Big Bear Municipal Water District
Aquatic Pesticide Application Plan (APAP)

APPLICATION FOR STATEWIDE GENERAL NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT FOR RESIDUAL AQUATIC PESTICIDE DISCHARGES TO WATERS OF THE UNITED STATES FROM ALGAE AND AQUATIC WEED CONTROL APPLICATION

AT
BIG BEAR LAKE

Submitted to:

State Water Resources Control Board
Aquatic Pesticide NPDES Program
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1. BACKGROUND INFORMATION

On March 5, 2013, the State Water Resources Control Board adopted the Statewide General National Pollutant Discharge Elimination System (NPDES) Permit for Residual Aquatic Pesticide Discharges to Waters of the United States from Algae and Aquatic Weed Control Applications (Permit). The permit requires that dischargers seeking permit coverage submit an Aquatic Pesticides Application Plan (APAP) with the permit application package to the State Water Resources Control Board (Reference: Section II.C.3. *Permit Coverage and Application Requirements, General Permit Application).* When the application package and the APAP are deemed complete, the Deputy Director of the Water Board will issue a Notice of Applicability allowing the discharger to apply aquatic pesticides in accordance with the requirements of the permit.

This Aquatic Pesticide Application Plan (APAP) is a comprehensive plan developed by the discharger (Big Bear Municipal Water District or BBMWD) to comply with the provisions of Water Quality Order No. 2013-0002-DWQ, Statewide General National Pollutant Discharge Elimination System Permit for Residual Aquatic Pesticide Discharges to Waters of the United States from Algae and Aquatic Weed Control Applicators, General Permit No. CAG990005, adopted by the State Water Resources Control Board on March 5, 2013.

The Aquatic Pesticide Application Plan (APAP) describes the project site, aquatic plant and algae nuisances, aquatic pesticide products expected to be used, the monitoring program, and best management practices (BMPs) to be followed, as well as the other conditions addressed in the General Permit, Section VIII, Aquatic Pesticide Use Requirements, Aquatic Pesticide Application Plan.

The application of aquatic pesticides is an undertaking necessary to control specific types of aquatic vegetation that have become a nuisance to the management of Big Bear Lake and are impacting its health and beneficial uses. Big Bear Lake's prescribed beneficial uses assigned by the Santa Ana River Basin (Regional Water Quality Control Board, 1995 & 2014) are: MUN (municipal and domestic supply), AGR (agriculture supply), GWR (groundwater recharge), REC1 (water contact recreation), REC2 (non-contact water recreation), WARM (warm freshwater habitat), COLD (cold freshwater habitat), WILD wildlife habitat), and RARE (rare, threatened, or endangered species). The first three uses relate to potable and agricultural water supply and groundwater recharge. Recreational uses include direct contact, such as swimming and fishing, and secondary contact, such as boating or water-skiing. The warm and cold designations refer to aquatic habitat for a variety of fish, invertebrates, vegetation, and wildlife. Wild and rare indicate supporting habitat for certain species.

1.1 Description of the lake

Big Bear Lake is located in the San Bernardino Mountains, San Bernardino County, California. It is seven miles long, one to one and a half miles wide, and 72 feet at its deepest point at the dam. The surface area of the lake is approximately 3,000 acres with a storage capacity of 73,320 acre feet and an average depth of 34 feet at full lake level. The Big Bear Lake drainage basin encompasses 37 square miles and includes more than 10 streams and two major snow ski resort areas. Local stream runoff and precipitation on the Lake are the sole source of water supply to the Lake; no water is pumped into the Lake. The spillway altitude is 6,743.2 feet. The major inflows to the lake are creeks, including Rathbun Creek, Summit Creek, and Grout Creek. Outflow from the Lake is to Bear Creek, which is a tributary to the Santa Ana River at about the 4,000 foot elevation level. Twelve percent of Big Bear Lake's drainage basin consists of the Lake itself. The US Forest Service is the largest landowner in the Big Bear area. Two ski resorts, Snow Summit and Bear Mountain, lease land from the Forest Service.

1.2 Conditions in Big Bear Lake

The lake was originally constructed in 1885 as a water supply reservoir, via a dam at the western side of the lake, Bear Valley Dam (N34d14.52' latitude and W116d58.62' longitude). The lake was enlarged to a

size of 3,000 acres in 1911. Several other uses of the lake have developed since, including general recreational uses by a seasonal resort community and habitat uses by fish and wildlife. Big Bear Municipal Water District controls releases to provide downstream fish habitat, irrigation water, and power generation.

Big Bear Lake is moderately eutrophic. During the summer months, deeper water may exhibit severe oxygen deficits. Nutrient enrichment has resulted in the growth of aquatic plants, which has impaired the fishing, boating, and swimming uses of the lake. To control this vegetation, mechanical harvesters and aquatic pesticides have been used to remove plants, including the roots.

The lake is subject to major aquatic weed problems, due to having shallow bays and shorelines and little outflow to disperse incoming nutrients. Currently, more or less than 200 acres are infested with Eurasian Water Milfoil. In the 1970s, the invasive aquatic species Eurasian Water Milfoil (*Myriophyllum spicata*) was introduced to the Lake. It has subsequently expanded and overtaken the natural plant communities within the Lake system. This weed is not native to North America and is thought to have been introduced during World War II into the Chesapeake Bay. It is assumed that fragments of the plant were brought on board an oceangoing freighter in Europe with ballast water and discharged in the Bay prior to taking on additional cargo. From there, the plant spread throughout that water body and has been widely dispersed throughout the United States by boat trailers carrying fragments of the plant. Eurasian Milfoil is classified by the U.S. Government as a "harmful non-indigenous species". This weed will completely replace native aquatic plants in infested water bodies, altering the biological integrity of those waters. Federal and state research scientists have documented severe degradation of water quality within Eurasian Milfoil beds altering the chemical integrity of those waters. Dissolved oxygen and temperature levels are degraded severely. The presence of this weed will change predator/prey relationships in many fisheries, again altering the biological integrity of those waters. If there are threatened or endangered plants or animal organisms present in the system, the environmental impacts of the introduction of Eurasian Milfoil can put further pressure on their ability to survive. The thick mats which form on the lake surface also impact recreational activities by entanglement of swimmers and boat propellers and by plugging the intakes of jet skis.

Though other non-invasive, native plants are found in Big Bear Lake, these non-invasive species can become a nuisance due to succession and replacement if their growth is not controlled in certain areas. These plants are coontail, sago pondweed, elodea, filamentous algae, platonic algae, spikerush, widgeon grass, widgeon grass, curly-leaf pondweed, and leafy pondweed.

Toxics may be entering Big Bear Lake watershed and accumulating in aquatic organisms and bottom sediments at concentrations that are of concern, not only for the protection of aquatic organisms, but for the protection of human health as well. Past Toxic Substances Monitoring Program data have indicated the presence of copper, lindane, mercury, zinc, and PCBs in fish tissue. Most heavy metal toxics may have entered the watershed from old mineral extraction and mining sites. The District is required by the State to perform TMDL testing at several sites throughout the Lake on a weekly basis.

1.3 Aquatic Plant Control Methods and Past Treatment

The objective of aquatic plant removal is to protect the health and safety of the public, facilitate recreation throughout the lake, protect native and beneficial species, and reduce eutrophication of the water column. If the abundance of weeds and algae present in the Lake are not controlled, excessive amounts of nutrients will be released into the food chain following die-off, providing a food source for more abundant vegetation.

Extensive growth of aquatic vegetation develops in Big Bear Lake during the summer months, particularly in the upper 15 to 20 feet. Even though weed removal is essential to remove nutrients and to provide adequate recreational areas on the Lake, vascular rooted aquatic plants must also be viewed as an important environmental attribute in Big Bear Lake. They provide essential habitat for fish life and they produce an abundance of food and food organisms for all species of fish present. Aquatic plants are also utilized as food to a significant extent by migratory waterfowl and often serve some control of shoreline erosion. Therefore, an integral part of the District's plant management program is careful identification of the areas where selective weed harvesting is necessary.

Big Bear Municipal Water District operates one aquatic weed harvester on the Lake for the purpose of removing weeds, primarily from around docks and navigational boating areas. Approximately 86% of the weed cutting occurs around private docks, with the remaining 14% occurring in area where improved public access is needed or navigational hazards must be removed. The harvesting program currently removes about 533 tons of weeds from the Lake annually. This equates to 327 pounds of phosphorous and 2772 pounds of nitrogen.

The District has also implemented aquatic herbicide treatments on an annual basis. Annually, the District, under General Permit Order No. R8-2004-0007, NPDES No. CA8000396 introduced California State legal liquid and granulated herbicides into dense weed beds in Grout Bay, Boulder Bay, Metcalf Bay, and most of the northeastern and southeastern shoreline of the Lake. Weed treatments were provided on as needed basis by District maintenance staff who are certified and qualified applicators of aquatic herbicides and algaecides. Under the General Permit, there were no monitoring protocols or methods expressed as long as all herbicides and algaecides were applied according to the manufacturer's product label. All past treatments specifically followed product label instructions for application.

Though Alum and Phoslock are not registered pesticides or listed under the Aquatic Weed Control

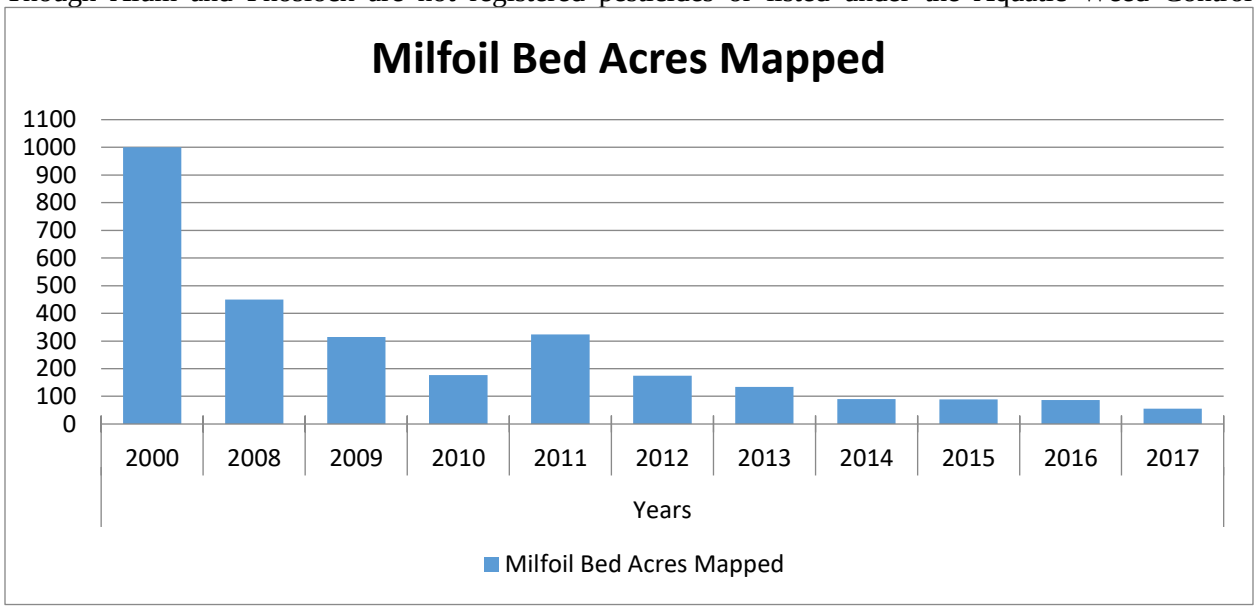


Figure 1: Histogram of Annual Milfoil Bed Size

Permit, Big Bear Lake has used Alum successfully in the past to reduce overall mobile phosphorus in the water column and lake bottom sediments which in turn limited chlorophyll-a presence and plant growth. In 2004, the District participated in a full-scale Alum application under Santa Ana Regional Water Quality Control Board Agreement No. 03-126-558-0, Order No. R8-2004-0007, NPDES No.

CA8000396. Aluminum sulfate was applied as a direct nutrient mitigation measure that reduced internal phosphorus loading from lake sediments. As a lake management tool and mitigation measure, the alum application was used to reduce water column total phosphorus concentrations as well as the amount of phosphorus released by the lake sediments. This alum application was the first of its magnitude to be conducted in the State of California. The dose of alum was expected to last five years. The level effort required for the application of 700,850 gallons approached the logistically limits of a manageable amount of work for a single alum application contractor. However, lasting control of the sediment phosphorus pool would require a single alum dose about 10 times greater than that applied in 2004 to inactivate the entire sediment phosphorus pool. Thus, continued control over the release of phosphorus from lake sediments will require re-applications of alum doses similar to that applied in 2004 over time. Further, internal phosphorus recycling will continue in areas of the lake where alum treatment was not applied. The alum application produced measureable improvements in the overall water quality of Big Bear Lake. Specifically, the 2004 full-scale alum application reduced water column nutrient concentrations and chlorophyll levels, while simultaneously improving water clarity. Furthermore, the alum application did not produce acidic pH levels, which in turn protected aquatic life within the lake from aluminum toxicity. Further, the lake's pH level was optimum for the formation of alum floc and a reactive alum barrier. In conclusion, the results of the alum study indicate that alum application is a viable lake nutrient remediation option for Big Bear Lake.

2. DESCRIPTION OF THE TREATMENT AREAS

Almost the entire shoreline of Big Bear Lake is prime habitat for Eurasian Milfoil and other types of aquatic plant and algae life. Aquatic plants cover about 800 acres around the perimeter of Big Bear Lake. The areas most heavily impacted by Eurasian Milfoil include: Boulder Bay, Metcalf Bay, Grout Bay, and the southeastern and northeastern shorelines. The least impact locations are those that are deepest - - from Papoose Bay, heading west to the dam, then northeast to the District's West Launch Ramp; or the far west end of the Lake. Though these areas are deeper and the littoral zone is narrower, Milfoil problems continue to exist. The District asks that the entire Lake shoreline be considered for this NPDES permit.

Water Body	Target Organism	Treatment Area
Big Bear Lake	Eurasian Water Milfoil	Entire Lake
	American Elodea	Area containing vegetation/ varies annually
	Coontail	Areas containing vegetation/ varies annually
	Widgeon Grass	Areas containing vegetation/ varies annually
	Filamentous Algae	Areas containing vegetation/ Varies annually
	All other species listed below	Spot treatments only if necessary/ Varies annually

Table 1: Treatment Area Description

3. DESCRIPTION OF AQUATIC WEEDS AND ALGAE TO BE CONTROLLED

The following are descriptions of plan and algae species found in the waters of Big Bear Lake. Some of these species are listed State and Federal agencies as noxious, while others are beneficial to the Lake and its aquatic, terrestrial, and avian species.

3.1 Eurasian Water Milfoil (*Myriophyllum spicatum*)

As described above, Eurasian Water Milfoil, is an extremely aggressive invasive plant which was first found in Big Bear Lake in the 1970s. It is considered by the Federal and State Government as a noxious and invasive weed. It is capable of rapid dispersion, principally by fragmentation of the plant parts. Each fragment is capable of growing roots and eventually developing into a new plant. Removal of fragments from boat trailers and along shoreline areas is advised to prevent its spread into new areas. Eurasian Water Milfoil is quite competitive with native species and may completely dominate a plant community within a few years after introduction. Due to the plant's ability to form dense growths, water use activities may become severely impaired. These plants are of little value to wildlife or fisheries.

3.2 Coontail (*Ceratophyllum demersum*)

This plant is easy to recognize as it resembles the plants often seen in home aquariums. It is submersed without roots, and the leaves are dark green in color and arranged in whorls on the stem. Coontail can be distinguished from milfoil by the forking of the leaves rather than the feather-like divisions. The spacing between leaf whorls is highly variable. Consequently, plants may be bushy or extremely long and sparse. Harvest or herbicide control may be necessary if Coontail rapidly succeeds eradicated milfoil.

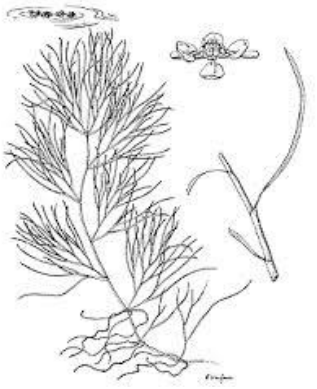
3.3 Curly Leaf Pondweed (*Potamogeton crispus*)

The leaves are thin and membranous with veins plainly visible. Minute teeth are visible along the entire margin of the leaf and the weed commonly grows early in the spring and dies back during midsummer. Fruits are borne in spikes above the water surface and leaves are alternately arranged on the stem. This plant tends to grow profusely early in the season, often shading and inhibiting other weed growth. Re-growth of this weed rarely occurs in the same season after control has been achieved.

3.4 American Elodea (*Elodea Canadensis*)

This weed has broad oval leaves, usually four in number, arranged in whorls around the stem. Whorls are compact near the growth tip, with spacing between the whorls gradually increasing further down the stem. Fragmented portions can develop into new plants. Elodea can rapidly succeed harvested milfoil patches and may require mechanical or herbicide harvesting.

3.5 Sago Pondweed (*Potamogenton pectinafus*)



These plants are bushy in appearance with narrow thread-like leaves alternately arranged on the stem. Nutlets are arranged like beads spaced on a string and emerging from the water. The leaves are alternately arranged on the stem.

3.6 Leafy-Pondweed (*Potamogenton foliosus*)

This plant has short, grass-like submerged leaves. Clumps of 4-8 fruiting bodies are attached to the center stem by a short seed stalk. It grows from shallow water to a depth of four feet. In waterfowl areas, these plants are a valuable food source.

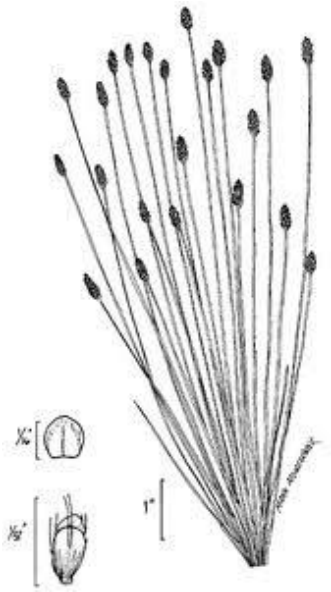
3.7 Widgeon Grass (*Ruppia maritime*)

The leaves are thread-like and narrow, extending from an extensive buried root system. It has four to six fruits borne in clusters on short stalks at the top of the plant. This plant is a prime waterfowl food and is desirable in some locations. However, beds can become dense and tangle in propellers hindering navigation; some removal may be necessary if beds become too thick.

3.8 Smartweed (*Polygonum hydropiperoides*)

Smartweed is a perennial plant that forms dense colonies in shallow water or moist soils and can grow to 3 feet tall. Stems are jointed or have swollen leaf nodes that are surrounded by a tubular sheath. Roots can develop from the leaf nodes. Leaves are alternate, lance-shaped up to 4 inches long but usually less than 1/2 inch wide. Flowers are on spikes at the end of stems (often numerous spikes on the same plant). Flowers begin as greenish then turn whitish or light pink in color as they mature. Fruits are flat, triangular (1/8 inch), dark brown to black.

Submerged portions of all aquatic plants provide habitats for many micro and macro invertebrates. These invertebrates in turn are used as food by fish and other wildlife species (e.g. amphibians, reptiles, ducks, etc.). After aquatic plants die, their decomposition by bacteria and fungi provides food (called “detritus”) for many aquatic invertebrates. Smartweed seeds are heavily consumed by ducks, small birds, and small mammals.



3.9 Spikerush (*Elocharis spp.*)
The stems are green and leafless, varying in length from 5 inches to 4 feet with varying diameters. IT grows in clumps, similar to turf. The mature stems are tipped with a brown to black, scaly, lance shaped spikelet. It reproduces from rootstalks and seeds, and is usually found on muddy or sandy shores and shallow water, but submerged forms do occur.

3.10 Planktonic Algae – common general: Anabaena, Chlorella, Pediastrum, Scenedesmus, Oocystis
These are microscopic plants usually suspended in the upper few feet of water often reaching bloom proportions. The water appears pea soup green or brownish and natural die-off may cause a summer kill of fish due to oxygen depletion. Some species may be toxic to livestock, wildlife or man, or impart taste and odor problems. At the mercy of wave and current action, planktonic algae will sometimes accumulate along the shore or in back water areas around Big Bear Lake.

3.11 Filamentous Algae – common genera: Spirogyra, Cladophora, Rhizocolnium, Mougeotia, Zygnema, and Hydrodictyon

This algae is also known as “pond scum” or “moss” because it forms greenish mats upon the water’s surface. Filamentous algae usually begins its growth along the edges or bottom of the body of water and “mushrooms” to the surface buoyed by the oxygen it has produced. Individual filaments are a series of cells jointed end to end which give the thread-like appearance. They also form fur-like growths on the bottom of logs, rocks and even on the backs of turtles. The texture of these growths may be slimy, cotton-like or coarse. Common names such as frog spittle and water net have been given to a few forms. Filamentous algae often appears in large mats which provide a smothering action when

hovering over milfoil plant masses. The algae reduces the sunlight and causes other problems which inhibit the growth of the milfoil. Therefore, this algae, although sometimes a functional aesthetic aquatic nuisance, must sometimes be viewed as a positive biological control agent for vascular aquatic plants. The District monitors algae carefully and control measures vary from year to year depending on the severity of the problem.

3.12 Toxic Algae

Death and sickness to pets, livestock, wildlife, and even man have been attributed to the presence of certain algae, mostly blue-green-forming species, in water supplies. Lethal substances produced by these algae are retained in the cell and released after death or are secreted from living cells. IT is important that wildlife specialists, pond owners, and lake property owners are aware of this potential danger. The only type of toxic algae identified in Big Bear Lake is blue green algae which can be found in stagnant, shallow areas of the Lake.

3.13 Blue Green Algae (*Lyngbya spp.*)

The species which are particularly troublesome to control are those which grow in colonies forming small spongy masses of mucilage. These blue-green, black or gray clumps made up of thousands of individual cells will lay on the bottom or float to the surface. Because of the protective mucilage, chemical control is difficult.

4. AQUATIC HERBICIDE PRODUCTS EXPECTED TO BE USED AND APPLICATION METHODS

Chemical herbicides are one of the leading methods of controlling, and in some cases, eliminating noxious aquatic weed growth. The herbicides that are approved for aquatic use by the US Environmental Protection Agency are well reviewed and considered compatible with the aquatic environment when used according to label directions.

There are two general types of aquatic herbicides in use, referred to as “contact” and “systemic” products. Contact herbicides kill susceptible plant stems and leaves generally leaving roots and some reproductive structures alive and capable of regrowth. As such, a contact herbicide is generally considered a maintenance tool, one that can provide relief from aquatic plant problems, but not something that can eliminate the problem from the lake system. Systemic herbicides are absorbed and carried throughout the plants thereby making them capable of killing the entire plant.

The contact herbicides approved for use are Diquat, Endothall (or Aquathol), and certain copper-containing products. The systemic herbicides that are registered and approved for use in California are Triclopyr, Fluridone, 2,4 –D DMA, and Glyphosate. Glyphosate is not appropriate for control of submersed plants.

Herbicide/Algaecide	Application Method	Adjuvant	Target Species	Formulation
Triclopyr	Granular blower/air vortex	None	Eurasian Milfoil	Systemic
Fluridone	Drop hose system	None	Eurasian Milfoil	Systemic
Diquat	Drop hose system	None	All aquatic plants	Contact
Chelated Copper/copper sulfate	Granular blower/ air vortex	None	All Algae	Contact
Endothall	Drop hose system	None	Eurasian Milfoil	Contact
Penoxsulam	Drop hose system	None	Most submerged plants	Systemic
Imazamox	Drop hose system	None	Most submerged plants	Systemic
Peroxyhydrate	Eductor	None	Planktonic algae	Systemic
Glyphosate	Backpack sprayer	Non-ionic surfactant approved for aquatic use	Semi aquatic/terrestrial plants	Contact
2, 4-D	Drop hose system	None	Eurasian Milfoil	Systemic

In the recent past, Big Bear Lake has been successful in controlling milfoil growth with the use of liquid and granulated aquatic herbicides, most notably Triclopyr, Diquat, and Fluridone. The figure shows the decrease in Eurasian Milfoil around the lake since 2000.

Two methods of herbicide application are used. Large broadcast treatment is applied using the vortex physics of water pumped through a nozzle at pressure to draw dry product from a hopper. Nozzles installed on either side of the back of the weed harvester barge distribute product in swaths 30 feet wide as the barge moves through milfoil infested littoral zone. Metering of product delivery in this unit is based on the known delivery rate of the equipment and the speed of the barge moving though the infested area. The other method also employs vortex physics but uses air instead of water. The unit has a blower that moves air across the bottom opening of a funnel shaped hopper. The air draws the product out of the hopper and is then directed through a hose to a hand held control and nozzle. Metering with this unit is based on an even distribution of a preloaded quantity of product in the hopper and the known area to be treated. In both cases application rates are computed using label instruction for plant species, treatment area and water depth.

4.1 Triclopyr, aka Renovate OTF

A trade name for triclopyr is Renovate3®. There are two formulations of triclopyr. It is the TEA formation of triclopyr that is registered for use in aquatic or riparian environments. Triclopyr, applied as a liquid, is a relatively fast-acting, systemic, selective herbicide used for the control of Eurasian Water Milfoil and other broad-leaved species such as purple loosestrife. Triclopyr can be effective for spot treatment of Eurasian Water Milfoil and is relatively selective to Eurasian Water Milfoil when used at the labeled rate. Many native aquatic species are unaffected by

triclopyr. Triclopyr is very useful for purple loosestrife control since native grasses and sedges are unaffected by this herbicide.

4.2 Glyphosate, aka Rodeo

Glyphosate is available in the Monsanto Corporation product Rodeo® as a liquid for aquatic use. As a systemic herbicide, glyphosate is capable of killing the entire plant and producing long term control. This herbicide is not effective below the water surface, however, because it breaks down rapidly in water and loses its herbicidal effect. This product is non-selective and can kill most vegetation if sufficient chemical contacts the plant. Applications can be somewhat selective however, as the applicator can focus the liquid spray on target plants and leave nearby non-target plants unaffected. It is often used in lake systems to contain water lily growth within habitat protection areas. It can also be used on rushes, cattails, and other terrestrial shoreline species.

4.3 Fluridone, aka Sonar

Fluridone is available in the SePRO Corporation product Sonar as a liquid or slow release pellet. Sonar can show good control of submersed and emergent plants where there is little water movement and an extended time for the treatment. It is most applicable to whole-lake or isolated bay treatments where dilution can be minimized. Because of the eight to ten week recommended treatment period, treatment should take place in early spring or fall.

There are a number of plants that are susceptible to fluridone, and milfoil is among them. Many native aquatic plants, including some in the pondweed family, are not impacted by this herbicide. As such, it can be used at low rates to remove a problematic species like milfoil and allow the native vegetation to recover. Other aquatic plants that may be impacted by Sonar are expected to grow out of the effect or to re-grow from seeds produced in previous seasons.

Use of Sonar does not pose a threat to human health or to fish and wildlife when used according to the label. While there is a short-term precaution when using treated waters for irrigation, there are no other water-use restrictions when using Sonar for milfoil control.

4.4 Diquat Dibromide, aka Tribune, Littora, Reward

A trade name for diquat is Reward®. Diquat is a fast-acting non-selective contact herbicide which destroys the vegetative part of the plant but does not kill the roots. It is applied as a liquid. Typically diquat is used primarily for short term (one season) control of a variety of submersed aquatic plants. It is very fast-acting and is suitable for spot treatment. However, turbid water or dense algal blooms can interfere with its effectiveness.

4.5 Sodium Carbonate Peroxyhydrate, aka PAK 27

Trade names include Pak27® and GreenClean®. These are peroxygen-based granular algaecides used for the prevention and control of algae in ponds, streams, irrigation systems, ornamental pools, and fountains. Areas being treated with these products must be closed to recreational activities during and for two-hours after treatment.

4.6 Endothall a.k.a. Aquathol, Hydrothol

Endothall manufactured by United Phosphorus Inc., is a broad spectrum contact herbicide. Endothall has an aquatic half-life of 2-14 days and degrades into organic acids (acetic and malic). There are no fishing or swimming regulations after the application of Endothall, if applied according to the MSDS label. As with any herbicide, dissolved oxygen issues can occur where weed beds are dense and water temperatures are warm due to high bacterial respiration.

4.7 Other Aquatic Herbicides, Algaecides

The District proposes the ability to use any other California State approved aquatic herbicide and/or algaecide deemed necessary and effective against nuisance weed or algae. These include imazapyr or imazamox, penoxsulam, acrolein, 2,4 –D DMA and copper sulfate or chelated copper. '*No Foam A'* may be used as an adjuvant.

5. DISCUSSION OF THE FACTORS INFLUENCING THE DECISION TO SELECT AQUATIC HERBICIDE FOR WEED AND ALGAE CONTROL

Big Bear Lake uses a number of combined strategies to reduce eutrophication and limit invasive and nuisance plant growth. The use of aquatic herbicides and algaecides is combined with mechanical harvesting, boat inspections to prohibit introduction of new species, wetland management, shoreline management, silt removal, silt retention, aeration, fountains, aqua-scaping, and plant replacement for an integrated management approach.

Without an integrated aquatic vegetation management approach to Big Bear Lake's eutrophication issues, the Lake would see more failure than success. Aquatic herbicides and algaecides are cost effective and District staff has 15+ years of experience in application techniques and methods. Furthermore, herbicides and algaecides have proven effective in the reduction of Eurasian Milfoil in Big Bear Lake. The decision to use aquatic algaecides and herbicides was originally proposed by the District as part of an Aquatic Vegetation Management Plan (AVMP) approach. One of the primary operational goals of the AVMP approach is to establish a general and reasonable set of control measures that not only aid in managing aquatic vegetation populations, but also address public health & safety, economic, legal, recreational, and aesthetic requirements. The AVMP approach is based on the determination of nuisance thresholds of plants and algae determined by the District. If vegetation or algae equals or exceeds a threshold, a control method is implemented. Algaecide and aquatic herbicide use may or may not be employed as a last resort control method, and is considered a critical part of the AVMP. For some aquatic weed varieties, herbicides offer the most effective (i.e. long-lasting or least labor intensive) control, and often they may be the only control available. Control tolerances are based on a number of factors. Beneficial uses and the impact of the weed and algae growth on those uses is a primary determining factor when using integrated aquatic plant management technologies to control this growth.

6. CONTROL STRUCTURES USED TO CONTROL RECEIVING WATERS

All of Big Bear's domestic water percolates from the surrounding hillsides and from the Lake into an aquafer, which is then pumped out via water wells. Big Bear contains no direct intake pipes for domestic or irrigation use. Therefore, during aquatic herbicide and algaecide treatments there is no reason to shut down pumping operations for any duration.

The District operates the main Big Bear Dam at the west end of the Lake. This is the primary control structure. It is evaluated and inspected by the California Division of Safety of Dams annually. There are two spillways at each end of the dam in Bays 1 and 10. Each spillway contains five (5) four foot (4') wide by eight foot (8') tall steel gates. There is a 36 inch valve located at the bottom of Bay 7, near the lowest point of the dam elevation. There is a six inch (6") pipe saddled to the 36 inch valve. There is also a three inch (3") pipe saddled to the 36 inch valve. After the saddled pipes, the 36 inch valve splits to a 24 inch valve and 14 inch valve. The six inch (6") pipe is almost constantly open and running at approximately 1 cfs or 448 gallons per minute to provide water for downstream fish habitat, irrigation and power generation.

7. SHORT-TERM OR SEASONAL EXPECTATIONS

Since 2000, Big Bear Lake has seen an average decrease of milfoil acreage present in the Lake. Annually, 12 of the last 13 years have recorded a decrease in milfoil acreage. And on average, each consecutive year has seen a 39.4% drop in milfoil acreage from the previous year. The District plans on mapping milfoil acreage late spring 2015 to compare it to the milfoil acreage maps of spring 2014. With continued application of herbicides and forecasted weather patterns, the District expects the milfoil acreage to be about 35% of what it was last year.

Table 2: Receiving Water Limitations

Constituent/ Parameter	BENEFICIAL USE[1]				Basis
	MUN, µg/L	WARM or COLD, µg/L	Other than MUN, WARM, or COLD, µg/L	All Designations	
2,4-D	70				U.S. EPA MCL
Acrolein[2]	320	21	780		U.S. EPA Water Quality Criteria, 1986.
Copper[2]				Dissolved Freshwater[3] Copper Chronic = 0.960exp{0.8545 [ln(hardness[4])] – 1.702} [5, 6] Dissolved saltwater[3] Copper Chronic = 0.83exp{0.8545 [ln(hardness[4])] – 1.702} [5,6]	California Toxics Rule
Diquat	20				U.S. EPA MCL
Endothall	100				U.S. EPA MCL
Fluridone	560				U.S. EPA Integrated Risk Information System
Glyphosate	700				U.S. EPA MCL
Nonylphenol				Freshwater Chronic Criterion = 6.6 µg/L Saltwater Chronic Criterion = 1.7 µg/L	U.S. EPA National Recommended Ambient Water Quality Criteria
Toxicity	Algaecide and aquatic herbicide applications shall not cause or contribute to toxicity in receiving water(s).				Regional Water Boards' Basin Plans

Notes:
1. See Regional Water Boards' Water Quality Control Plans (Basin Plans) for beneficial use definitions.
2. Public entities and mutual water companies* listed in Attachment G are not required to meet these limitations in receiving waters during the exception period described in the APAP and Section VIII.C.10 below.
3. For waters in which the salinity is equal to or less than 1 part per thousand 95% or more of the time, the freshwater criteria apply. For waters in which the salinity is equal to or greater than 10 parts per thousand 95% or more of the time, saltwater criteria apply. For waters in which the salinity is between 1 and 10 parts per thousand, the applicable criteria are the more stringent of the freshwater or saltwater criteria.
4. For freshwater aquatic life criteria, waters with a hardness 400 mg/L or less as calcium carbonate, the actual ambient hardness of surface water shall be used. For waters with a hardness of over 400 mg/L as calcium carbonate, a hardness of 400 mg/L as calcium carbonate shall be used with a default Water-Effect Ratio of 1.
5. Values should be rounded to two significant figures.
6. This limitation does not apply to the Sacramento River and its tributaries above the State Highway 32 Bridge at Hamilton City. See Table III-1 of the Basin Plan for the Sacramento and San Joaquin River Basins for copper limitation.

8. DESCRIPTION OF MONITORING PROGRAM

As the District has done in the past, the first step undertaken each year this plan is in effect will be to conduct a survey of the littoral area of the lake. This survey will confirm the presence and density of various aquatic plant communities. This data will be reviewed by the District to determine where aquatic weed growth is having an impact and effect on beneficial uses of the water body. When those

areas are outlined, the General Manager and Lake Manager will review them and develop treatment recommendations. In the

The monitoring program addresses two key questions:

1. Does the residual algaecides and aquatic herbicides discharge cause an exceedance of the receiving water limitations?
2. Does the discharge of residual algaecides and aquatic herbicides, including active ingredients, inert ingredients, and degradation byproducts, in any combination, cause or contribute to an exceedance of the "no toxics in toxic amount" narrative toxicity objective?

Records of Monitoring will include:

1. Date of application
2. Location of application
3. Name of applicator
4. Type and amount of aquatic herbicide and/or algaecide used
5. Application details, such as flow and level of water body, time application started and stopped, aquatic herbicide and/or algaecide application rate and concentration
6. Visual monitoring assessment
7. Certification that applicator followed the APAP

8.1 Data Collection

Visual monitoring will be performed for all aquatic herbicide and algaecide applications at all sites and will be recorded by qualified personnel on standardized forms (see Appendices) that will stored both digitally and centrally and be made available upon request.

8.2 Monitoring Locations and Frequency Minimums

No water quality sampling is required for application of products that contain sodium carbonate peroxyhydrate. For application of all other aquatic herbicides and algaecides listed on the Permit, the District will collect samples from a minimum of six application events for each active ingredient in each environmental setting per year. If there are less than six application events in a year for an active ingredient, the Discharger will collect samples for each application event in each environmental setting.

If the results from six consecutive sampling events show concentrations that are less than the applicable receiving water limitation/trigger in an environmental setting, then sampling frequency for that active ingredient will be reduced to one per year in that environmental setting. If the annual sampling shows exceedances of the applicable receiving water limitation/trigger, the District will be required to return to sampling six application the next year, and until sampling may be reduced again.

8.3 In-situ Measurements

In conjunction with sample collection, temperature will be measured in the field. Turbidity, electrical conductivity, pH, and dissolved oxygen may be measured in the field using field meters: Turbidity, pH, and dissolved oxygen meters are calibrated according to manufacturer's specifications at the recommended frequency, and checked with a standard prior to each use.

The table below indicates the required monitoring parameters as per Permit:

Sample Type	Constituent/Parameter	Units	Sample Method	Minimum Sampling Frequency	Sample Type Requirement	Required Analytical Test Method
Visual	1. Monitoring area description 2. Appearance of water (sheen color, clarity, etc. 3. Weather conditions	N/A	Visual Observation	1	Background, Event and Post-event monitoring	N/A
Physical	1. Temperature	ºF	Grab	5	Background, Event and Post-event monitoring	6
	2. pH	Number				
	3. Turbidity	NTUs				
	4. Electric Conductivity @ 25ºC	µmhos/cm				
Chemical	1. Active Ingredient	µg/L	Grab	5	Background, Event and Post-event monitoring	6
	2. Nonylphenol	µg/L				
	3. Hardness (if copper is monitored)	mg/L				
	4. Dissolved Oxygen	mg/L				

Table 4 Required Monitoring Parameters

*Table 5 Note: Collect samples from a minimum of six application events for each active ingredient in each environmental setting (flowing water and non-flowing water) per year, except for glyphosate. If there are less than six application events in a year, collect samples during each application event for each active ingredient in each environmental setting (flowing water and non-flowing water). If the results from six consecutive sampling events show concentrations that are less than the receiving water limitation/trigger for an active ingredient in an environmental setting, sampling shall be reduced to one application event per year for that active ingredient in that environmental setting. If the yearly sampling event shows exceedance of the receiving water limitation/trigger for an active ingredient in an environmental setting, then sampling shall return to six application events for that active ingredient in each environmental setting. For glyphosate, collect samples from one application event from each environmental setting (flowing water and non-flowing)

8.4 Sample Locations

Sampling will include background, event, and post-event monitoring as follows:

Background Monitoring: The background sample is collected in the treatment area within 24 hours prior to the start of the application.

Event Monitoring: The event sample is collected outside the treatment area immediately after the application event, but after sufficient time has elapsed such that treated water would have exited the treatment area.

Post-Event Monitoring: The post-event monitoring sample is collected within the treatment area within one week after the application.

One full set of three samples (i.e. Background, Event, and Post) will be collected during each treatment from the representative site(s) treated.

Monitoring Records: Records of monitoring events will include the following information:

1. The date, exact place (degrees, minutes, seconds), and time of sampling or measurements;
2. The individual's names who performed the sampling or measurements;
3. The dates analyses were performed;

4. The individual's names who performed the analysis;
5. The analytical techniques or methods used; and
6. The results of such analyses.

9. SAMPLE METHODS AND GUIDELINES (PREVENTING SAMPLE CONTAMINATION)

The purpose of this section is to present methods and guidelines for the collection and analysis of samples necessary to meet the APAP objective of assessing adverse impacts, if any, to beneficial uses of water bodies treated with aquatic herbicides and algaecides.

This section describes the techniques, equipment, and methods for sample collection and analysis.

9.1 Sample Collection

If the water depth is 6 feet or greater the sample will be collected at a depth of 3 feet. If the water depth is less than 6 feet the sample will be collected at the approximate mid-depth. The sampling container will be inverted before being lowered into the water to the desired sample depth, where it will be turned upright to collect the sample.

During collection, the samples will be collected in a manner that minimizes the amount of suspended sediment and debris in the sample. Surface water grab samples will be collected directly by the sample container or by intermediary container in the event that the sample container cannot be adequately or safely used.

To ensure data quality control, each container will be affixed with a label indicating a sample number for each sample location. The label will also indicate the date and time of sampling and the sampler's name.

9.2 Field Sampling Procedures

A logbook will be maintained for each sampling site. The log book will indicate sampling times, locations, observations, and field monitoring results for parameters collected with field equipment and not requiring laboratory analysis.

As per Permit, field observations will note: floating or suspended matter, discolorations, bottom deposits, aquatic life, visible sheens or coatings, and/or potential nuisance conditions. See Appendix B.

9.3 Sample Equipment Cleaning

Upon completion of the sampling event, the equipment will be thoroughly cleaned with and triple rinsed with distilled water, and then rinsed once with the water being sampled prior to its first use at a new sampling location.

9.4 Sample Preservation

If necessary, samples will be collected with bottles containing the correct preservative(s), refrigerated at four (4) degrees Celsius (c), stored in a dark place, and transported to the analytical laboratory within a suitable time frame so as to insure compliance with required hold times for specific constituents.

9.5 Sample Packing and Shipping

All samples will be packed and transported the day they are collected in order to observe required holding times for lab samples. Ice will be included in coolers containing samples that require temperature control and samples will be packaged in the following manner:

1. Each sampling container will have an identifying label
2. A chain of custody form will be completed with the required date, time, location, sample collector, and required analysis.
3. Samples requiring shipment will be properly packed with protective padding and secured for express delivery or courier pick-up.

9.6 Sample Preservation and Transportation

If preservation is required for the monitored constituent, the preservative will be placed in the sample container by the container vendor prior to sample collection. Once a sample is collected and labeled it will immediately be placed in a dark, cold (4° C) environment, typically a cooler with ice. Delivery to the laboratory should occur on the same day or the next day as the sample collection.

9.7 Chain-of-Custody (COC)

A COC form will be completed for each sampling event, and the form will accompany the samples to the laboratory, COC forms will indicate time, date, location of sampling, sampler name, and analyses required. A copy of the COC will be retained upon delivery of samples to the lab.

9.8 Field Sampling Kit

Each field sampling kit will contain the following equipment:

1. Appropriate sampling container as provided by certified lab
2. COC's
3. Field collection forms
4. Sample i.d. labels
5. Deionized water
6. Cooler or ice chest
7. Ice packs
8. Sub surface sampler
9. Non powdered plastic or nitrile gloves
10. GPS for sampling location collection
11. Plastic storage bags for samples and or paper work

9.9 Laboratory Quality Assurance and Quality Control

All laboratory analyses will be conducted by a state certified laboratory as per Permit specification. Laboratory precision and accuracy will be monitored by a series of laboratory-generated quality control samples. As long as sufficient sample volume is collected and submitted to the laboratory, no additional effort is required by field activities to generate laboratory quality control samples. Each set of field samples will have associated with it one each from the following set of laboratory quality control samples.

9.10 Reporting Procedures

An annual report for each reporting period, from January 1 to December 31 will be prepared by March 1 of the following year and will be submitted to the Santa Ana Regional Water Quality Control Board (RWQCB). In years when no aquatic herbicides or algaecides are used, a letter stating "no application was made" will be sent to the RWQCB in lieu of an annual report.

The annual report will contain the following information:

a. An 'executive summary' discussing compliance or violation of the Permit and the effectiveness of the APAP; and

b. A summary of monitoring data, including the identification of water quality improvements or degradation as a result of aquatic herbicide or algaecide application

The Discharger will collect and retain all information on the previous reporting year. When requested by the Deputy Director or Executive Officer of the RWQCB, the District will submit the annual information collected, including:

a. An Executive Summary discussing compliance or violation of the Permit and the effectiveness of the APAP to reduce or prevent the discharge of pollutants associated with herbicide applications;
b. A summary of monitoring data, including the identification of water quality improvement or degradation as a result of aquatic herbicide or algaecide application, if appropriate, and recommendations for improvement to the APAPA (including proposed BMPs) and monitoring program based on the monitoring results. All receiving water monitoring data shall be compared to applicable receiving water limitations and receiving water monitoring triggers;
c. Identification of BMPs and a discussion of their effectiveness in meeting the Permit requirements;
d. A discussion of BMP modifications addressing violations of the Permit;
e. A map showing the location of each treatment area;
f. Types and amounts of aquatic herbicides used at each application event during each application;
g. Information on surface area and/or volume of treatment area and any other information used to calculate dosage, concentration, and quantity of each aquatic herbicide used;
h. Sampling results shall indicate the name of the sampling agency or organization, detailed sampling location information including latitude and longitude, detailed map or description of each sampling area including latitude and longitude, collection date, name of constituent/parameter and its concentration detected, minimum levels, method detection limits for each constituent analysis; name or description of water body sampled, and a comparison with applicable water quality standards, description of analytical QA/quality control plan. Sampling results shall be tabulated so that they are readily discernible; and
i. Summary of aquatic herbicide application logs

The results of sampling and analysis will be summarized in the Annual Report. The data will be tabulated so that they are readily discernible.

9.11 Emergency Situations

24 Hour Report and Five Day Reporting: The discharger or District will orally report any non-compliance. This includes any unexpected or unintended effect of the use of an aquatic herbicide or algaecide that may danger health or the environment. This information will be provided orally within 24 hours from the time the discharger becomes aware of the circumstances. A written report of the non-compliance will be provided within five (5) days of the time the discharger becomes aware of the non-compliance.

9.12 Procedures to Prevent Sample Contamination

Personnel that are making aquatic herbicide and algaecide application will not be allowed to collect samples. Sample collection personnel will not be allowed to handle or come into contact with aquatic herbicide or algaecide application equipment, containers or personal protective equipment (PPE) used by applicators. Care will be taken by samplers to minimize contact with any treated water or vegetation.

In the event that sampling equipment will be used in more than one location, the equipment will be triple rinsed in uncontaminated water, and then rinsed once with the water being sampled prior to its first use at a new sample collection location. Gloves will be changed between sites.

10. DESCRIPTION OF BMPs TO BE IMPLEMENTED

The controlling agency has established the following Best Management Practices (BMP) in order to assure that all aquatic herbicides are used in a safe and effective manner.

10.1 Measures to Prevent Spills and Spill Containment in the Event of a Spill

Applicators take care when mixing and loading aquatic herbicides and algaecides and adjuvants. All label language is followed to ensure safe handling and loading of algaecides and aquatic herbicides. Application equipment is regularly checked and maintained to identify and minimize the likelihood of leaks developing or failure that would lead to a spill.

If aquatic herbicides or algaecides are spilled, they will be prevented from entering any waterbodies to the extent practicable. Applicator staff are trained in the use of absorbent materials such as kitty litter, "pigs" and "pillows". Spills will be cleaned up according to label instructions, and all equipment used to remove spills will be properly contained and disposed of or decontaminated as appropriate. Applicators will report spills as required and in a manner consistent with local, state and federal requirements.

10.2 Measures to Ensure Appropriate Use Rate

The following BMPs help to ensure that the appropriate pesticide application rate is used.

a. Site Scouting
   Prior to the treatment, qualified staff will scout sites to determine where nuisance thresholds have been exceeded. These thresholds are based on the agreed upon standard and maintenance of the beneficial uses of the lake.

   If a location is deemed to have exceeded a threshold, or given algae or aquatic weed population is anticipated to exceed a threshold based on site and weather conditions, lake depth, historic aquatic weed growth, or other information, an aquatic herbicide or algaecide application is considered. If the application can be made without negatively impacting the water quality, then an application is made.

b. Applications Made According to Label
   All aquatic herbicide and algaecide applications are made in accordance with the Federal Insecticide Fungicide and Rodenticide Act (FIFRA) and in accordance with the regulations of the EPA, CAL EPA, CADPR, and local Agricultural Commissioner.

c. Applications Made by Qualified Applicator Certificate Holders
   Applicators with QALs, QACs or properly trained staff under the supervision of applicators with QALs or QACs make applications or supervise applications. These staff have knowledge of proper equipment loading, nozzle selection, calibration, and operation so that spills are minimized, precise application rates are made according to the label, and only target plants are treated.

d. The Discharger's Plan in Educating Its Staff and Herbicide Applicators on How to Avoid Any Potential Adverse Effects from the Herbicide Applications.

All Discharger's application staff hold QALs from CADPR and are trained annually in the safe handing, mixing, application, storage, and transport of all aquatic herbicides and algaecides that are used. In addition to this, staff are briefed as to site specific conditions including water volume, use restrictions, environmental constraints, flow conditions, pest identification, and nuisance thresholds. All application staff are familiar with label instructions and conditions in regard to the safe and legal handing, mixing, and application of aquatic herbicides and algaecides in their control. Training materials and procedures are updated every 6-12 months or as required depending upon the use of different active ingredients, compounds, or the addition of new treatment sites. All QALs require 20 continuing education units every two years in order to stay current on new application methods and requirements.

e. Planning and coordination with water users in order to minimize impacts during application.
As required by the aquatic herbicide and algaecide label, water users potentially affected by any water use restrictions will be notified prior to an application being made. AS necessary, gates, weirs, etc. will be closed as necessary to prevent discharge of residual aquatic herbicides or algaecides to off target locations.

f. Description of Measures to Prevent Fish Kills
Applications Made According to Label
Precautions on the product label to prevent fish kills will be followed. For example, limitations on the surface water area treated will be followed to prevent dead algae or aquatic weeds from accumulating and then decaying and subsequently depressing the dissolved oxygen (DO) level.

Applications Made by Qualified Applicator Certificate Holders
Holders of QACs, QALs, or those under their direct supervision make applications recommended by the PCA. These applicators have knowledge of proper equipment loading, nozzle selection, calibration, and operation so that spills are minimized , precise application rates are made according to the label, and only target algae or vegetation are treated. Calibration ensures that the correct quantity and rate of herbicide is applied.

11. EXAMINATION OF POSSIBLE ALTERNATIVES

Evaluation of Management Options

When developing an aquatic vegetation management program, all applicable aquatic plan management technologies should be considered along with their limitations and applicability to the situation experienced in the Lake. An Integrated Plant Management Plan (IPM) approach is developed with this principle in mind. Aquatic plant management technologies are broadly categorized within the following framework:

1. No action
2. Prevention
3. Mechanical or physical methods of removal
4. Cultural methods of control
5. Biological control agents
6. Aquatic herbicides and algaecides

11.1 No Action

Whenever possible, this is the preferred BMP. The "less is more" approach is optimal in regard to chaos as well as environmental impact. If pre-determined nuisance levels have not been reached, than this may be a feasible approach.

11.2 Prevention i.e. Biological and Cultural Methods

This approach focuses on altering the environmental conditions in such a way as to modify the habitat in order to prevent nuisance aquatic weeds and algae. Methods such as aeration, light attenuating dyes, dredging, or bio-manipulation have all had positive results in regard to reduction of the growth rate of aquatic plants and algae. Aeration, oxygenation and mixing are methods that can mechanically add oxygen directly to the water, and can result in the reduction of nuisance algae growth. Shading the water column using non-toxic, inert dyes can reduce unwanted submerged plants and algae. Use of dyes works on algae and submerged vegetation by limiting their ability to photosynthesize when the dye is present, but is not a long-term solution.

Bio-manipulation utilizes various natural mechanisms that can reduce suspended algae, and involves increasing biological controls in the habitat. Outcomes from the type of management approach can be unpredictable and often don't address the immediate nuisance.

Another preventative method is the use of bottom barrier or benthic blanket technologies (weed blankets). Bottom barriers are materials that come in sheets and are negatively buoyant. They can be attached to the bottom and rolled over the top of existing plant beds, they are then weighted or pinned to the lake bottom. These systems provide immediate and long term control of all aquatic vegetation where they are placed. The drawbacks are generally the high costs of materials. These barriers cost from $0.75 to $1.00 per square foot installed. At this rate they can be cost effective for small application such as along a dock line or private swim beach, but the per-acre cost is calculated using the 43,560 square feet in an acre. In addition, barriers can trap gasses between the lake sediment and the barrier causing them to lift into propellers or create areas that might be a threat to swimmers diving under the water line. Regular maintenance and inspections are required.

11.3 Mechanical or Physical Methods

Mechanical Removal

There are two primary mechanical control technologies available to managers.

Aquatic weed harvesting systems can cut and remove aquatic vegetation from the lake. These systems are barges with cutting knives around a conveyor belt that harvest the plants, and move them onto the barge where a second conveyor belt collects and off loads the vegetation. These systems cut generally to a depth of five feet. Aquatic plants will then go through a short period of recovery and then begin to grow again.

Harvesting operations are efficient when the plants can be accessed without interference of obstructions such as docks and boat houses, and when the shore side operations for transfer and removal of the vegetation can be located close to where the harvester is working. The more time the harvester has to spend transporting weeds to the shore-side operation, the lower the production of the harvester.

Harvesting systems have some drawbacks in this circumstance, as there is limited shoreline accessibility and no launch access for vessels this size. In addition, these systems do not

capture all of the fragments created by the cutting operation, leading to propagation through fragmentation.

Rotovation systems used underwater tilling systems to cut the widgeon grass roots from the lake sediment. This can provide somewhat longer term control of this species. Rotovation however dislodges a considerable amount of plant material, detritus, and nutrients in the lakebed. IN the long term, rotovation may actually increase the presence of nuisance species.

Environmental impacts due to the use of mechanical techniques include the creation of water borne sediment and turbidity due to people and equipment working in the water. This suspended sediment can adversely affect aquatic species by lowering dissolved oxygen and preventing light penetration. Disturbing sediment or conveyance banks may cause additional problems including, but not limited to, new areas for aquatic weed establishment, fragmentation, re-establishment of aquatic weeds and siltation.

Physical Methods
Diver hand removal can be a very effective method of controlling American Elodea and other aquatic plants under certain conditions. Divers swim through the littoral zone of the lake, note and often map the locations of stands of weeds, and had remove and bag the plant material and roots. This system is effective in waters where visibility is good. The method provides rapid removal and clears the plants from the water column. One of the drawbacks of this method is the expense of deploying divers. Many states require prevailing wages for this activity that can cost upwards of $100.00 per hour for a dive team. For safety purposes, at least two divers must be working together underwater with a tender/safety diver on the support boat monitoring these operations.

Diver dredging is also used in this type of application. Using this technology dive teams use a hose system to pump the vegetation to a barge where it is captured for removal from the lake. While this system is more productive than diver hand removal, the same potential drawbacks apply.

11.4 Aquatic Herbicides and Algaecides
The selection of and decision to use an aquatic herbicide or algaecide is based on the recommendation of a PCA. The PCA considers a variety of control options that may include mechanical and cultural techniques that alone or in combination with chemical controls are the most efficacious and protective of the environment. Several factors are taken into consideration in the process; expense, efficacy, expediency, and environmental impact to name a few. IN general, alternative control techniques are expensive, labor intensive, not as effective, and cause temporary water quality degradation.

The quantity of aquatic herbicide and algaecide required for an application is determined by a PCA that has followed the label directions in making a recommendation. The rate at which an aquatic herbicide or algaecide is used is highly variable and depends on the type, time of year, location, and density and type of aquatic weeds, water presence, and goal of the application.

11.5 Using the Least Intrusive Method of Aquatic Herbicide Application
Discharger staff will use application techniques so as to apply aquatic herbicides in the least intrusive manner, and order to insure rapid and accurate delivery to the treatment site.

Algaecides and herbicides that are selected are chosen for the maximum efficacy at the lowest suitable amount, and for minimal impact on the lake during application.

11.6 Applying a Decision Matrix Concept to the Choice of the most Appropriate Formulation

When selecting the appropriate formulation for aquatic weed and algae control, several factors must be taken into consideration. All of the environmental factors are taken into consideration. The components of this decision matrix are as follows:

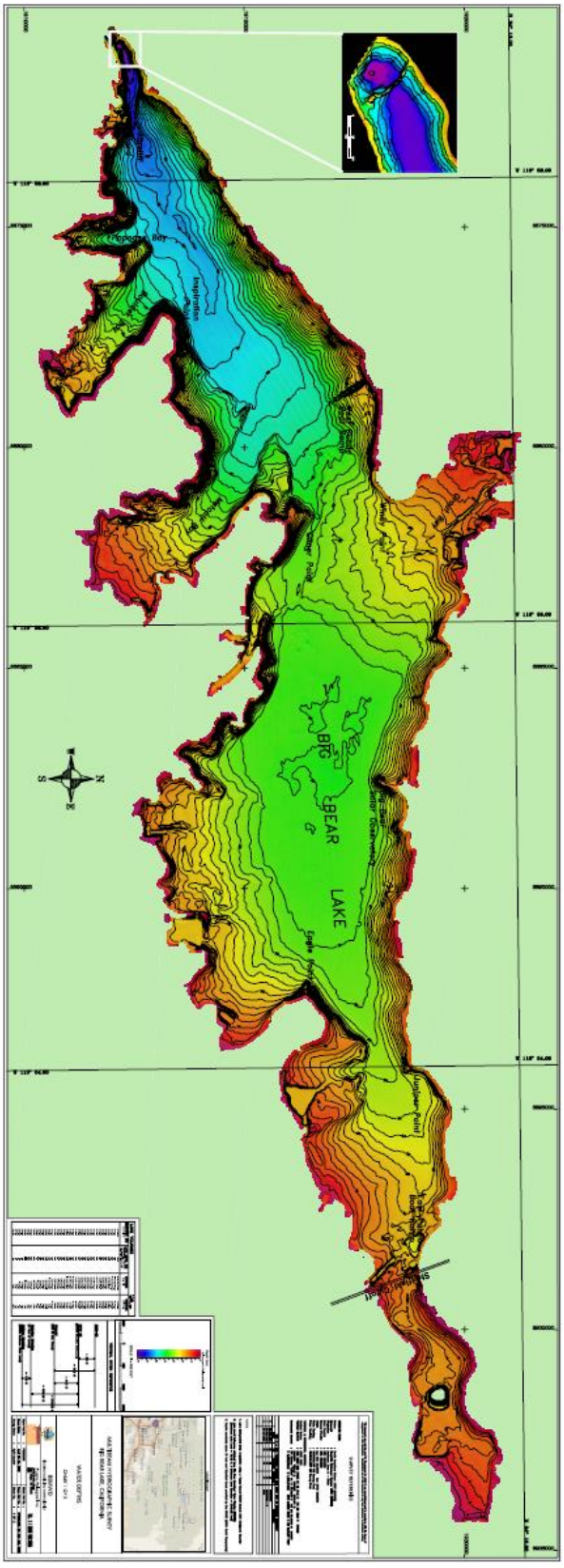
a. Accurate identification of pest
b. Established nuisance threshold and tolerances
c. External influences such as flow, water volume, and water use restrictions
d. Method of application
e. Duration of application
f. Mitigation of treatment effects on lake ecology
g. Ability to apply BMPs effectively

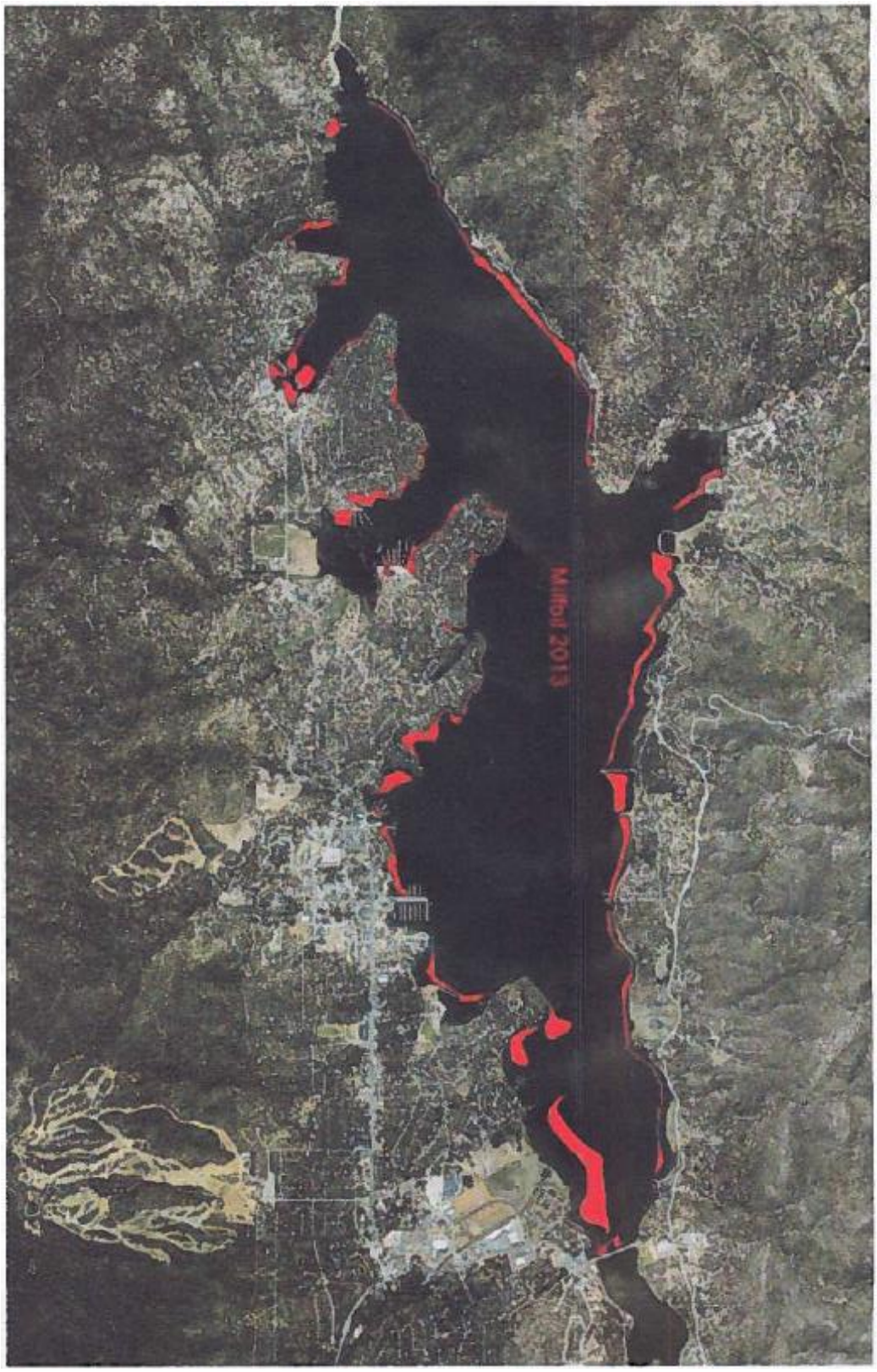
All of these factors are involved in the selection of a control method in order to maintain plant and algae growth below nuisance thresholds, and to protect the beneficial uses of the Lake.

APPENDIX A: VICINITY MAP AND TREATMENT MAP

VICINITY MAP

TREATMENT MAP (2013)




MARCH 2013

APPENDIX B: PESTICIDE APPLICATION LOG

AQUATIC PESTICIDE APPLICATION LOG

Date of Applciation:	**APPLICATION AREA**
Location:	Surface area:
Application Start Time:	Volume:
Applciation End Time:	**TREATMENT AREA**
Applicator Name:	Surface Area:
Discharge Gates or Control Stuctures	Volume:
Name:	**Attach a map showing applciation area,
Date Closed:	treatment area, immdeiately adjacent untreated
Time Closed:	area, and other information used to calculate
Date Opened:	dosage and quantity of each pesticide
Time Opened:	at each applcaiton site.
Calculations to determine openings and closures:	

Product Name	Chemical Name Detail	Liquid/Granule

Application Details

Plot #	Area	Depth	Product	Quantity	Rate

APAP Certification

I, _____ certify that the APAP has been followed.

Sign here: X_____

Date: _____

APPENDIX C: RECEIVING WATER VISUAL OBSERVATION FORM

NPDES RECEIVING WATER VISUAL OBSERVATION FORM

Background Monitoring Parameters (u/s or at treatment area up to 24 hours or at time of treatment)

Monitoring Date:	Location:	
Sampled By:		
Monitoring Area Description:		
Site Conditions/Appearance of Waterway:		
	Present	Absent
Floating or sustepended matter:		
Discoloration:		
Bottom Deposits:		
Aquatic Life:		
Weather Conditions/observations:		

	Present	Absent
Visible films, sheens, or coatings:		
Fungi, slimes, objectionalbe growths:		
Potential nuisance conditions:		

Event Monitoring Parameters (immediately adjacent to treatment area after application)

Monitoring Date:	Location:	
Sampled By:		
Monitoring Area Description:		
Site Conditions/Appearance of Waterway:		
	Present	Absent
Floating or sustepended matter:		
Discoloration:		
Bottom Deposits:		
Aquatic Life:		
Weather Conditions/observations:		

	Present	Absent
Visible films, sheens, or coatings:		
Fungi, slimes, objectionalbe growths:		
Potential nuisance conditions:		

Post Event Monitoring Parameters (collected in the treatment area within one week post application)

Monitoring Date:	Location:	
Sampled By:		
Monitoring Area Description:		
Site Conditions/Appearance of Waterway:		
	Present	Absent
Floating or sustepended matter:		
Discoloration:		
Bottom Deposits:		
Aquatic Life:		
Weather Conditions/observations:		

	Present	Absent
Visible films, sheens, or coatings:		
Fungi, slimes, objectionalbe growths:		
Potential nuisance conditions:		

APPENDIX D: RECEIVING WATER PHYSICAL QUALITY FORM

NPDES RECEIVING WATER PHYSICAL QUALITY FORM

Background Monitoring Parameters (u/s or at treatment area up to 24 hours or at time of treatment)		
Monitoring Date:	Location:	Dissolved oxygen:
Monitoring time:		
Sampled By:		Comments/Notes:
Monitoring Area Description:		
Site Conditions/Appearance of Waterway:		
Temp:		
pH:		
Turbidity (NTUs):		
Clairity (ft):		
Electrical conductivity:		
Event Monitoring Parameters (immediately adjacent to treatment area after application)		
Monitoring Date:	Location:	Dissolved oxygen:
Monitoring time:		
Sampled By:		Comments/Notes:
Monitoring Area Description:		
Site Conditions/Appearance of Waterway:		
Temp:		
pH:		
Turbidity (NTUs):		
Clairity (ft):		
Electrical conductivity:		
Post Event Monitoring Parameters (collected in the treatment area within one week post application)		
Monitoring Date:	Location:	Dissolved oxygen:
Monitoring time:		
Sampled By:		Comments/Notes:
Monitoring Area Description:		
Site Conditions/Appearance of Waterway:		
Temp:		
pH:		
Turbidity (NTUs):		
Clairity (ft):		
Electrical conductivity:		

APPENDIX E: CHAIN OF CUSTODY FORM

CHAIN OF CUSTODY FORM

BIG BEAR MUNNICIPAL WATER DISTRICT
P.O. BOX 2863, BIG BEAR LAKE, CA 92315
PH. (909) 866-5796 FX. (909) 866-6485

SECTION 1: SAMPLE INFORMATION

CONTACT PERSON:	PROVIDE RESULTS WITHIN: (please circle)				CHECK ALL THAT APPLY:
DIRECT PHONE:	Reg. 6 days	Rush 72 hrs	Rush 24 hrs	Rush 2 hrs	☐ REPORT
DIRECT EMAIL:					☐ SPREADSHEET ONLY
					☐ EMAIL
SITE NAME AND LOCATION (LAT,LON):					☐ FAX
					☐ VERBAL
COLLECTED BY:	DATE COLLECTED:				
PROJECT NAME:					

SECTION 2: SAMPLE DETAILS

SAMPLE ID	LOCATION SAMPLED	SAMPLE TYPE	DATE/TIME

Relinquished by:	Date/Time:	Relinquished by:	Date/Time:
Relinquished by:	Date/Time:	Relinquished by:	Date/Time:
Containers intact? Y N	COC Complete? Y N	Properly preserved? Y N	Temp upon arrival:

APPENDIX F: SAMPLE BOTTLE LABEL

SAMPLE BOTTLE LABEL
Sample #
Sample Location: (lat, lon)
Location name:
Date:
Time:
Sampler's name:
Treatment/application type: