherry, pin / Oak, southern red / Sweetgum / Prunus:** For control, apply 3 to 7 1/2 pints of this product per acre as a broadcast spray or as a 1 to 1 1/2 percent solution with hand-held equipment.
- Coyote brush:** For control, apply a 1 1/4 to 1 1/2 percent solution with hand-held equipment when at least 50 percent of the new leaves are fully developed.
- Dogwood / Hickory / Salt cedar:** For partial control, apply a 1 to 2 percent solution of this product with hand-held equipment or 6 to 7 1/2 pints per acre as a broadcast spray.
- Eucalyptus, bluegum:** For control of eucalyptus resprouts, apply a 1 1/2 percent solution of this product with hand-held equipment when resprouts are 6 to 12-feet tall. Ensure complete coverage. Apply when plants are actively growing. Avoid application to drought-stressed plants.
- Holly, Florida / Waxmyrtle, southern:** For partial control, apply this product as a 1 1/2 percent solution with hand-held equipment.
- Kudzu:** For control, apply 6 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Repeat applications will be required to maintain control.
- Maple, red:** For control, apply as a 3/4 to 1 1/4 percent solution with hand-held equipment when leaves are fully developed. For partial control, apply 2 to 7 1/2 pints of this product per acre as a broadcast spray.
- Maple, sugar / Oak: northern pin / Oak, red:** For control, apply as a 3/4 to 1 1/4 percent solution with hand-held equipment when at least 50 percent of the new leaves are fully developed.
- Poison-ivy / Poison-oak:** For control, apply 6 to 7 1/2 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Repeat applications may be required to maintain control. Fall treatments must be applied before leaves lose green color.
- Rose, multiflora:** For control, apply 3 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Treatments should be made prior to leaf deterioration by leaf-feeding insects.
- Sage, black / Sagebrush, California / Chamise / Tallowtree, Chinese:** For control of these species, apply a 3/4 percent solution of this product as a foliar spray with hand-held equipment. Thorough coverage of foliage is necessary for best results.
- Saltbush, sea myrtle:** For control, apply this product as a 1 percent solution with hand-held equipment.
- Willow:** For control, apply 4 1/2 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment.
- Other woody brush and trees listed above:** For partial control, apply 3 to 7 1/2 pints of this product per acre as a broadcast spray or as a 3/4 to 1 1/2 percent solution with hand-held equipment.

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### **Warranty Disclaimer**

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Dow AgroSciences warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated on the label when used in strict accordance with the directions, subject to the inherent risks set forth below. Dow AgroSciences MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER EXPRESS OR IMPLIED WARRANTY.

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### **Inherent Risks of Use**

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It is impossible to eliminate all risks associated with use of this product. Crop injury, lack of performance, or other unintended consequences may result because of such factors as use of the product contrary to label instructions (including conditions noted on the label, such as unfavorable temperatures, soil conditions, etc.), abnormal conditions (such as excessive rainfall, drought, tornadoes, hurricanes), presence of other materials, the manner of application, or other factors, all of which are beyond the control of Dow AgroSciences or the seller. All such risks shall be assumed by buyer.

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### **Limitation of Remedies**

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The exclusive remedy for losses or damages resulting from this product (including claims based on contract, negligence, strict liability, or other legal theories), shall be limited to, at Dow AgroSciences' election, one of the following:

- (1) Refund of purchase price paid by buyer or user for product bought, or
- (2) Replacement of amount of product used.

Dow AgroSciences shall not be liable for losses or damages resulting from handling or use of this product unless Dow AgroSciences is promptly notified of such loss or damage in writing. In no case shall Dow AgroSciences be liable for consequential or incidental damages or losses.

The terms of the Warranty Disclaimer above and this Limitation of Remedies cannot be varied by any written or verbal statements or agreements. No employee or sales agent of Dow AgroSciences or the seller is authorized to vary or exceed the terms of the Warranty Disclaimer or this Limitation of Remedies in any manner.

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Label Code: D02-148-002

Replaces Label: D02-148-001

EPA-accepted 05/15/2002

#### **Revisions:**

1. Update of specific uses allowed in the state of California.

# **Appendix B**

## **Cost Budget Analysis**

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Anchorage International Airport  
 Aquatic Vegetation Management  
 Present Worth Analysis of Management Options

Summary of Treatment Option Costs

Treatment Description	Capital Costs	Annual O&M Costs	5-Year Present Worth Cost
<b>WHOLE LAKE (208 acres)</b>			
Triploid Carp	\$ 70,912	\$ 800	\$ 74,616
Herbicides			
Sonar A.S. (Fluridone)	\$ -	\$ 30,886	\$ 143,001
Sonar SRP (Fluridone)	\$ -	\$ 26,763	\$ 123,912
Aquathol K (Endothall)	\$ -	\$ 184,157	\$ 852,630
Hydrothol 191 (Endothall)	\$ -	\$ 285,037	\$ 1,319,693
<b>DEEP LITTORAL ZONE (to 10 ft deep, 134 acres)</b>			
Borrow Homer's Harvester	\$ 2,000	\$ 38,065	\$ 178,235
Harvesting Contractor - 5-days per year	\$ -	\$ 11,000	\$ 50,929
Harvesting Contractor -134 Acres, 56-days per year	\$ -	\$ 122,833	\$ 568,705
Purchase Large Harvester	\$ 128,450	\$ 26,509	\$ 251,183
Purchase Small Harvester	\$ 102,025	\$ 38,065	\$ 278,260
Herbicides			
Sonar A.S. (Fluridone)	\$ -	\$ 30,649	\$ 141,899
Sonar SRP (Fluridone)	\$ -	\$ 38,678	\$ 179,074
Aquathol K (Endothall)	\$ -	\$ 98,978	\$ 458,258
Hydrothol 191 (Endothall)	\$ -	\$ 153,153	\$ 709,081
Reward (Diquat)	\$ -	\$ 38,427	\$ 177,914
Navigate (2,4-D)	\$ -	\$ 67,110	\$ 310,712
Renovate (Triclopyr)	\$ -	\$ 161,439	\$ 747,447
Bottom Barrier	\$ 5,515,866	\$ 7,000	\$ 5,548,276
<b>SHALLOW LITTORAL ZONE (to 5 ft deep, 28.5 acres)</b>			
Small Harvester	\$ 102,025	\$ 8,039	\$ 139,246
Weed Mower	\$ 2,655	\$ 4,275	\$ 22,448
Herbicides			
Sonar A.S. (Fluridone)	\$ -	\$ 6,748	\$ 31,244
Sonar SRP (Fluridone)	\$ -	\$ 8,456	\$ 39,151
Aquathol K (Endothall)	\$ -	\$ 14,332	\$ 49,687
Hydrothol 191 (Endothall)	\$ -	\$ 16,483	\$ 76,312
Reward (Diquat)	\$ -	\$ 8,403	\$ 38,904
Navigate (2,4-D)	\$ -	\$ 14,503	\$ 67,148
Renovate (Triclopyr)	\$ -	\$ 17,483	\$ 80,944
Bottom Barrier	\$ 1,173,127	\$ 4,000	\$ 1,191,647
<b>ALL FLOAT PLANE SLIPS (6 acres for all 325 slips)</b>			
Weed Mower	\$ 1,948	\$ 1,800	\$ 10,282
Weed Cutter	\$ 20,019	\$ 8,125	\$ 57,637
Hand Rake	\$ 1,350	\$ 16,250	\$ 76,586
<b>INDIVIDUAL FLOAT PLANE SLIPS (700 square feet)</b>			
Bottom Barrier	\$ 694	\$ 400	\$ 2,546
Weed Mower	\$ 2,655	\$ -	\$ -
Weed Cutter	\$ 2,064	\$ 25	\$ 2,180
Hand Rake	\$ 135	\$ 50	\$ 366
Herbicides			
Aquathol K (Endothall)	\$ -	\$ 156	\$ 722
Hydrothol 191 (Endothall)	\$ -	\$ 159	\$ 737
Reward (Diquat)	\$ -	\$ 155	\$ 715
Navigate (2,4-D)	\$ -	\$ 158	\$ 731
Renovate (Triclopyr)	\$ -	\$ 160	\$ 739
<b>Assumptions</b>			
Interest Rate	0.04	percent	
Life Cycle Period	5	years	

**Anchorage International Airport**  
**Aquatic Vegetation Management**  
**Present Worth Analysis of Management Options**

**Triploid Carp**

**Whole Lake**

Size = 208 surface acres, average depth of 6.0 feet, however 138 acres of the lake is vegetated

Description	Quantity	Unit	Unit Cost	Total Cost	Resource
<b>Capital Costs</b>					
Triploid Carp, 10 fish per acre stocking rate	1,380	fish	\$ 12.00	\$ 16,560.00	9-25 fish per vegetated acre (Washington State Ecological Services), 5-10 carp per acre of water for 40-60 percent plant cover (Missouri Department of Conservation)
Shipping	138	boxes with coolers	\$ 104.00	\$ 14,352.00	Federal Express Online Shipping
Fish Gate	2	gates	\$ 20,000.00	\$ 40,000.00	
<b>Present Worth Analysis Summary Capital Costs</b>	<b>5</b>			<b>\$ 70,912.00</b>	
<b>Operations and Maintenance Costs</b>					
Labor	16	hour	\$ 50.00	\$ 800.00	
<b>Subtotal O&amp;M Costs</b>				<b>\$ 800.00</b>	
<b>Present Worth Costs</b>				<b>\$74,615.92</b>	
<b>Assumptions</b>					
Interest Rate	0.04	percent			
Life Cycle Period	5	years			
1 acre = 43,560 square foot					



**Anchorage International Airport  
 Aquatic Vegetation Management  
 Present Worth Analysis of Management Options**

**Herbicides**

**Whole Lake**

Size = 208 surface acres, average depth of 6.0 feet

Description	Quantity	Units	Unit Cost	Total Cost	Resource
<b>Sonar A.S. (Fluridone)</b>					
<b>Present Worth Analysis Summary Capital Costs</b>				\$ -	
<b>Operations and Maintenance Costs</b>					
Application Labor	16	hour	\$ 100.00	\$ 1,600.00	
Target dose = 16 ppb, .256 quarts per surface acre, Annual re-application of herbicide	53	quarts	\$ 550.00	\$ 29,286.40	Dr. Bill Haller, University of Florida (July 2004), Sonar A.S. Label, Aerators Aquatics 4 Lakes N Ponds, Aquatechnex, LLC
<b>Subtotal Costs</b>				\$ 30,886.40	
<b>Present Worth Costs</b>				\$143,000.80	
<b>Sonar SRP (Fluridone)</b>					
<b>Present Worth Analysis Summary Capital Costs</b>				\$ -	
<b>Operations and Maintenance Costs</b>					
Application Labor	16	hour	\$ 100.00	\$ 1,600.00	
Target dose = 16 ppb, 5.2 lbs per surface acre (sold in 40 lbs packages). Annual re-application of herbicide	27	40 pound bags	\$ 930.60	\$ 25,163.42	Dr. Bill Haller, University of Florida (July 2004), Sonar SRP Label, Aerators Aquatics 4 Lakes N Ponds, Aquatechnex, LLC
<b>Subtotal O&amp;M Costs</b>				\$ 26,763.42	
<b>Present Worth Costs</b>				\$123,911.85	
<b>Aquathol K (Endothall)</b>					
<b>Present Worth Analysis Summary Capital Costs</b>				\$ -	
<b>Operations and Maintenance Costs</b>					
Application Labor	16	hour	\$ 100.00	\$ 1,600.00	
Target dose = 3.0 ppm for target species, 11.5 gallons per surface acre (sold in 2.5 gallon packages). Annual re-application of herbicide	956.8	2.5 gallons	\$ 190.80	\$ 182,557.44	Aquathol K Label, Aerators Aquatics 4 Lakes N Ponds
<b>Subtotal O&amp;M Costs</b>				\$ 184,157.44	
<b>Present Worth Costs</b>				\$852,629.65	
<b>Hydrothol 191 (Endothall)</b>					
<b>Present Worth Analysis Summary Capital Costs</b>				\$ -	
<b>Operations and Maintenance Costs</b>					
Application Labor	16	hour	\$ 100.00	\$ 1,600.00	
Target dose of 2.0 ppm for target species, 16.3 gallons per surface acre (sold in 2.5 gallon packages). Annual re-application of herbicide	1356.16	2.5 gallons	\$ 209.00	\$ 283,437.44	Hydrothol 191 Label, Aerators Aquatics 4 Lakes N Ponds
<b>Subtotal O&amp;M Costs</b>				\$ 285,037.44	
<b>Present Worth Costs</b>				\$1,319,693.48	
<b>Assumptions</b>					
Interest Rate	0.04	percent			
Life Cycle Period	5	years			

**Anchorage International Airport**  
**Aquatic Vegetation Management**  
**Present Worth Analysis of Management Options**  
**Borrow EH-220 Harvester from Homer**  
**134 Acre (Littoral Zone to 10-ft depth) Lake Treatment**

Average depth = 5.0 feet

Description	Quantity	Unit	Unit Cost	Total Cost	Resource
<b>All Float Plane Slips</b>					
Shipping	2	shipping	\$ 1,000.00	\$ 2,000.00	
<b>Present Worth Analysis Summary Capital Costs</b>				<b>\$ 2,000.00</b>	
<b>Operations and Maintenance Costs</b>	<b>5</b>				
harvester operation labor (one coverage)	450	hours	\$ 50.00	\$ 22,500.00	Anchorage International Airport, 2004, Aquarius, 2004
dump truck driver	225	hours	\$ 50.00	\$ 11,250.00	
maintenance labor	45	hours	\$ 50.00	\$ 2,233.33	Anchorage International Airport, 2004, Aquarius, 2004
spare parts	450	cost per hour	\$ 0.75	\$ 337.50	Spare parts generally \$0.58-0.93 per hour of operation, Aquarius, 2004
repairs	450	cost per hour	\$ 1.25	\$ 562.50	Repairs cost range from \$0.66-\$1.47 per hour of operation, Aquarius, 2004
fuel for harvester	675	gallons	\$ 1.55	\$ 1,046.25	Fuel efficiency average 1.5 gal per hr. for all harvesters, Aquarius, 2004
fuel for dump truck	225	hours	\$ 0.60	\$ 135.00	Estimated gas for dump truck per hour harvester operation = 0.60, Aquarius, 2004
<b>Subtotal O&amp;M Costs</b>				<b>\$ 38,064.58</b>	
<b>Present Worth Costs</b>				<b>\$178,235.03</b>	
<i>Assumptions</i>					
Interest Rate	0.04	percent			
Life Cycle Period	5	years			
Area to be harvested	134	acres			
EH-220 efficiency	0.3	acres/hour			
hours =	447	hours			
weeks =	11	weeks			
total maintenance =	45	hours			
total hours =	491	hours			

**Anchorage International Airport**  
**Aquatic Vegetation Management**  
**Present Worth Analysis of Management Options**  
**Outsourcing Harvester - 5-Days Per Year**  
**134 Acre (Littoral Zone to 10-ft depth) Lake Treatment**  
 Average depth = 5.0 feet

Description	Quantity	Unit	Unit Cost	Total Cost	Resource
<b>Capital Costs</b>					
<b>Present Worth Analysis Summary Capital Costs</b>				\$ -	
Operations and Maintenance Costs					
Charges from contract harvesting company	56	Days	\$ 2,200.00	\$ 122,833.33	Cost estimate given to ANC by local private contractor
<b>Subtotal O&amp;M Costs</b>				<b>\$ 122,833.33</b>	
<b>Present Worth Costs</b>				<b>\$568,705.46</b>	
<i>Assumptions</i>					
Interest Rate	0.04	percent			
Life Cycle Period	5	years			
Area to be harvested	134	acres			
EH-220 efficiency	0.3	acres/hour			
hours =	447	hours			
weeks =	11	weeks			
total maintenance =	45	hours			
total hours =	491	hours			

**Anchorage International Airport**  
**Aquatic Vegetation Management**  
**Present Worth Analysis of Management Options**  
**Outsourcing Harvester - 5-Days Per Year**  
**134 Acre (Littoral Zone to 10-ft depth) Lake Treatment**

Average depth = 5.0 feet

Description	Quantity	Unit	Unit Cost	Total Cost	Resource
<b>Capital Costs</b>					
<b>Present Worth Analysis Summary Capital Costs</b>				\$ -	
Operations and Maintenance Costs					
Charges from contract harvesting company	5	days	\$ 2,200.00	\$ 11,000.00	Cost estimate given to ANC by local private contractor
<b>Subtotal O&amp;M Costs</b>				<b>\$ 11,000.00</b>	
<b>Present Worth Costs</b>				<b>\$50,928.85</b>	
<i>Assumptions</i>					
Interest Rate	0.04	percent			
Life Cycle Period	5	years			
Area to be harvested	134	acres			
EH-220 efficiency	0.3	acres/hour			
hours =	450	hours			
weeks =	11	weeks			
total maintenance =	45	hours			
total hours =	495	hours			

**Anchorage International Airport  
 Aquatic Vegetation Management  
 Present Worth Analysis of Management Options**

**Large Harvester**

**134 Acre (Littoral Zone to 10-ft depth) Lake Treatment**

Average depth = 5.0 feet

Description	Quantity	Unit	Unit Cost	Total Cost	Resource
<b>Capital Costs</b>					
HN-420 - 7-ft cutter width, 0.425 acres per hour	1	harvester	\$ 83,500.00	\$ 83,500.00	Aquarius, 2004
TR-23 Trailer	1	trailer	\$ 9,450.00	\$ 9,450.00	Aquarius, 2004
SC-23 Shore Conveyor	1	shore conveyor	\$ 20,500.00	\$ 20,500.00	Aquarius, 2004
Shipping	5	shipping to Alaska	\$ 15,000.00	\$ 15,000.00	Aquarius, 2004
<b>Present Worth Analysis Summary Capital Costs</b>				<b>\$ 128,450.00</b>	
<b>Operations and Maintenance Costs</b>					
harvester operation labor (one coverage)	315	hours	\$ 50.00	\$ 15,750.00	Anchorage International Airport, 2004, Aquarius, 2004
dump truck driver	157.5	hours	\$ 50.00	\$ 7,875.00	
maintenance labor	32	hours	\$ 50.00	\$ 1,576.47	Anchorage International Airport, 2004, Aquarius, 2004
spare parts	250	cost per hour	\$ 0.75	\$ 187.50	Spare parts generally \$0.58-0.93 per hour of operation, Aquarius, 2004
repairs	250	cost per hour	\$ 1.25	\$ 312.50	Repairs cost range from \$0.66-\$1.47 per hour of operation, Aquarius, 2004
fuel for harvester	472.5	gallons	\$ 1.55	\$ 732.38	Fuel efficiency average 1.5 gal per hr. for all harvesters, Aquarius, 2004
fuel for dump truck	125	hours	\$ 0.60	\$ 75.00	Estimated gas for dump truck per hour harvester operation = 0.60, Aquarius, 2004
<b>Subtotal O&amp;M Costs</b>				<b>\$ 26,508.85</b>	
<b>Present Worth Costs</b>				<b>\$251,183.18</b>	
<b>Assumptions</b>					
Interest Rate	0.04	percent			
Life Cycle Period	5	years			
Area to be harvested	134	acres			
HN-420 efficiency	0.425	acres/hour			
hours =	315	hours			
weeks =	8	weeks			
total maintenance =	32	hours			
total hours =	347	hours			

**Anchorage International Airport  
 Aquatic Vegetation Management  
 Present Worth Analysis of Management Options**

**Small Harvester**

**134 Acre (Littoral Zone to 10-ft depth) Lake Treatment**

Average depth = 5.0 feet

Description	Quantity	Unit	Unit Cost	Total Cost	Resource
<b>Capital Costs</b>					
EH-220 - 5-ft cutter width, 0.3 acres per hour	1	harvester	\$ 63,650.00	\$ 63,650.00	Aquarius, 2004
TR-12 Trailer	1	trailer	\$ 7,875.00	\$ 7,875.00	Aquarius, 2004
SC-12 Shore Conveyor	1	shore conveyor	\$ 20,500.00	\$ 20,500.00	Aquarius, 2004
Shipping	5	shipping to Alaska	\$ 10,000.00	\$ 10,000.00	Aquarius, 2004
<b>Present Worth Analysis Summary Capital Costs</b>				<b>\$ 102,025.00</b>	
<b>Operations and Maintenance Costs</b>					
harvester operation labor (one coverage)	450	hours	\$ 50.00	\$ 22,500.00	Anchorage International Airport, 2004, Aquarius, 2004
dump truck driver	225	hours	\$ 50.00	\$ 11,250.00	
maintenance labor	45	hours	\$ 50.00	\$ 2,233.33	Anchorage International Airport, 2004, Aquarius, 2004
spare parts	450	cost per hour	\$ 0.75	\$ 337.50	Spare parts generally \$0.58-0.93 per hour of operation, Aquarius, 2004
repairs	450	cost per hour	\$ 1.25	\$ 562.50	Repairs cost range from \$0.66-\$1.47 per hour of operation, Aquarius, 2004
fuel for harvester	675	gallons	\$ 1.55	\$ 1,046.25	Fuel efficiency average 1.5 gal per hr. for all harvesters, Aquarius, 2004
fuel for dump truck	225	hours	\$ 0.60	\$ 135.00	Estimated gas for dump truck per hour harvester operation = 0.60, Aquarius, 2004
<b>Subtotal O&amp;M Costs</b>				<b>\$ 38,064.58</b>	
<b>Present Worth Costs</b>				<b>\$278,260.03</b>	
<b>Assumptions</b>					
Interest Rate	0.04	percent			
Life Cycle Period	5	years			
Area to be harvested	134	acres			
EH-220 efficiency	0.3	acres/hour			
hours =	447	hours			
weeks =	11	weeks			
total maintenance =	45	hours			
total hours =	491	hours			

**Anchorage International Airport**  
**Aquatic Vegetation Management**  
**Present Worth Analysis of Management Options**  
**Herbicides**

**134 Acre (Littoral Zone to 10-ft depth) Lake Treatment**

Average depth = 5.0 feet

Description	Quantity	Units	Unit Cost	Total Cost	Resource
<b>Sonar A.S. (Fluridone)</b>					
<b>Present Worth Analysis Summary Capital Costs</b>				\$ -	
<b>Operations and Maintenance Costs</b>					
Application Labor	8	hour	\$ 100.00	\$ 800.00	
Target dose = 30 ppb, .405 quarts per surface acre. Annual re-application of herbicide. Higher concentrations are recommended for partial lake treatment.	54	quarts	\$ 550.00	\$ 29,848.50	Sonar A.S. Label recommendation for partial lake treatment, Aerators Aquatics 4 Lakes N Ponds, Aquatechnex, LLC
<b>Subtotal O&amp;M Costs</b>				\$ 30,648.50	
<b>Present Worth Costs</b>				\$ 141,899.34	
<b>Sonar SRP (Fluridone)</b>					
<b>Present Worth Analysis Summary Capital Costs</b>				\$ -	
<b>Operations and Maintenance Costs</b>					
Application Labor	8	hour	\$ 100.00	\$ 800.00	
Target dose = 45 ppb, 12.2 lbs per surface acre (sold in 40 lbs packages). Annual re-application of herbicide. Higher concentrations are recommended for partial lake treatment.	41	40 pound bags	\$ 930.60	\$ 37,877.75	Sonar SRP Label recommendation for partial lake treatment, Aerators Aquatics 4 Lakes N Ponds, Aquatechnex, LLC
<b>Subtotal O&amp;M Costs</b>				\$ 38,677.75	
<b>Present Worth Costs</b>				\$ 179,073.91	
<b>Aquathol K (Endothall)</b>					
<b>Present Worth Analysis Summary Capital Costs</b>				\$ -	
<b>Operations and Maintenance Costs</b>					
Application Labor	8	hour	\$ 100.00	\$ 800.00	
Target dose = 3.0 ppm for target species, 9.6 gallons per surface acre for 5-ft deep avg (sold in 2.5 gallon packages). Annual re-application of herbicide	515	2.5 gallons	\$ 190.80	\$ 98,178.05	Aquathol K Label, Aerators Aquatics 4 Lakes N Ponds
<b>Subtotal O&amp;M Costs</b>				\$ 98,978.05	
<b>Present Worth Costs</b>				\$ 458,257.99	
<b>Hydrothol 191 (Endothall)</b>					
<b>Present Worth Analysis Summary Capital Costs</b>				\$ -	
<b>Operations and Maintenance Costs</b>					
Application Labor	8	hour	\$ 100.00	\$ 800.00	
Target dose of 2.0 ppm for target species, 13.6 gallons per surface acre for 5-ft deep avg (sold in 2.5 gallon packages), Annual re-application of herbicide	729	2.5 gallons	\$ 209.00	\$ 152,352.64	Hydrothol 191 Label, Aerators Aquatics 4 Lakes N Ponds
<b>Subtotal O&amp;M Costs</b>				\$ 153,152.64	
<b>Present Worth Costs</b>				\$ 709,080.68	
<b>Reward (Diquat)</b>					
<b>Present Worth Analysis Summary Capital Costs</b>				\$ -	
<b>Operations and Maintenance Costs</b>					
Application Labor	8	hour	\$ 100.00	\$ 800.00	
2 gallons per surface acre for target species (sold in 2.5 gallon packages). Annual re-application of herbicide	107	2.5 gallons	\$ 351.00	\$ 37,627.20	Reward Label, Aerators Aquatics 4 Lakes N Ponds
<b>Subtotal O&amp;M Costs</b>				\$ 38,427.20	
<b>Present Worth Costs</b>				\$ 177,913.91	
<b>Navigate (2,4-D)</b>					
<b>Present Worth Analysis Summary Capital Costs</b>				\$ -	
<b>Operations and Maintenance Costs</b>					
Application Labor	8	hour	\$ 100.00	\$ 800.00	
150 pounds per surface acre (sold in 50 lbs packages). Annual re-application of herbicide	402	50 pounds	\$ 164.95	\$ 66,309.90	Navigate Label, The Lake Doctors, Inc.
<b>Subtotal O&amp;M Costs</b>				\$ 67,109.90	
<b>Present Worth Costs</b>				\$ 310,711.81	

<b>Renovate (Triclopyr)</b>					
<b>Present Worth Analysis Summary Capital Costs</b>					<b>\$ -</b>
<b>Operations and Maintenance Costs</b>					
Application Labor	8	hour	\$ 100.00	\$ 800.00	
Target dose = 2 ppm (recommended 0.75-2.5 ppm), 9 gallons per surface acre for 5-ft deep avg (sold in packages of 2.5 gallons). Annual re-application of herbicide	482	2.5 gallons	\$ 333.00	\$ 160,639.20	Renovate Label, Aerators Aquatics 4 Lakes N Ponds
<b>Subtotal O&amp;M Costs</b>				<b>\$ 161,439.20</b>	
<b>Present Worth Costs</b>				<b>\$747,446.58</b>	
<i>Assumptions</i>					
Interest Rate	0.04	percent			
Life Cycle Period	5	years			



**Anchorage International Airport  
 Aquatic Vegetation Management  
 Present Worth Analysis of Management Options**

**Bottom Barrier**

**134 Acre (Littoral Zone to 10-ft depth) Lake Treatment**

134 acre = 5,837,040 square foot  
 needed = 40,535, 12 x 12 frames

Description	Quantity	Unit	Unit Cost	Total Cost	Resource
<b>Capital Costs</b>					
synthetic bottom barrier material	5,837,040	square feet	\$ 0.75	\$ 4,377,780.00	Washington Dept. Ecology
sand bags (twelve per frame)	486,420	bags	\$ 0.16	\$ 77,827.20	Berry Small Interprises (14"x26" sandbags)
2" x 2" twelve foot long (15 per frame)	5	boards	\$ 2.98	\$ 14.88	Lowe's Hardware, \$5.95 for 2x4x12, will need to be sawed in half
nails (two for each 2" x 2")	0	pounds	\$ 1.69	\$ 0.09	Home Depot, 181 nails per pound)
marine plywood (12 square feet (48 gussets) per frame)	486,420	square feet	\$ 2.13	\$ 1,036,074.60	<a href="http://www.westwindhardwood.com/wood_marine.html">http://www.westwindhardwood.com/wood_marine.html</a>
Staple guns	10	staple gun	\$ 16.97	\$ 169.70	Lowe's Hardware
Installation Labor (scuba divers)	240	hour	\$ 100.00	\$ 24,000.00	
<b>Present Worth Analysis Summary Capital Costs</b>				<b>\$ 5,515,866.47</b>	
<b>Operations and Maintenance Costs</b>					
Maintenance Labor	140	hour	\$ 50.00	\$ 7,000.00	
Replacement materials					
<b>Subtotal O&amp;M Costs</b>				<b>\$ 7,000.00</b>	
<b>Present Worth Costs</b>				<b>\$ 5,548,275.73</b>	
<b>Assumptions</b>					
Interest Rate	0.04	percent			
Life Cycle Period	5	years			
1 acre = 43,560 square foot					

**Anchorage International Airport  
 Aquatic Vegetation Management  
 Present Worth Analysis of Management Options**

**Weed Mower**

**28.5 Acres (Littoral Zone to 5-ft depth) Lake Treatment**

Average depth = 2.5 feet

Description	Quantity	Unit	Unit Cost	Total Cost	Total Cost per square foot	Resource
<b>Capital Costs</b>						
Jensen Lake Mower	1	mower	\$ 1,735.00	\$ 1,735.00	\$ 2.48	Jensen Technologies, 2004
Packaging and Shipping (ground)	1		\$ 61.00	\$ 61.00	\$ 0.09	
2' extender	1	extender	\$ 159.00	\$ 159.00	\$ 0.23	Jensen Technologies, 2004
marine battery	5	battery	\$ 140.00	\$ 700.00	\$ 1.00	<a href="http://www.1st-optima-batteries.com/">http://www.1st-optima-batteries.com/</a>
<b>Estimated Present Worth Analysis Summary Capital Costs</b>				<b>\$ 2,655.00</b>	<b>\$ 3.79</b>	
<b>Operations and Maintenance Costs</b>						
Labor (covers 1 acre in 3 hours with 1/10 hp engine boat)	85.5	hour slips	\$ 50.00	\$ 4,275.00	\$ 6.11	
<b>Subtotal O&amp;M Costs</b>				<b>\$ 4,275.00</b>	<b>\$ 6.11</b>	
<b>Present Worth Costs</b>				<b>\$22,447.80</b>		
<i>Assumptions</i>						
Interest Rate	0.04	percent				
Life Cycle Period	5	years				
Assumed that mower is used 2 times per year and covers 28.5 1 acre = 43,560 square foot	85.5	hours				

**Anchorage International Airport  
 Aquatic Vegetation Management  
 Present Worth Analysis of Management Options**

**Small Harvester**

**28.5 Acres (Littoral Zone to 5-ft depth) Lake Treatment**

Average depth = 2.5 feet

Description	Quantity	Unit	Unit Cost	Total Cost	Resource
<b>Capital Costs</b>					
EH-220 - 5-ft cutter width, 0.3 acres per hour	1	harvester	\$ 63,650.00	\$ 63,650.00	Aquarius, 2004
TR-12 Trailer	1	trailer	\$ 7,875.00	\$ 7,875.00	Aquarius, 2004
SC-12 Shore Conveyor	1	shore conveyor	\$ 20,500.00	\$ 20,500.00	Aquarius, 2004
Shipping	5	shipping to Alaska	\$ 10,000.00	\$ 10,000.00	Aquarius, 2004
<b>Present Worth Analysis Summary Capital Costs</b>				<b>\$ 102,025.00</b>	
<b>Operations and Maintenance Costs</b>					
harvester operation labor (one coverage)	95	hours	\$ 50.00	\$ 4,750.00	Anchorage International Airport, 2004, Aquarius, 2004
dump truck driver	47.5	hours	\$ 50.00	\$ 2,375.00	
maintenance labor	10	hours	\$ 50.00	\$ 475.00	Anchorage International Airport, 2004, Aquarius, 2004
spare parts	95	cost per hour	\$ 0.75	\$ 71.25	Spare parts generally \$0.58-0.93 per hour of operation, Aquarius, 2004
repairs	95	cost per hour	\$ 1.25	\$ 118.75	Repairs cost range from \$0.66-\$1.47 per hour of operation, Aquarius, 2004
fuel for harvester	142.5	gallons	\$ 1.55	\$ 220.88	Fuel efficiency average 1.5 gal per hr. for all harvesters, Aquarius, 2004
fuel for dump truck	47.5	hours	\$ 0.60	\$ 28.50	Estimated gas for dump truck per hour harvester operation = 0.60, Aquarius, 2004
<b>Subtotal O&amp;M Costs</b>				<b>\$ 8,039.38</b>	
<b>Present Worth Costs</b>				<b>\$139,246.46</b>	
<b>Assumptions</b>					
Interest Rate	0.04	percent			
Life Cycle Period	5	years			
Area to be harvested	28.5	acres			
EH-220 efficiency	0.3	acres/hour			
hours =	95	hours			
weeks =	2	weeks			
total maintenance =	10	hours			
total hours =	105	hours			

**Anchorage International Airport  
 Aquatic Vegetation Management  
 Present Worth Analysis of Management Options  
 Herbicides**

**28.5 Acres (Littoral Zone to 5-ft depth) Lake Treatment**

Average depth = 2.5 feet

Description	Quantity	Units	Unit Cost	Total Cost	Resource
<b>Sonar A.S. (Fluridone)</b>					
<b>Present Worth Analysis Summary Capital Costs</b>				\$ -	
<b>Operations and Maintenance Costs</b>					
Application Labor	4	hour	\$ 100.00	\$ 400.00	
Target dose = 30 ppb, .405 quarts per surface acre. Annual re-application of herbicide. Higher concentrations are recommended for partial lake treatment	12	quarts	\$ 550.00	\$ 6,348.38	Dr. Bill Haller, University of Florida, Sonar A.S. Label, Aerators Aquatics 4 Lakes N Ponds, Aquatechnex, LLC
<b>Subtotal O&amp;M Costs</b>				\$ 6,748.38	
<b>Present Worth Costs</b>				\$31,244.27	
<b>Sonar SRP (Fluridone)</b>					
<b>Present Worth Analysis Summary Capital Costs</b>				\$ -	
<b>Operations and Maintenance Costs</b>					
Application Labor	4	hour	\$ 100.00	\$ 400.00	
Target dose = 45 ppb, 12.2 lbs per surface acre (sold in 40 lbs packages). Annual re-application of herbicide. Higher concentrations are recommended for partial lake treatment.	9	40 pound bags	\$ 930.60	\$ 8,056.09	Sonar SRP Label recommendation for partial lake treatment, Aerators Aquatics 4 Lakes N Ponds, Aquatechnex, LLC
<b>Subtotal O&amp;M Costs</b>				\$ 8,456.09	
<b>Present Worth Costs</b>				\$39,150.80	
<b>Aquathol K (Endothall)</b>					
<b>Present Worth Analysis Summary Capital Costs</b>				\$ -	
<b>Operations and Maintenance Costs</b>					
Application Labor	4	hour	\$ 100.00	\$ 400.00	
Target dose = 3.0 ppm for target species, 4.75 gallons per surface acre for 2.5 ft deep avg (sold in 2.5 gallon packages). Annual re-application of herbicide	54	2.5 gallons	\$ 190.80	\$ 10,331.82	Aquathol K Label, Aerators Aquatics 4 Lakes N Ponds
<b>Subtotal O&amp;M Costs</b>				\$ 10,731.82	
<b>Present Worth Costs</b>				\$49,687.20	
<b>Hydrothol 191 (Endothall)</b>					
<b>Present Worth Analysis Summary Capital Costs</b>				\$ -	
<b>Operations and Maintenance Costs</b>					
Application Labor	4	hour	\$ 100.00	\$ 400.00	
Target dose of 2.0 ppm for target species, 6.75 gallons per surface acre for 2.5 ft deep avg (sold in 2.5 gallon packages). Annual re-application of herbicide	77	2.5 gallons	\$ 209.00	\$ 16,082.55	Hydrothol 191 Label, Aerators Aquatics 4 Lakes N Ponds
<b>Subtotal O&amp;M Costs</b>				\$ 16,482.55	
<b>Present Worth Costs</b>				\$76,312.48	
<b>Reward (Diquat)</b>					
<b>Present Worth Analysis Summary Capital Costs</b>				\$ -	
<b>Operations and Maintenance Costs</b>					
Application Labor	4	hour	\$ 100.00	\$ 400.00	
2 gallons per surface acre for target species (sold in 2.5 gallon packages). Annual re-application of herbicide	23	2.5 gallons	\$ 351.00	\$ 8,002.80	Reward Label, Aerators Aquatics 4 Lakes N Ponds
<b>Subtotal O&amp;M Costs</b>				\$ 8,402.80	
<b>Present Worth Costs</b>				\$38,904.08	
<b>Navigate (2,4-D)</b>					
<b>Present Worth Analysis Summary Capital Costs</b>				\$ -	
<b>Operations and Maintenance Costs</b>					
Application Labor	4	hour	\$ 100.00	\$ 400.00	
150 pounds per surface acre (sold in 50 lbs packages). Annual re-application of herbicide	86	50 pound pkg.	\$ 164.95	\$ 14,103.23	Navigate Label, The Lake Doctors, Inc.
<b>Subtotal O&amp;M Costs</b>				\$ 14,503.23	
<b>Present Worth Costs</b>				\$67,148.41	
<b>Renovate (Triclopyr)</b>					
<b>Present Worth Analysis Summary Capital Costs</b>				\$ -	
<b>Operations and Maintenance Costs</b>					
Application Labor	4	hour	\$ 100.00	\$ 400.00	
Target dose = 2 ppm (recommended 0.75-2.5 ppm), 4.5 gallons per surface acre for 2.5 ft deep avg (sold in packages of 2.5 gallons). Annual re-application of herbicide	51	2.5 gallons	\$ 333.00	\$ 17,082.90	Renovate Label, Aerators Aquatics 4 Lakes N Ponds
<b>Subtotal O&amp;M Costs</b>				\$ 17,482.90	
<b>Present Worth Costs</b>				\$80,944.00	
<b>Assumptions</b>					
Interest Rate	0.04	percent			
Life Cycle Period	5	years			

**Anchorage International Airport  
 Aquatic Vegetation Management  
 Present Worth Analysis of Management Options**

**Bottom Barrier**

**28.5 Acres (Littoral Zone to 5-ft depth) Lake Treatment**

Size = 1,241,460 square foot  
 needed = 8,622, 12 x 12 frames

Description	Quantity	Unit	Unit Cost	Total Cost	Resource
<b>Capital Costs</b>					
synthetic bottom barrier material	1,241,460	square feet	\$ 0.75	\$ 931,095.00	Washington Dept. Ecology
sand bags (twelve per frame)	103,464	bags	\$ 0.16	\$ 16,554.24	Berry Small Interprises (14"x26" sandbags)
2" x 2" twelve foot long (15 per frame)	5	boards	\$ 2.98	\$ 14.88	Lowes Hardware, \$5.95 for 2x4x12, will need to be sawed in half
nails (two for each 2" x 2")	0	pounds	\$ 1.69	\$ 0.09	Home Depot, 181 nails per pound)
marine plywood (12 square feet (48 gussets) per frame)	103,464	square feet	\$ 2.13	\$ 220,378.32	<a href="http://www.westwindhardwood.com/wood_marine.html">http://www.westwindhardwood.com/wood_marine.html</a>
Staple guns	5	staple gun	\$ 16.97	\$ 84.85	Lowes Hardware
Installation Labor	100	hour	\$ 50.00	\$ 5,000.00	
<b>Estimated Present Worth Analysis Summary Capital Costs</b>				<b>\$ 1,173,127.38</b>	
<b>Operations and Maintenance Costs</b>					
Maintenance Labor	80	hour	\$ 50.00	\$ 4,000.00	
Replacement materials					
<b>Subtotal O&amp;M Costs</b>				<b>\$ 4,000.00</b>	
<b>Present Worth Costs</b>				<b>\$1,191,646.96</b>	
<b>Assumptions</b>					
Interest Rate	0.04	percent			
Life Cycle Period	5	years			
1 acre = 43,560 square foot					

**Anchorage International Airport  
 Aquatic Vegetation Management  
 Present Worth Analysis of Management Options  
 Weed Mower**

**All Float Plane Slips**

Size of average slip = 20x35 = 700 square feet, total of 325 slips, and approximately 6 acres for all slips

Description	Quantity	Unit	Unit Cost	Total Cost	Total Cost per square foot	Resource
<b>Capital Costs</b>						
Jensen Weed Mower	1	mower	\$ 1,735.00	\$ 1,735.00	\$ 2.48	Jensen, 2004 Optima Batteries, 2004
12-vole deep cycle marine battery	1	battery	\$ 144.00	\$ 144.00	\$ 0.21	
Shipping			\$ 69.00	\$ 69.00	\$ 0.10	
<b>Estimated Present Worth Analysis Summary Capital Costs</b>	<b>5</b>			<b>\$ 1,948.00</b>	<b>\$ 2.78</b>	
<b>Operations and Maintenance Costs</b>						
Labor (covers 1 acre in 3 hours with 1/10 hp engine boat)	36	hour slips	\$ 50.00	\$ 1,800.00	\$ 2.57	
<b>Subtotal O&amp;M Costs</b>				<b>\$ 1,800.00</b>	<b>\$ 2.57</b>	
<b>Present Worth Costs</b>				<b>\$10,281.81</b>		
<i>Assumptions</i>						
Interest Rate	0.04	percent				
Life Cycle Period	5	years				
Assumed that mower is used 2 times per year for 18 hours each time in order to cover 325 slips (6 acres) 1 acre = 43,560 square foot						

**Anchorage International Airport**  
**Aquatic Vegetation Management**  
**Present Worth Analysis of Management Options**

**Weed Cutter**

**All Float Plane Slips**

Size of average slip = 20x35 = 700 square feet, total of 325 slips, and approximately 6 acres for all slip:

Description	Quantity	Unit	Unit Cost	Total Cost	Total Cost per square foot	Resource
<b>Capital Costs</b>						
Swordfish Aquatic Weed Cutter	10	cutter	\$ 1,995.00	\$ 19,950.00	\$ 28.50	Aquamow, 2004
Shipping			\$ 69.00	\$ 69.00		
<b>Estimated Present Worth Analysis Summary Capital Costs</b>				<b>\$ 20,019.00</b>	<b>\$ 28.60</b>	
<b>Operations and Maintenance Costs</b>						
Labor (1/4 hour per slip, 2-times per year)	0.5 325	hour slips	\$ 50.00	\$ 8,125.00	\$ 11.61	
<b>Subtotal O&amp;M Costs</b>				<b>\$ 8,125.00</b>	<b>\$ 11.61</b>	
<b>Present Worth Costs</b>				<b>\$57,636.90</b>		
<b>Assumptions</b>						
Interest Rate	0.04	percent				
Life Cycle Period	5	years				
Assumed that mower is used 4 times per year for 1.0 hours each time						
1 acre = 43,560 square foot						

**Anchorage International Airport  
 Aquatic Vegetation Management  
 Present Worth Analysis of Management Options**

**Weed Rake**

**All Float Plane Slips**

Size of average slip = 20x35 = 700 square feet, total of 325 slips, and approximately 6 acres for all slip:

Description	Quantity	Unit	Unit Cost	Total Cost	Total Cost per square foot	Resource
<b>Capital Costs</b>						
Swordfish Aquatic Weed Cutter	10	cutter	\$ 105.00	\$ 1,050.00	\$ 1.50	Aquamow, 2004
Shipping	10		\$ 30.00	\$ 300.00		
<b>Estimated Present Worth Analysis Summary Capital Costs</b>				<b>\$ 1,350.00</b>	<b>\$ 1.93</b>	
<b>Operations and Maintenance Costs</b>						
Labor ((1/2 hour per slip, 2-times per year)	1 325	hour slips	\$ 50.00	\$ 16,250.00	\$ 23.21	
<b>Subtotal O&amp;M Costs</b>				<b>\$ 16,250.00</b>	<b>\$ 23.21</b>	
<b>Present Worth Costs</b>				<b>\$76,585.80</b>		
<i>Assumptions</i>						
Interest Rate	0.04	percent				
Life Cycle Period	5	years				
Assumed that mower is used 4 times per year for 1.0 hours each time						
1 acre = 43,560 square foot						



**Anchorage International Airport**  
**Aquatic Vegetation Management**  
**Present Worth Analysis of Management Options**

**Bottom Barrier**

**Individual Float Plane Slip**

Size of average slip = 20x35 = 700 square feet  
 needed = 5, 12 x 12 frames

Description	Quantity	Unit	Unit Cost	Total Cost	Total Cost per square foot	Resource
<b>Capital Costs</b>						
synthetic bottom barrier material	700	square feet	\$ 0.75	\$ 525.00	\$ 0.75	Washington Dept. Ecology
sand bags (twelve per frame)	60	bags	\$ 0.16	\$ 9.60	\$ 0.01	Berry Small Interprises (14"x26" sandbags)
2" x 2" twelve foot long (15 per frame)	5	boards	\$ 2.98	\$ 14.88	\$ 0.02	Lowes Hardware, \$5.95 for 2x4x12, will need to be sawed in half
nails (two for each 2" x 2")	0	pounds	\$ 1.69	\$ 0.09	\$ 0.00	Home Depot, 181 nails per pound)
marine plywood (12 square feet (48 gussets) per frame)	60	square feet	\$ 2.13	\$ 127.80	\$ 0.18	Westwind Hardwood http://www.westwindhardwood.com/wood_marine.html
Staple guns	1	staple gun	\$ 16.97	\$ 16.97	\$ 0.02	Lowes Hardware
Installation Labor (scuba divers)	4	hour	\$ 50.00	\$ 200.00	\$ 0.29	
<b>Estimated Present Worth Analysis Summary Capital Costs</b>				<b>\$ 694.34</b>	<b>\$ 0.99</b>	
<b>Operations and Maintenance Costs</b>						
Maintenance Labor	8	hour	\$ 50.00	\$ 400.00	\$ 0.57	
Replacement materials						
<b>Subtotal O&amp;M Costs</b>				<b>\$ 400.00</b>	<b>\$ 0.57</b>	
<b>Present Worth Costs</b>				<b>\$2,546.30</b>		
<b>Assumptions</b>						
Interest Rate	0.04	percent				
Life Cycle Period	5	years				
1 acre = 43,560 square foot						

# **Appendix C**

## **Regulatory Permit Applications**

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# Coastal Project Questionnaire and Certification Statement

All questions must be answered. **If you answer "Yes" to any of the questions, please call that specific department for further instructions to avoid delay in processing your application.** Maps and plan drawings must be included with your packet.

*An incomplete packet will be returned.*

**■ APPLICANT INFORMATION**

1. _____	2. _____
Name of Applicant	Agent (or responsible party if other than applicant)
Address	Address
City/State/Zip	City/State/Zip      State      Zip Code
Daytime Phone	Daytime Phone
Fax Number	E-mail Address
	Fax Number
	E-mail Address

**■ PROJECT INFORMATION**

**Yes      No**

1. This activity is a:  new project     modification or addition to an existing project  
 If this is a modification, do you currently have any State, federal or local approvals for this activity? .....

*Note: Approval means any form of authorization. If "yes," please list below:*

Approval Type	Approval #	Issuance Date	Expiration Date

2. If this is a modification, was this project reviewed for consistency with Alaska Coastal Management? .....

Previous State I.D. Number: AK \_\_\_\_\_

Previous Project Name \_\_\_\_\_

**■ PROJECT DESCRIPTION**

1. Provide a brief description of your entire project and ALL associated facilities and land use conversions.

\_\_\_\_\_

Proposed starting date for project: \_\_\_\_\_ Proposed ending date for project: \_\_\_\_\_

2. Attach the following: • a detailed project description, all associated facilities, and land use conversions, etc. (Be specific, including access roads, caretaker facilities, waste disposal sites, etc.); • a project timeline for completion of all major activities; • a site plan depicting project boundary with all proposed actions; • other supporting

documentation to facilitate project review. Note: If the project is a modification, identify existing facilities and proposed changes on the site plan.

**■ PROJECT LOCATION**

1. Attach a copy of the topographical and vicinity map clearly indicating the location of the project. Please include a map title and scale.
2. The project is located in which region (see attached map):  Northern  Southcentral  Southeast  
 Southwest  within or associated with the Trans-Alaska Pipeline corridor
3. Location of project (Include the name of the nearest land feature or body of water.) \_\_\_\_\_  
 Township \_\_\_\_\_ Range \_\_\_\_\_ Section \_\_\_\_\_ Meridian \_\_\_\_\_ Latitude/Longitude \_\_\_\_\_ / \_\_\_\_\_  
 USGS Quad Map \_\_\_\_\_
4. Is the project located in a coastal district? Yes  No  If yes, identify: \_\_\_\_\_  
*(Coastal districts are a municipality or borough, home rule or first class city, second class with planning, or coastal resource service area.) Note: A coastal district is a participant in the State's consistency review process. It is possible for the State review to be adjusted to accommodate a local permitting public hearing. Early interaction with the district is important; please contact the district representative listed on the attached contact list.*
5. Identify the communities closest to your project location: \_\_\_\_\_
6. The project is on:  State land or water\*  Federal land  Private land  
 Municipal land  Mental Health Trust land  
*\*State land can be uplands, tidelands, or submerged lands to 3 miles offshore. See Question #1 in DNR section. Contact the applicable landowner(s) to obtain necessary authorizations.*

**■ DEPARTMENT OF ENVIRONMENTAL CONSERVATION (DEC) APPROVALS**

- |  | Yes                      | No                       |
|--|--------------------------|--------------------------|
| 1. Will a discharge of wastewater from industrial or commercial operations occur? .....  | <input type="checkbox"/> | <input type="checkbox"/> |
| Will the discharge be connected to an approved sewer system? .....   | <input type="checkbox"/> | <input type="checkbox"/> |
| Will the project include a stormwater collection/discharge system? .....   | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Do you intend to construct, install, modify, or use any part of a wastewater (sewage or greywater) disposal system? .....                         | <input type="checkbox"/> | <input type="checkbox"/> |
| a) If the answer is yes, will the discharge be 500 gallons per day or greater?.....  | <input type="checkbox"/> | <input type="checkbox"/> |
| b) If constructing a domestic wastewater treatment or disposal system, will the system be located within fill material requiring a COE permit? ..... | <input type="checkbox"/> | <input type="checkbox"/> |

If you answered yes to a) or b), answer the following:

- 1) What is the distance from the bottom of the system to the top of the subsurface water table? \_\_\_\_\_
- 2) How far is any part of the wastewater disposal system from the nearest surface water? \_\_\_\_\_
- 3) Is the surrounding area inundated with water at any time of the year? .....
- 4) How big is the fill area to be used for the absorption system? \_\_\_\_\_  
*(Questions 1 & 2 will be used by DEC to determine whether separation distances are being met; Questions 3 & 4 relate to the required size of the fill if wetlands are involved.)*

- |   | Yes                      | No                       |
|---|--------------------------|--------------------------|
| 3. Will your project require a mixing zone? .....   | <input type="checkbox"/> | <input type="checkbox"/> |
| <i>(If your wastewater discharge will exceed Alaska water quality standards, you may apply for a mixing zone. If so, please contact DEC to discuss information required under 18 AAC 70.032.)</i>   |                          |                          |
| 4. a) Will your project result in construction, operation, or closure of a facility for solid waste disposal?.....  | <input type="checkbox"/> | <input type="checkbox"/> |
| <i>(Note: Solid waste means drilling wastes, household garbage, refuse, sludge, construction or demolition wastes, industrial solid waste, asbestos, and other discarded, abandoned, or unwanted solid or semi-solid material, whether or not subject to decomposition, originating from any source. Disposal means placement of solid waste on land.)</i>                          |                          |                          |
| b) Will your project result in treatment of solid waste at the site?.....   | <input type="checkbox"/> | <input type="checkbox"/> |
| <i>(Examples of treatment methods include, but are not limited to: incineration, open burning, baling, and composting.)</i>   |                          |                          |
| c) Will your project result in storage or transfer of solid waste at the site?.....   | <input type="checkbox"/> | <input type="checkbox"/> |
| d) Will the project result in storage of more than 50 tons of materials for reuse, recycling, or resource recovery?.....  | <input type="checkbox"/> | <input type="checkbox"/> |
| e) Will any sewage solids or biosolids be disposed of or land-applied to the site? .....  | <input type="checkbox"/> | <input type="checkbox"/> |
| <i>(Sewage solids include wastes that have been removed from a wastewater treatment plant system, such as a septic tank, lagoon dredge, or wastewater treatment sludge that contain no free liquids. Biosolids are the solid, semi-solid, or liquid residues produced during the treatment of domestic septage in a treatment works which are land applied for beneficial use.)</i> |                          |                          |
| 5. Will your project require application of oil, pesticides, and/or any other broadcast chemicals? .....  | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. a) Will you have a facility with industrial processes that are designed to process no less than five tons per hour and needs air pollution controls to comply with State emission standards? .....   | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Will you have stationary or transportable fuel burning equipment, including flares, with a total fuel consumption capacity no less than 50 million Btu/hour?.....  | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Will you have a facility with incinerators having a total charging capacity of no less than 1,000 pounds per hour?.....  | <input type="checkbox"/> | <input type="checkbox"/> |
| d) Will you have a facility with equipment or processes that are subject to Federal New Source Performance Standards or National Emission Standards for hazardous air pollutants? ....  | <input type="checkbox"/> | <input type="checkbox"/> |
| i) Will you propose exhaust stack injection?.....   | <input type="checkbox"/> | <input type="checkbox"/> |
| e) Will you have a facility with the potential to emit no less than 100 tons per year of any regulated air contaminant?.....  | <input type="checkbox"/> | <input type="checkbox"/> |
| f) Will you have a facility with the potential to emit no less than 10 tons per year of any hazardous air contaminant or 25 tons per year of all hazardous air contaminants?.....   | <input type="checkbox"/> | <input type="checkbox"/> |
| g) Will you construct or add stationary or transportable fuel burning equipment of no less than 10 million Btu/hour in the City of Unalaska or the City of St. Paul? .....  | <input type="checkbox"/> | <input type="checkbox"/> |
| h) Will you construct or modify in the Port of Anchorage a volatile liquid storage tank with a volume no less than 9,000 barrels, or a volatile liquid loading rack with a design throughput no less than 15 million gallons? .....   | <input type="checkbox"/> | <input type="checkbox"/> |
| i) Will you be requesting operational or physical limits designed to reduce emissions from an existing facility in an air quality nonattainment area to offset an emission increase from another new or modified facility? .....  | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. Do you plan to develop, construct, install, or alter a public water system?.....   | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. a) Will your project involve the operation of waterborne tank vessels or oil barges that carry crude or non-crude oil as bulk cargo, or the transfer of oil or other petroleum products to or from such a vessel or a pipeline system?.....  | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Will your project require or include onshore or offshore oil facilities with an effective aggregate storage capacity of greater than 5,000 barrels of crude oil or greater than 10,000 barrels of non-crude oil?.....  | <input type="checkbox"/> | <input type="checkbox"/> |

- Yes      No
- c) Will you operate facilities on land or water for exploration or production of hydrocarbons? .....

**If you answered "No" to ALL questions in this section, continue to next section.**  
**If you answered "Yes" to ANY of these questions, contact the DEC office nearest you for information and application forms. Please be advised that all new DEC permits and approvals require a 30-day public notice period. DEC Pesticide permits take effect no sooner than 40 days after the permit is issued.**

Based on your discussion with DEC, please complete the following:

Types of project approvals or permits needed and name of individual you contacted.	Date application submitted

9. Does your project qualify for a general permit for wastewater or solid waste?.....         
*Note: A general permit is an approval issued by DEC for certain types of routine activities.*

**If you answered "Yes" to any questions in this section and are not applying for DEC permits, indicate reason:**

- \_\_\_\_\_ (DEC contact) told me on \_\_\_\_\_ that no DEC approvals are required on this project because \_\_\_\_\_
- Other:** \_\_\_\_\_

**■ DEPARTMENT OF FISH AND GAME (DFG) APPROVALS**

Yes      No

1. Is your project located in a designated State Game Refuge, Critical Habitat Area or State Game Sanctuary? .....
2. Does your project include construction/operation of a salmon hatchery? .....
3. Does your project affect, or is it related to, a previously permitted salmon hatchery?.....
4. Does your project include construction of an aquatic farm?.....

**If you answered "No" to ALL questions in this section, continue to next section.**  
**If you answered "Yes" to ANY questions under 1-4, contact the ADF&G Commercial Fisheries Division headquarters for information and application forms**

Based on your discussion with ADF&G, please complete the following:

Types of project approvals or permits needed.	Date application submitted

**If you answered "YES" to any questions in this section and are not applying for ADF&G permits, indicate reason:**

- \_\_\_\_\_ (ADF&G contact) told me on \_\_\_\_\_ that no ADF&G approvals are required on this project because \_\_\_\_\_
- Other:** \_\_\_\_\_

**■ DEPARTMENT OF NATURAL RESOURCES (DNR) APPROVALS**

Yes      No

1. Is the proposed project on State-owned land or water or will you need to cross State-owned land for access? ("Access" includes temporary access for construction purposes. *Note: In addition to State-owned uplands, the State owns almost all land below the ordinary high water line of navigable streams, rivers and lakes, and below the mean high tide line seaward for three miles.*) .....    
a) Is this project for a commercial activity? .....
2. Is the project on Alaska Mental Health Trust land (AMHT) or will you need to cross AMHT land? *Note: Alaska Mental Health Trust land is not considered State land for the purpose of ACPMP reviews.* .....
3. Do you plan to dredge or otherwise excavate/remove materials on State-owned land? .....    
Location of dredging site if different than the project site: \_\_\_\_\_  
Township \_\_\_\_\_ Range \_\_\_\_\_ Section \_\_\_\_\_ Meridian \_\_\_\_\_ USGS Quad Map \_\_\_\_\_
4. Do you plan to place fill or dredged material on State-owned land? .....    
Location of fill disposal site if other than the project site: \_\_\_\_\_  
Township \_\_\_\_\_ Range \_\_\_\_\_ Section \_\_\_\_\_ Meridian \_\_\_\_\_ USGS Quad Map \_\_\_\_\_  
Source is on:  State Land  Federal Land  Private Land  Municipal Land
5. Do you plan to use any of the following State-owned resources: .....    
 **Timber:** Will you harvest timber? Amount: \_\_\_\_\_  
 **Materials such as rock, sand or gravel, peat, soil, overburden, etc.:**  
Which material? \_\_\_\_\_ Amount: \_\_\_\_\_  
Location of source:  Project site  Other, describe: \_\_\_\_\_  
Township \_\_\_\_\_ Range \_\_\_\_\_ Section \_\_\_\_\_ Meridian \_\_\_\_\_ USGS Quad Map \_\_\_\_\_
6. Do you plan to divert, impound, withdraw, or use any fresh water, except from an existing public water system or roof rain catchment system (regardless of land ownership)? .....    
Amount (maximum daily, not average, in gallons per day): \_\_\_\_\_  
Source: \_\_\_\_\_ Intended Use: \_\_\_\_\_  
If yes, will your project affect the availability of water to anyone holding water rights to that water? .....
7. Do you plan to build or alter a dam (regardless of land ownership)? .....
8. Do you plan to drill a geothermal well (regardless of land ownership)? .....
9. At any one site (regardless of land ownership), do you plan any of the following? .....    
 Mine five or more acres over a year's time  
 Mine 50,000 cubic yards or more of materials (rock, sand or gravel, soil, peat, overburden, etc.) over a year's time  
 Have a cumulative unreclaimed mined area of five or more acres  
If yes to any of the above, contact DNR about a reclamation plan.  
If you plan to mine less than the acreage/amount stated above and have a cumulative unreclaimed **Yes**  
**No** mined area of less than five acres, do you intend to file a voluntary reclamation plan for approval? .....

10. Do you plan to explore for or extract coal? .....
11. a) Will you explore for or produce oil and/or gas?.....    
 b) Will you conduct surface use activities on an oil and/or gas lease or within an oil and/or gas unit?.....
12. Will you investigate, remove, or impact historical or archaeological or paleontological resources (anything over 50 years old) on State-owned land?.....
13. Is the proposed project located within a known geophysical hazard area?.....    
*Note: 6 AAC 80.900(9) defines geophysical hazard areas as "those areas which present a threat to life or property from geophysical or geological hazards, including flooding, tsunami run-up, storm surge run-up, landslides, snowslides, faults, ice hazards, erosion, and littoral beach process." "known geophysical hazard area" means any area identified in a report or map published by a federal, state, or local agency, or by a geological or engineering consulting firm, or generally known by local knowledge, as having known or potential hazards from geologic, seismic, or hydrologic processes.*
14. Is the proposed project located in a unit of the Alaska State Park System? .....
15. Will you work in, remove water or material from, or place anything in, a stream, river or lake? (This includes work or activities below the ordinary high water mark or on ice, in the active flood plain, on islands, in or on the face of the banks, or, for streams entering or flowing through tidelands, above the level of mean lower low tide.)  
*Note: If the proposed project is located within a special flood hazard area, a floodplain development permit may be required. Contact the affected city or borough planning department for additional information and a floodplain determination.)* .....    
 Name of waterbody: \_\_\_\_\_

16. Will you do any of the following:.....    
*Please indicate below:*
- |  |  |
|--|--|
| <input type="checkbox"/> Build a dam, river training structure, other instream impoundment, or weir  | <input type="checkbox"/> Build a bridge (including an ice bridge)  |
| <input type="checkbox"/> Use water   | <input type="checkbox"/> Use a stream, lake or waterbody as a road (even when frozen), or cross a stream with tracked or wheeled vehicles, log-dragging or excavation equipment (backhoes, bulldozers, etc.) |
| <input type="checkbox"/> Pump water into or out of stream or lake (including dry channels)   | <input type="checkbox"/> Install a culvert or other drainage structure   |
| <input type="checkbox"/> Divert or alter a natural stream channel  | <input type="checkbox"/> Construct, place, excavate, dispose or remove any material below the ordinary high water of a waterbody   |
| <input type="checkbox"/> Change water flow or the stream channel   | <input type="checkbox"/> Construct a storm water discharge or drain into a waterbody   |
| <input type="checkbox"/> Introduce silt, gravel, rock, petroleum products, debris, brush, trees, chemicals, or other organic/inorganic material, including waste of any type, into water | <input type="checkbox"/> Place pilings or anchors  |
| <input type="checkbox"/> Alter, stabilize or restore banks of a river, stream or lake (provide number of linear feet affected along the bank(s))   | <input type="checkbox"/> Construct a dock  |
| <input type="checkbox"/> Mine, dig in, or remove material, including woody debris, from beds or banks of a waterbody   | <input type="checkbox"/> Construct a utility line crossing   |
| <input type="checkbox"/> Use explosives in or near a waterbody   | <input type="checkbox"/> Maintain or repair an existing structure  |
|  | <input type="checkbox"/> Use an instream in-water structure not mentioned here   |

**If you answered "No" to ALL questions in this section, continue to next section.  
 If you answered "Yes" to ANY questions under 1-16, contact the Area DNR, office for information and application forms.**

Based on your discussion with DNR, please complete the following:

Types of project approvals or permits needed.	Date application submitted




If you answered "Yes" to any questions in this section and are not applying for DNR permits, indicate reason:

\_\_\_\_\_ (DNR contact) told me on \_\_\_\_\_ that no DNR approvals are required on this project because \_\_\_\_\_

**■ FEDERAL APPROVALS**

**Yes No**

**U.S. Army Corps of Engineers (COE)**

1. Will you dredge or place structures or fills in any of the following:
- tidal (ocean) waters? streams? lakes? wetlands\*? .....
- If yes, have you applied for a COE permit? .....

Date of submittal: \_\_\_\_\_

Name of COE contact: \_\_\_\_\_

*(Note: Your application for this activity to the COE also serves as application for DEC Water Quality Certification.)*

*\*If you are not certain whether your proposed project is in a wetlands (wetlands include muskegs), contact the COE, Regulatory Branch at 907-753-2712 for a wetlands determination (outside the Anchorage area call toll free 1-800-478-2712)*

**Bureau of Land Management (BLM)**

2. Is the proposed project located on BLM land, or will you need to cross BLM land for access?.....
- If yes, have you applied for a BLM permit or approval? .....

Date of submittal: \_\_\_\_\_

Name of BLM contact: \_\_\_\_\_

**U.S. Coast Guard (USCG)**

3. a) Do you plan to construct a bridge or causeway over tidal (ocean) waters, or navigable rivers, streams or lakes?.....
- b) Does your project involve building an access to an island?.....
- c) Do you plan to site, construct, or operate a deepwater port?.....
- If yes, have you applied for a USCG permit? .....

Date of submittal: \_\_\_\_\_

Name of USCG contact: \_\_\_\_\_

**U.S. Environmental Protection Agency (EPA)**

4. a) Will the proposed project have a discharge to any waters?.....
- b) Will you dispose of sewage sludge (contact EPA at 206-553-1941)? .....
- If you answered yes to a) or b), have you applied for an EPA National Pollution Discharge Elimination System (NPDES) permit? .....

Date of submittal: \_\_\_\_\_

Name of EPA contact: \_\_\_\_\_

*(Note: For information regarding the need for an NPDES permit, contact EPA at 1-800-424-4372)*

- c) Will construction of your project expose 5 or more acres of soil? *(This applies to the total amount of land disturbed, even if disturbance is distributed over more than one season, and also applies to areas that are part of a larger common plan of development or sale.)* ..... **Yes** **No**
- d) Is your project an industrial facility that will have stormwater discharge directly .....

related to manufacturing, processing, or raw materials storage areas at an industrial plant?.....    
 If you answered yes to c) or d), your project may require an NPDES Stormwater permit.  
 Contact EPA at 206-553-8399.

**Federal Aviation Administration (FAA)**

5. a) Is your project located within five miles of any public airport?.....    
 b) Will you have a waste discharge that is likely to decay within 5,000 feet of any public airport? .....    
 If yes, please contact the Airports Division of the FAA at 907-271-5438.

**Federal Energy Regulatory Commission (FERC)**

6. a) Does the project include any of the following:  
 1) a non-federal hydroelectric project on any navigable body of water.....    
 2) a location on federal land (including transmission lines) .....    
 3) utilization of surplus water from any federal government dam .....    
 b) Does the project include construction and operation, or abandonment of natural gas pipeline facilities under sections (b) and (c) of the Federal Power Act (FPA)?.....    
 c) Does the project include construction for physical interconnection of electric transmission facilities under section 202 (b) of the FPA? .....    
 If you answered yes to any questions under number 6, did you apply for a permit from FERC?.....

Date of submittal: \_\_\_\_\_

Name of FERC contact: \_\_\_\_\_

*(Note: For information, Div. Hydropower-Environment and Engineering contact: Vince Yearek 202-502-6174 or Mike Henry 503-944-6762, 202-502 8700; (for Natural Gas Projects) Division of Pipeline Certificate 202-502-8625; for Alaska projects contact Richard Foley – 202-502-8955)*

**U.S. Forest Service (USFS)**

7. a) Does the proposed project involve construction on USFS land? .....    
 b) Does the proposed project involve the crossing of USFS land with a water line?.....    
 If the answer to either question is yes, did you apply for a USFS permit or approval?.....

Date of submittal: \_\_\_\_\_

Name of USFS contact: \_\_\_\_\_

8. Have you applied for any other federal permits or authorizations?.....

AGENCY	APPROVAL TYPE	DATE SUBMITTED

**Please be advised that the CPQ identifies permits subject to a consistency review. You may need additional permits from other agencies or the affected city and/or borough government to proceed with your activity.**



### **Certification Statement**

The information contained herein is true and complete to the best of my knowledge. I certify that the proposed activity complies with, and will be conducted in a manner consistent with, the Alaska Coastal Management Program.

\_\_\_\_\_  
Signature of Applicant or Agent

\_\_\_\_\_  
Date

*Note:* Federal agencies conducting an activity that will affect the coastal zone are required to submit a federal consistency determination, per 15 CFR 930, Subpart C, rather than this certification statement. ACMP has developed a guide to assist federal agencies with this requirement. Contact ACMP to obtain a copy.

This certification statement will not be complete until all required State and federal authorization requests have been submitted to the appropriate agencies.

- **To complete your packet, please attach your State permit applications and copies of your federal permit applications to this questionnaire.**

**ALASKA DEPARTMENT OF NATURAL RESOURCES**  
**FISH HABITAT PERMIT APPLICATION**  
**SPECIFIC INSTRUCTIONS**

- NOTE:** Provide as much information as possible. If you need assistance, please contact the nearest DNR Office of Habitat Management and Permitting (OHMP) area office. OHMP reserves the right to require additional information for the proper protection of fish and game.
- Step A:** Provide your name, address, and telephone number and the name, address, and telephone number of the contractor who will be doing the work, if known.
- Step B:**
1. Name of the waterbody in or adjacent to which the project will occur.
  2. For Anadromous Stream numbers, refer to the Atlas to the Catalog of Waters Important for Spawning, Rearing or Migration of Anadromous Fishes.
  3.
    - a. Provide plans (or field sketch) showing the following as a minimum: access to the site, plan view showing all project features and dimensions, or crossing/fording sites; material removal plans should also include, at a minimum, the following: 50' contour lines; nearby watercourses and lakes; location of facilities (i.e., screening, washing, and crushing plants, and commercial and private buildings); aliquot parts identified in order they are to be mined; site where fuel will be stored; a cross section view of the material site showing current land and water elevations and bank slopes and final excavation grades and slopes; and project expansion sites (scale no greater than 1 in. = 400 ft.)
    - b. Provide specifications, if available; and
    - c. Provide a current aerial photograph, if available.
- Step C:** Describe the type of project (e.g., bridge, culvert, utility line placement, impoundment structure, bank stabilization, channelization, low water crossing, log removal, etc.) and the purpose of the project. A brief description of alternatives considered would be useful but is not required.
- Step D:** Indicate the time of year when project construction will occur. Is the project temporary or permanent?
- Step E:** What precautions will be taken to insure that fish and other aquatic organisms are protected from adverse impacts? Outline plan for restoring, rehabilitating, or revegetating the site if channel or bank alterations occur. What precautions will be taken to maintain State Water Quality Standards.
- Step F:** Provide the waterbody characteristics at the site of the project.
- Step G:** Provide available hydraulic information for the types of projects indicated. For information on selecting a culvert size that will ensure fish passage, consult OHMP permittees or references available at OHMP offices.

### Headquarters and

#### Juneau Area (I) Office

400 Willoughby Avenue, 4<sup>th</sup> Floor  
Juneau, AK 99801-1796  
465-4105 phone  
465-4759 fax

- Northern Southeast – Juneau, Douglas, Gustavus, Haines, Skagway, Hoonah, Sitka, Yakutat, Icy Bay
- Game Management Units (GMUs; designations are approximate) 1C & 1D; 4 (most); 5; 6A E of Cape Suckling

#### Operations Manager and Fairbanks Area (III) Office

1300 College Road  
Fairbanks, AK 99701-1551  
459-7289 phone  
456-3091 fax

- Interior, Northern, Western, and Southwest Alaska; North Slope, Yukon and Kuskokwim river basins, Copper River basin north of the Chugach Mountains – Fairbanks, Delta Junction, Glennallen, Chitna, Bethel, Nome, Kotzebue, Barrow
- GMUs: 11 N of Haley Cr.; 12; E portions of 13A, 13B, & 13D; 13E (Cantwell and upper Nenana River only); 18 through 26

#### Anchorage Area (II) Office

550 West 7<sup>th</sup> Avenue, Suite 1420  
Anchorage, AK 99501-1599  
269-8690 phone  
269-5673 fax

- Municipality of Anchorage, Prince William Sound, Copper River Delta, Alaska Peninsula, Aleutian Islands, Bristol Bay – Anchorage, Valdez, Cordova, Kodiak, Dillingham, Unalaska
- GMUs: 6 W of Cape Suckling; 8; 9; 10; 11 S of Haley Cr.; 14C; 16B (S half); 17

#### Kenai Area (V) Office

514 Funny River Road  
Soldotna, AK 99669-8255  
260-4882, Ext. 221 phone  
260-5992 fax

- Kenai Peninsula – Kenai, Soldotna, Homer, Seldovia, Cooper Landing, Moose Pass, Seward
- GMUs: 7; 15

#### Mat-Su Area (IV) Office

1800 Glenn Highway, Suite 12  
Palmer, AK 99645-6736  
745-7363 phone  
745-7369 fax

- Matanuska/Susitna Basin, Talkeetna Mountains – Palmer, Wasilla, Big Lake, Talkeetna, Trapper Creek
- GMUs: W portion of 13A, 13B, & 13D; 13E (except Cantwell and upper Nenana River); 14A & 14B; 16A & 16B (north half)

#### Petersburg Area (VI) Office

P.O. Box 667  
Petersburg, AK 99833-0667  
772-5224 phone  
772-9336 fax

- Southern Southeast – Petersburg, Kake, Wrangell, Angoon
- GMUs: 1A (most) & 1B; 3; 4 (Admiralty Island from Angoon south)

#### Prince of Wales Area (VII) Office

P.O. Box 668  
Craig, AK 99921-0668  
826-2560 phone  
826-2562 fax

- Prince of Wales, Dall, Long, Revillagigedo, and Gravina islands – Craig, Klawock, Hydaburg, Thorne Bay, Coffman Cove, Ketchikan
- GMU: 1A (Revillagigedo and Gravina islands) ; 2

**FISH HABITAT PERMIT APPLICATION**  
**ALASKA DEPARTMENT OF NATURAL RESOURCES**  
**Office of Habitat Management and Permitting**

**A. APPLICANT**

1. Name: \_\_\_\_\_
2. Address: \_\_\_\_\_  
Telephone: \_\_\_\_\_ Fax: \_\_\_\_\_
3. Project Contractor: Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
Telephone: \_\_\_\_\_ Fax: \_\_\_\_\_

**B. TYPE AND PURPOSE OF PROJECT:** \_\_\_\_\_

**C. LOCATION OF PROJECT SITE**

1. Name of River, Stream, or Lake: \_\_\_\_\_  
or Anadromous Stream # \_\_\_\_\_
2. Legal Description: Township \_\_\_\_\_ Range \_\_\_\_\_ Section \_\_\_\_\_  
Meridian \_\_\_\_\_ USGS Quad Map \_\_\_\_\_
3. Plans, Specifications, and Aerial Photograph  
(See specific instructions)

**D. TIME FRAME FOR PROJECT:** \_\_\_\_\_ to \_\_\_\_\_ (dates)

**E. CONSTRUCTION METHODS:**

1. Will the stream be diverted? Yes \_\_\_\_\_ No \_\_\_\_\_  
How will the stream be diverted? \_\_\_\_\_

How long will the stream be diverted? \_\_\_\_\_

2. Will stream channelization occur? Yes \_\_\_\_\_ No \_\_\_\_\_

3. Will the banks of the stream be altered or modified? Yes \_\_\_\_\_ No \_\_\_\_\_

Describe: \_\_\_\_\_

\_\_\_\_\_

4. List all tracked or wheeled equipment (type and size) that will be used in the stream (in the water, on ice, or in the floodplain):

\_\_\_\_\_

\_\_\_\_\_

How long will equipment be in the stream? \_\_\_\_\_

5. a. Will material be removed from the floodplain, bed, stream, or lake? Yes \_\_\_\_\_ No \_\_\_\_\_

Type: \_\_\_\_\_

Amount: \_\_\_\_\_

b. Will material be removed from below the water table? Yes \_\_\_\_\_ No \_\_\_\_\_

If so, to what depth? \_\_\_\_\_

Is a pumping operation planned? Yes \_\_\_\_\_ No \_\_\_\_\_

6. Will material (including spoils, debris, or overburden) be deposited in the floodplain, stream, or lake? Yes \_\_\_\_\_ No \_\_\_\_\_

If so, what type? \_\_\_\_\_

Amount: \_\_\_\_\_

Disposal site location(s): \_\_\_\_\_

\_\_\_\_\_

7. Will blasting be performed? Yes \_\_\_\_\_ No \_\_\_\_\_

Weight and Location of Charge: \_\_\_\_\_

Type of substrate: \_\_\_\_\_

8. Will temporary fills in the stream or lake be required during construction (e.g., for construction traffic around construction site)? Yes \_\_\_\_\_ No \_\_\_\_\_

9. Will ice bridges be required? Yes \_\_\_\_\_ No \_\_\_\_\_

**F. SITE REHABILITATION/RESTORATION PLAN:** On a separate sheet present a site rehabilitation/restoration plan (see specific instructions).

**G. WATERBODY CHARACTERISTICS:**

Width of stream: \_\_\_\_\_

Depth of stream or lake: \_\_\_\_\_

Type of stream or lake bottom: \_\_\_\_\_ (e.g., sand, gravel, mud)

Stream gradient: \_\_\_\_\_

**H. HYDRAULIC EVALUATION:**

1. Will a structure (e.g., culvert, bridge support, dike) be placed below ordinary high water of the stream? Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, attach engineering drawings or a field sketch, as described in Step B.

For culverts, attach stream discharge data for a mean annual flood (Q=2.3), if available.

Describe potential for channel changes or increased bank erosion, if applicable:

\_\_\_\_\_  
\_\_\_\_\_

2. Will more than 25,000 cubic yards of material be removed? Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, attach a written hydraulic evaluation including, at a minimum, the following: potential for channel changes, assessment of increased aufeis (glaciering) potential, assessment of potential for increased bank erosion.

**I HEREBY CERTIFY THAT ALL INFORMATION PROVIDED ON OR IN CONNECTION WITH THIS APPLICATION IS TRUE AND COMPLETE TO THE BEST OF MY KNOWLEDGE AND BELIEF.**

\_\_\_\_\_  
Signature of Applicant

\_\_\_\_\_  
Date



**Appendix D**  
**Short-Term Water Quality Variance Waiver**

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