State of Vermont
WATER RESOURCES BOARD

In re: Aquatic Nuisance Control Permit #C93-01-Morey
Lake Morey, Town of Fairlee, Vermont
Docket No. WQ-93-04

FINDINGS OF FACT, CONCLUSIONS OF LAW AND ORDER

This decision, dated April 12, 1994, pertains to an appeal from a permit issued to the Town of Fairlee by the Secretary of the Agency of Natural Resources authorizing the application of the pesticide Garlon 3A to the waters of Lake Morey for the purpose of controlling Eurasian watermilfoil. As explained below, the Water Resources Board has determined that the ANR's decision granting the permit should be reversed, and the permit declared void, for failure of the permittee to demonstrate that it has met all applicable standards of 10 V.S.A. § 1263a(e).

I. PROCEDURAL HISTORY

On June 4, 1993, the Water Resources Board ("Board") received an appeal filed jointly by David Adams, Kern McCarty and Amy McCarty ("the appellants"). The appellants sought reversal of the decision of the Agency of Natural Resources ("ANR") granting Aquatic Nuisance Control Permit #C93-01-Morey ("the permit"). The ANR had issued the permit to the Town of Fairlee ("the Town") on May 11, 1993. The permit authorized the application of the pesticide Garlon 3A to the waters of Lake Morey, located in the Town of Fairlee, Vermont, for the purpose of controlling Eurasian watermilfoil, as part of a three-year Integrated Management Program. This permit was granted under authority of 10 V.S.A. § 1263a.

The appellants filed their appeal pursuant to 10 V.S.A. § 1269. This statute authorizes the Board to hear de novo matters determined by the Secretary of ANR. Pursuant to this statute, the Board may issue an order affirming, reversing or modifying the act or decision of the Secretary.

On June 4, 1993, the Board issued a Notice of Appeal and Prehearing Conference which was sent to persons required to receive notice and published in the Valley News on June 5, 1993, pursuant to Rule 18 of the Board's Rules of Procedure. A prehearing conference was convened by the Board's delegate on June 18, 1993, at the Midstate Regional Library in Berlin, Vermont. A Prehearing Conference Report and Order was issued by the Board's Chair on July 1, 1993.

Persons entering timely appearances in this matter and granted party status were: the appellants, represented by Paul S. Gillies, Esq., of the firm Tarrant and Marks; the Town, represented by David

A. Otterman, Esq., of the firm Otterman and Allen; the ANR, represented by Anne Whiteley, Esq.; and the Lake Morey Protective Association ("LMPA"), represented by Kenneth D. Allen. The Board granted permissive intervention, pursuant to Rule 22(B) of the Board's Rules of Procedure, to the following persons seeking reversal of the permit: Anthony H. and Melissa P. Gahagan, Noelle Walker, Peter and Barbara Wood, Peter Berger, and Tony and Theresa Thurston. These persons were represented by Mr. Gillies, Esq. The Board also granted Rule 22(B) permissive intervention to the following persons supporting the issuance of the permit: William and Marjorie Scott, Donald K. Weaver, James and Margaret Southworth, Richard A. Allen, Philip H. Zalinger, Jr., and Ann Kennard Zalinger. See Memorandum of Decision on Party Status (Aug. 25, 1993).

On August 25, 1993, the Board Chair issued a Supplemental Prehearing Order. The parties filed prefiled testimony and exhibits in accordance with this order.

On September 10, 1993, the Board issued a Memorandum of Decision on Preliminary Issues and a Notice of Public Hearing. The Board held a de novo hearing in this matter on September 28 and 29, 1993, and again on October 26, 1993. It conducted a site visit on September 28, 1993.

After receipt of evidence and closing arguments, the Board recessed the matter pending the submission of proposed findings of fact and conclusions of law, and review of the record and decision. On November 1, 1993, the Town filed a motion to strike testimony or, in the alternative, to accept additional testimony. On November 8, 1993, the appellants filed a response in opposition to this motion. On November 19, 1993, the Board voted to defer action on the permittee's request until receipt of transcripts and review of the record. [1]

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[1] **The Board declines to grant the Town's motion to strike or, in the alternative, to accept additional testimony. To rebut the testimony of the appellants' witness, Noell Gahagan Walker, the Board permitted the Town to recall its expert witness, Ann Bove, an aquatic biologist and ANR's lead staff for the Eurasian Watermilfoil Control Program who has personal knowledge of the use of suction harvesting to control milfoil at Hall's Lake and at other lakes in Vermont. Tr. at 184-201 (Oct. 26, 1993). The Board has considered and declines the Town's offer to call another ANR staff biologist, Rich Kirn, to testify on the impacts of suction harvesting on fish and wildlife. The Board believes there is ample evidence in the record on the impacts of suction harvesting on non-target species and that Mr. Kirn's testimony would be redundant.**

On November 22, 1993, the appellants and the Town each filed proposed findings of fact, conclusions of law, and orders. On November 29, the appellants and the Town also filed briefs on specific legal issues raised at hearing. On December 2, 1993, LMPA filed a response to the appellants' proposed conclusions of law. On December 3, 1993, the Town filed a response to the appellants' legal brief of November 29, and on December 6, 1993, the appellants filed a response to the Town's brief.

The Board deliberated in this matter on December 15, 1993, and January 5, February 15, and March 21, 24, and 29, and April 7, 1994. On April 7, 1994, following a review of the evidence and the parties' filings, the Board declared the record complete and adjourned the hearing.

This matter is now ready for decision. The following Findings of Fact and Conclusions of Law are based exclusively on the record developed at the hearing. To the extent any proposed findings of fact and conclusions of law are included below, they are granted; otherwise, they are denied.

II. ISSUES

This appeal requires the Board to decide whether a permit should be issued for the use of a pesticide in waters of the state for the control of nuisance aquatic vegetation, pursuant to 10 V.S.A. § 1263a(e). The Town requested permission to apply the herbicide Garlon 3A to the waters of Lake Morey for the control of Eurasian watermilfoil and this permission was granted by the ANR with the issuance of Aquatic Nuisance Control Permit #C93-01-Morey. In order for the Board to affirm the Secretary's decision to issue this permit, the permittee must demonstrate by a preponderance of the evidence and the Board must determine de novo that a permit should be granted consistent with the statutory standards of 10 V.S.A. § 1263a(e), identified by the appellant in its notice of appeal. Because the appellant does not challenge the Secretary's findings with respect to one statutory standard (10 V.S.A. § 1263a(e)(4)) concerning the existance of a long-range management plan, the Board is asked to make affirmative findings with respect to the following:

(1) Whether there is no reasonable nonchemical alternative available;

(2) Whether there is acceptable risk to the nontarget environment;

(3) Whether there is negligible risk to public health; and ...

(5) Whether there is a public benefit to be achieved from the application of the pesticide.

See 10 V.S.A. § 1263a(e)(1)-(3), (5); see also, Prehearing Conference Report and Order at 2 (July 1, 1993).

III. FINDINGS OF FACT

A. The Problem: History of Eurasian Watermilfoil Infestation

1. There are thirteen or fourteen species of watermilfoil that are native to the United States and Canada. However, Eurasian watermilfoil (Myriophillum spicatum) is an exotic species that was transported to North America probably in the late 1800s or early 1900s. In the early 1950s, Eurasian watermilfoil ("watermilfoil") began to spread throughout Canada and the midwestern United States.

2. Watermilfoil was first discovered in St. Albans Bay of Lake Champlain in 1962. As of September 1993, it had spread to thirty-seven (37) of Vermont's lakes and ponds that are over twenty acres in size. This represents thirteen (13) percent of all the lakes in Vermont with a surface area larger than twenty acres and includes the state's three largest lakes: Lake Champlain, Lake Memphremagog and Lake Bomoseen.

3. Watermilfoil is continuing to spread. It is transported from lake to lake in several ways including by boat propellers and recreational equipment.

4. Watermilfoil frequently outcompetes native plants. It can grow up to one inch per day. Watermilfoil has the potential to become extremely thick and widespread in a lake. Limited studies conducted in other areas of North America have shown that when watermilfoil growth becomes extremely dense, it can affect the aquatic ecosystem.

5. Watermilfoil has become established at nuisance levels in various waterbodies covering a wide range of trophic conditions and it does not necessarily decline in response to reduction of nutrients in an infested waterbody.

6. Watermilfoil was first discovered in Lake Morey in August of 1991 by staff of the Department of Environmental Conservation ("DEC"), ANR.

7. Lake Morey is a 538 acre body of water located in the Town of Fairlee, Vermont. It has a maximum depth of 43 feet and an average depth of approximately 27 feet.

8. Based on the 1991 survey, the watermilfoil infestation at Lake Morey was estimated to be less than five (5) acres. Three areas of dense, contiguous growth were found. Scattered individual plants and groups of individual plants were identified along less than fifty (50) percent of the shoreline.

9. A survey of the watermilfoil infestation at Lake Morey was performed in May 1992. The infestation increased between the time of the October 1991 survey and the May 1992 survey. The milfoil growth at the north end of the lake was described as scattered individual plants or small patches in the fall 1991 survey. In the May 1992 survey it was described as common in the northern end of the lake and scattered throughout much of the remaining shoreline.

10. In the summer of 1992, various control activities were implemented as part of the permittee's Integrated Management Plan ("IMP"). These control activities included bottom barriers, diver-operated suction harvesting, and hand harvesting. These activities were undertaken pursuant to permits issued by the ANR. These three control techniques were effective in managing much of the watermilfoil growth identified in the May 1992 survey. However, further inspection in 1992 revealed a significantly greater amount of watermilfoil in the lake than was identified for treatment in the IMP.

11. A watermilfoil survey was performed in May of 1993. This survey indicated further expansion of the watermilfoil infestation in both density and location. A larger portion of the northern end of the lake was classified as "very abundant" and a new area of the eastern lakeshore was classified as abundant. Only a small portion of the western shore could be found where no watermilfoil plants were seen.

12. A survey of Lake Morey was performed in September 1993. This survey indicated that the infestation had increased in size and density in spite of the control activities which took place in the summer of 1993.

13. The control activities which were undertaken in the summer of 1993 included the use of bottom barriers in three locations and hand harvesting. No attempt was made to utilize a suction harvester during the summer of 1993 due to the

problems which were experienced with this machine in the summer of 1992.

14. Despite the efforts to control watermilfoil during both the summer of 1992 and the summer of 1993, the infestation at Lake Morey continued to increase substantially. In the autumn of 1993, Lake Morey had an "advanced pioneer infestation" of watermilfoil.

15. No known aquatic management technology, chemical or non-chemical, will completely eradicate watermilfoil. Control of the infestation is the objective of the permittee.

B. Garlon 3A

16. Garlon 3A is an herbicide produced by the DowElanco Company. It consists of 44.4 percent Triclopyr (3,5,6-trichloro-2-pyridinloyxyacetic acid, combined with a tiethylmaine salt) and 55.6 percent inert ingredients. Its specific gravity is 1.135, making it heavier than water.

17. Garlon 3A has been used for many years for terrestrial application. It was originally used on rights-of-way, non-irrigation ditchbanks and grazed areas to reduce shrubs and small plants. It was initially registered as a terrestrial herbicide with the United States Environmental Protection Agency (EPA) in 1979.

18. The use of Garlon 3A in an aquatic environment is still experimental. In 1991, the EPA issued an Experimental Use Permit (EUP) for its use on up to 2,040 acres in 22 states, including Vermont. On April 7, 1993, the EUP was renewed for the purpose of allowing DowElanco to gather data on the performance of Garlon 3A under commercial conditions as an aquatic herbicide and to evaluate its effect on non-target species. Garlon 3A is currently being used in seven states for watermilfoil control under this EUP.

19. Full EPA registration of Garlon 3A, dependent on its efficacy as a pesticide for aquatic weed control, is not expected until 1996. Registration of a chemical does not mean that it is safe, but merely that in the opinion of EPA the benefits of use outweigh the risks.

20. Garlon 3A is a systemic herbicide, killing watermilfoil after contact by interfering with the metabolic processes of the plant. Garlon 3A kills plant shoots, roots and root crowns.

21. Preliminary field tests indicate that Garlon 3A is selective for control of watermilfoil and that it will control watermilfoil plants for up to two years. However, Garlon 3A is not entirely effective in eradicating watermilfoil.

22. Garlon 3A is best applied in late May or early June when watermilfoil is actively growing and other aquatic plants are only beginning to break dormancy.

23. Garlon 3A is best applied to dense, contiguous areas of watermilfoil. Control of watermilfoil may be more erratic in areas where water exchange rates are high, due to more rapid dilution and dissipation of the initial triclopyr concentration.

24. Based on studies conducted in other states, Garlon 3A has a short half-life in an aquatic environment. The degradation of Garlon 3A in an aquatic environment is induced primarily by sunlight. The active ingredient, triclopyr, has a half-life in field studies of one to four days. Other studies show photodegradation of between two hours and six days, depending on water depth, time of year and geographical location.

25. The depth at which ultraviolet radiation from sunlight lacks sufficient intensity to photodegrade Garlon 3A is unknown.

26. Photodegradation may be decreased by cool temperatures. Available data on photodegradation rates of triclopyr in large part assess chemical breakdown rates in a terrestrial environment at a temperature of 25 degrees C (80 degrees F). It is likely that the lake water temperature would be considerably lower than 25 degrees C at the time of proposed treatment in May or June. Thus, the breakdown rates suggested in the literature may be unreliable.

27. The Town of Fairlee requested authorization from the DEC to use Garlon 3A on forty-five (45) acres of Lake Morey. It proposed to apply a liquid formulation at an application rate of 1.5 ppm (15 gallons/acre) in treatment areas greater than one acre in size and at a rate of 2.0 ppm (20 gallons/acre) in treatment areas approximately one acre in size. On May 11, 1993, the DEC approved the application of Garlon 3A, at the above rates, to about nineteen and one-half (19.5) acres of Lake Morey. The treatment areas have been identified in Exhibit P-3F and represent contiguous occasional, common, abundant, and very abundant densities of watermilfoil growth.

28. The permittee proposes to apply concentrated Garlon 3A to

the lake using a specially modified spray boat equipped with a chemical pump and chemical injection system. The pumps would draw concentrated liquid pesticide to mix with lake water on the output side of the pump. The diluted pesticide would then be injected beneath the water surface through weighted hoses extending from a "T" spray boom.

29. Watermilfoil plants that come into contact with the diluted pesticide are expected to be effectively controlled in approximately 14 to 28 days. However, it is also expected that "spot" chemical treatments, in conjunction with non-chemical control methods, will be required in subsequent years to successfully control the watermilfoil population.

30. Gerald Smith of Aquatic Control Technologies, Inc. ("ACT"), the Town's consultant and proposed applicator of Garlon 3A, asserts that water movement in Lake Morey will have little to no impact on the application and effectiveness of Garlon 3A. He does not expect a large volume of water to enter the lake which would interfere with and displace the pesticide, although he stated that he did not know the relationship between application concentrations and dispersal rates. This conclusion was drawn without a knowledge of lake-specific dispersal rates.

31. No studies were offered describing the water movement patterns in those portions of the lake where Garlon 3A is proposed to be applied.

32. The amended DowElanco supplemental label for Garlon 3A provides that, with respect to the pesticide's use in controlling watermilfoil, higher application rates are recommended in areas of greater water exchange and that such areas may require repeat application.

33. Garlon 3A treatment at Lake Morey is now proposed for June 1994. The Town requests the Board to allow the DEC to determine the final treatment areas and acreage based upon a pre-treatment field survey to be conducted in May 1994.

C. <u>Nonchemical Alternatives for Control of Eurasian Watermilfoil</u>

34. There are several control techniques available which have been utilized at Lake Morey or at other sites around Vermont. These techniques include bottom barriers, suction harvesters, mechanical harvesters, hand-pulling and the introduction of weevils.

(1) Bottom Barriers

35. Bottom barriers can be effective in killing small, dense patches of watermilfoil.

36. Bottom barriers have been used at Lake Morey. Portions of the lake floor have been covered with a pond liner material that blocks out sunlight and therefore prevents plant photosynthesis.

37. Bottom barriers decimate all aquatic plants and invertebrate populations in the treated areas during the period of treatment.

38. The use of bottom barriers is expensive. According to the Town, the cost of bottom barriers for use at Lake Morey is estimated at between $40,000 and $45,000 per acre. The cost factors in determining this estimate are not detailed in the record.

39. Bottom barriers have been used at Lake Morey since 1992 in accordance with Aquatic Nuisance Control Permit #B92-01-Morey. The survey of the lake in 1993 revealed that watermilfoil growth had returned to some areas of the lake where bottom barriers had been installed in 1992 and removed in 1993. This indicates that the use of bottom barriers is not always sucessful in eradicating watermilfoil growth in the area of treatment.

40. The Town estimates that the cost of application of Garlon 3A will be $1,200 per acre. Exhibit P-1E indicates that this figure includes the cost of the chemical, labor, and equipment for application, but not the cost of surveys, monitoring, residue testing, and other tasks required for compliance with permit conditions. Using the estimated figures provided, the cost of initially treating nineteen and one-half acres would be $23,400. Treatment proposed for the subsequent two years would require additional unknown expenditures.

(2) Suction Harvesters

41. If properly operated, a suction harvester can remove watermilfoil plants, including roots from a lake bed, thereby controlling the milfoil infestation.

42. A suction harvester was utilized at Lake Morey as a method of watermilfoil control during the summer of 1992, but not

repeated in 1993. Aquatic Nuisance Control Permit #H92-01-Morey, authorizing the use of a suction harvester, contemplated that the harvester would be used in a small area of the lake where moderate densities of watermilfoil plants were found.

43. The suction harvester used at Lake Morey was a converted dredging machine which sucks plants from the lake bottom into a carrier at the surface. The plants are then disposed of ashore. The suction harvester used at Lake Morey was operated by a certified scuba diver and an attendant on the dredging machine. The diver directed the milfoil plants into the suction hose.

44. The suction harvester used at Lake Morey successfully removed watermilfoil plants. However, the design of this particular harvester resulted in the fragmentation of watermilfoil plants, with the result that small pieces of the plant were dispersed and subsequently rerooted, thereby recolonizing the lake with watermilfoil plants.

45. The suction harvester used at Lake Morey also disturbed lake bottom materials, resulting in extreme turbidity. The turbidity made it difficult for divers to locate the watermilfoil plants and to distinguish between milfoil and other aquatic plants. During the summer of 1992, there were a number of occasions when the operation of the suction harvester had to be halted due to the lack of visibility caused by excessive turbidity.

46. A small suction harvester was constructed and used at Hall's Lake in Newbury, Vermont, during the summer of 1993. This harvester incorporated certain design improvements over the harvester used in Lake Morey. This machine was used with a fragment barrier/silt curtain system to prevent milfoil fragments and silt from passing into other areas of the lake.

47. Hall's Lake is approximately eighty acres (80) in size and it had a dense area of Eurasian watermilfoil (1 1/2 acres). The suction harvester was used for approximately three weeks to treat the infested area.

48. The total cost of harvesting at Hall's Lake was $12,000. The construction of the suction harvester cost between $8,000 and $9,000, while the cost of operation, including the cost of professional divers, amounted to $3,000. These figures do not account for volunteer labor.

49. The success of the Hall's Lake treatment operation will not

be known until summer 1994.

50. A suction harvester can disturb organisms on the lake bottom and result in destruction of fish eggs and fry due to short-term turbidity and siltation. Therefore, use of a suction harvester during the months of May and June has been found to present an unacceptable risk to the spawning grounds of largemouth and smallmouth bass.

51. Suction harvesting is a slow and labor intensive method of harvesting watermilfoil plants.

52. The Town estimates the cost of suction harvesting in Lake Morey is estimated to be $9,150.00 per acre. The Town estimates that it would need to spend $22,000 per year for a minimum of three years to control the milfoil infestation. This figure includes the cost of equipment rental, labor and miscellaneous other costs.

(3) Hand-Pulling

53. Hand-pulling is an effective, selective, but labor-intensive means of controlling watermilfoil. It can be done by laypersons in areas near shore and by scuba divers in areas which are located at greater depths. It must be done repeatedly throughout the summer.

54. Hand-pulling has been utilized in Lake Morey for the purpose of attempting to control the watermilfoil infestation of scattered density.

55. While hand-pulling has reduced the size of the population of watermilfoil in some areas of the lake, handpulling has not successfully controlled the spread of watermilfoil in other areas, particularly in the northern end due to the mucky conditions of the lake bottom, plant density and large area of infestation (approximately 14.7 acres).

(4) Weevils

56. The use of insects, especially a native weevil (Euhrychiopsis lecontei), may be an effective means of controlling Eurasian watermilfoil infestations, although no conclusive data have been generated at this time to determine just how effective this method of control may be.

57. A survey in 1986 of watermilfoil in Brownington Pond,

Brownington, Vermont, found very dense beds of watermilfoil (approximately 45 acres). In 1989, another survey found a substantial decline in watermilfoil (down to approximately 2 acres). Researchers from the ANR found evidence that resident weevils played a major role in the reduction of watermilfoil in that pond.

58. Further studies by the ANR and Middlebury College found that the weevils have a highly selective appetite for watermilfoil, especially for larger and healthier plants.

59. The weevil eats watermilfoil and pupates inside the stem of the plant. Larvae burrow through the stem and hollow out the vascular tissue of the stem. The stem then fills with water, the plant sinks, and then dies.

60. The normal life cycle of a weevil is approximately one month from egg to adult weevil. In laboratory studies at Middlebury College, a single female weevil laid 462 eggs during a five month period. Of these eggs, there was an 87 percent hatch rate.

61. In 1992, at Norton Brook Pond in Bristol, Vermont, the ANR and Middlebury College were very successful at reducing watermilfoil through the use of weevils under controlled conditions. There was a 50-percent reduction of watermilfoil through the use of plastic columns containing weevils during a period of five weeks at this site.

62. Five thousand weevils were introduced into Norton Brook Pond in 1993, without the controls of the 1992 experiment. Results of this experiment are expected as early as July 1994. Additional data will be collected in the summer of 1995.

63. Native plants do not appear to suffer negative ecological effects from the weevils.

64. Preliminary results on the use of weevils to control watermilfoil are promising. The scientific community is sufficiently excited about a biological control for this aquatic weed that the EPA has funded a Lake Bomoseen Demonstration Program. The results of the first in-lake weevil introductions are expected to be reported at the end of the summer of 1994.

65. During the summer of 1993, the ANR started a weevil rearing laboratory in Waterbury, Vermont. At the present time, the ANR does not have the means to rear sufficiently high numbers of weevils to use in lakes other than those

identified in the funded projects.

66. Weevils occur naturally in Lake Morey. They were discovered in the north end of the lake, where the densest beds of watermilfoil are located, when the plant survey was conducted in September 1993. It is not known how long the weevils have been present in the lake nor whether they are causing any decline in the watermilfoil population. The ANR plans to look for more weevils in Lake Morey in 1994.

67. Weevils also have been found to exist naturally in Sunrise Lake and Lake Iroquois. They have been present in these lakes for a number of years. There are no lakewide control methods taking place for the purpose of controlling the spread of watermilfoil. Despite the presence of weevils in these two lakes, watermilfoil continues to spread at a rapid rate. Therefore, it is not known whether watermilfoil must reach some peak biomass state before weevils will have any effect upon its growth.

(5) Other

68. If no chemical or nonchemical treatment of watermilfoil is performed at Lake Morey, this plant may out-compete native species and eventually dominate the littoral zone of the lake.

69. The implementation of one or more nonchemical control methods, alone or in combination, can control the infestation of watermilfoil in areas of contiguous occasional, common, abundant, and very abundant densities.

D. Acceptable risk to nontarget environment

(1) Plants

70. The DEC has concluded that the proposed treatment of 2 mg/l (active ingredient) of Garlon 3A will have an impact on the non-target environment of Lake Morey, but that this impact will be acceptable.

71. There are thirty-one (31) aquatic plant species that have been identified in Lake Morey.

72. Preliminary field tests of Garlon 3A completed in Alabama, California, Florida, Georgia, Minnesota and Washington indicate that Garlon 3A is very selective for watermilfoil.

73. Twenty-three (23) of the thirty (30) non-target aquatic plant species in Lake Morey are not likely to be affected by Garlon 3A.

74. Garlon 3A will affect dicots. There are three dicot plant species in Lake Morey which may be affected by exposure to Garlon 3A. These species are: spatterdock (Nuphar ssp.), white waterlily (Nymphaea ssp.) and pickerel-weed (pontederia cordata).

75. Preliminary field studies performed in other states indicate that the spatterdock and white waterlily treated with Garlon 3A will recover in successive growing seasons.

76. Triclopyr, the active ingredient in Garlon 3A, is toxic to certain broadleaf plants and even small amounts may injure some plants.

77. There is little information to indicate whether three species -- Quillwort (Isoetes sp.), Water Marigold (Megalodonta beckii) and Common Bladderwort (Utircularia vulgaris) -- will be affected by the treatment of Lake Morey with Garlon 3A.

78. During the summer of 1993, the DEC conducted Garlon 3A toxicity tests. Water marigold plants were exposed to Garlon 3A in an attempt to determine the impacts of the herbicide on the plants. Exposed plants exhibited minor symptoms in the growing tips. The DEC was unable to draw any conclusions as to the susceptibility of water marigold to the herbicide in the short time period the toxicity tests were performed.

79. Vasey's pondweed (Potamogeton vaseyi) was discovered in three locations in Lake Morey in 1992 and in two additional sites in 1993. It is known to exist in only three other lakes in Vermont, although it is not presently protected under the Vermont Endangered Species Act, 10 V.S.A. ch. 123.

80. The Non-game and Natural Heritage Program of the ANR has asked that Garlon 3A not be used in the area of the largest population of Vasey's Pondweed. It has asked that state officials make observations of the impact on Vasey's Pondweed in other areas where Garlon 3A is to be applied.

(2) <u>Fish</u>

81. A recent unpublished study of ten species of fish exposed to

an actual lake treatment found no measurable concentrations of Garlon 3A in any of the fish sampled. Of these species, five are known to occur in Lake Morey.

82. The DEC has concluded that the proposed treatment of 2 mg/l (active ingredient) of Garlon 3A will have no measurable effect on fish populations in Lake Morey. This conclusion is based upon several studies, only a few of which were identified and described by ANR aquatic biologist Richard Langdon. One study examined toxicity of Garlon 3A in three species of fish, one of which (bluegill) is present in Lake Morey. Another study tested maximum concentrations for a species not present in Lake Morey. Two studies tested bioaccumulation, one done by Dow Chemical, the other unpublished. Neither study found significant bioaccumulation in fish.

83. During the summer of 1993, the DEC conducted its own toxicity tests on fish (pumpkinseed and largemouth bass) at two concentrations of Garlon 3A. The concentrations tested were 2 mg/l (the proposed treatment level for Lake Morey) and 10 mg/l (five times the proposed treatment for Lake Morey) active ingredient. None of these tests was conclusive, as a number of the fish tested died due to their inability to adapt to artificial food.

84. The application of Garlon 3A to Lake Morey is expected to produce a slight reduction in dissolved oxygen levels following treatment caused by decaying plant material. The reduction in dissolved oxygen is not expected to be significant because plants other than watermilfoil will not be growing when Garlon 3A is proposed to be applied in late May or early June. The area proposed for treatment comprises about ten percent of the total lake area. The treatment area is divided into several sites. If any localized depressions in dissolved oxygen develop, most fish species would be capable of moving to an adjacent untreated area to avoid the depressions in dissolved oxygen.

85. The time of the proposed application of Garlon 3A (late May or early June) is the spawning period for large mouth bass, pumpkinseed and bluegill, species common to Lake Morey. No studies have been made of the effects of Garlon 3A on the reproductive behavior of these species.

(3) Macroinvertebrates

86. The proposed treatment of 2 mg/l (active ingredient) of Garlon

3A will have no measurable effect on the macroinverbrate population in Lake Morey.

87. The DEC exposed four species of macroinvertebrates to two concentrations of Garlon 3A as described in the fish tests in Finding 83. Three of the four species of macroinvertebrates are native to Lake Morey. They are the clam (elliptio complanata), snail (helisoma anceps), and mayfly (stenonema femoratum). The fourth species is the weevil, recently discovered in the lake and a potential control animal. No mortality occurred during these tests which could be related to Garlon 3A. No clams died during the tests, although some mortality occurred in the snail, mayfly and weevil. These deaths occurred at both exposure concentrations and are attributable to handling problems.

88. Available literature described toxicity tests on two other species of macroinvertebrates, crayfish (procambarus clarki) and water flea (Daphnia magna), indicating that the lethal concentration of a chemical that will kill fifty percent of the animals exposed ("LC50 values") for macroinvertebrates is as much as 50 times greater than the levels of Garlon 3A concentration proposed for use in Lake Morey. The DEC ran 24-hour acute toxicity tests using cerioadaphnia dubia. The results indicated that the LC50 for this species is also about 50 times greater than the levels of concentration proposed for Lake Morey. Based on all of the above information, the macroinvertebrate communities of Lake Morey are not expected to suffer significant mortality from the proposed treatment concentration of 2 mg/l.

(4) Other

89. There have been no reported studies on the effects of Garlon 3A on algae or bacteria.

90. There have been no reported studies on the effects of Garlon 3A on amphibians and reptiles. The ANR is unaware of which reptile and amphibian species are found in Lake Morey. However, the ANR does not forsee that the application of Garlon 3A would significantly affect the mortality rate of reptile or amphibian species resident at the lake.

91. The ANR proposes to monitor the treatment areas for the mortality of fish, amphibians and reptiles. Fish cages containing native species would be anchored within the treatment areas to determine mortality resulting from treatment with Garlon 3A.

92. The long-term physiological effects of Garlon 3A on plant and animal species have not been studied, nor have there been any community-level assessments to determine the effects of Garlon 3A on fish and invertebrates.

(5) Wetlands

93. At the north end of Lake Morey there is a wetland comprising of between thirty and forty acres, containing scrub/shrub, emergent and forest, and woody and herbaceous plant species. This wetland is contiguous to several National Wetland Inventory mapped wetlands (Class Two wetlands), and is an important fisheries resource and fish spawning area. It is also important for aquatic birds, waterfowl, and furbearers.

94. The wetland is hydrologically connected with the northern end of Lake Morey. Water flows from the wetland through streams into the lake.

95. The Town proposes to block the wetland stream outlets with hay bales during the treatment period in order to ensure that there is no backflow of Garlon 3A into the wetland.

E. Negligible risk to public health

96. Thirty-five households use the water of Lake Morey for some domestic purpose. Some draw water from the lake or the outlet stream for use as drinking water, for bathing, or for flushing toilets.

97. It is possible that Garlon 3A will not degrade but will enter the domestic water supplies of lakeshore residents or persons residing downstream from the lake.

98. During the application and post-application period, persons might come in contact with Garlon 3A through swimming and other recreational activities.

99. On May 20, 1993, the Vermont Department of Agriculture issued a state EUP, 93-EUP-1, exclusively for application of Garlon 3A in Lake Morey on not more than sixty (60) acres total. This state EUP referred to DowElanco supplemental label 62719-EUP-1.

100. At the time of the issuance of the state EUP, the DowElanco supplemental label, 62719-EUP-1, included the following

precaution: "Do not treat within 5 miles of a potable water intake."

101. In June 1993, after the issuance of the state EUP, EPA approved an amended DowElanco supplemental label. This amended label substituted the following precaution for that in 62719-EUP-1 respecting the application of Garlon 3A for aquatic weed control: "Potable Water: Do not use water in contact with treated area, or within 1 mile down stream from the treated area, for domestic purposes for 14 days after application or until an approved assay shows less than 0.5 ppm triclopyr."

102. In order to determine the degree of risk to human health posed by the application of Garlon 3A to Lake Morey, it is essential to determine how risk to human health is evaluated by toxicologists charged with determining the safety of chemicals used as pesticides, especially when some of the ingredients are proprietary information not revealed to the general public.

103. The National Research Council has defined the standard risk assessment process to be used by federal government agencies in evaluating the risk posed by a given chemical on the public health. This process involves four steps or phases of analysis: first, hazard identification; second, dose response assessment; third, exposure assessment; and fourth, risk characterization.

104. Hazard identification involves determining whether exposure to the agent can cause an increase in the incidence of some health condition. Before a pesticide receives EPA approval, EPA toxicologists must evaluate various studies performed by the manufacturer and others to determine whether tests used are valid. Studies typically submitted to EPA include carcinogenicity or teratology studies, performed at very high levels of exposure to animals. These studies range from short-term (acute) exposures to lifetime (chronic) exposures in test animals. EPA publishes a brief summary of each study reviewed by its staff ("EPA Tox Oneliners").

105. The dose response assessment characterizes the relationship between the dose of the agent administered and the incidence of the adverse health effects as a function of the human exposure to the agent. This involves the assessment of how many milligrams of agent per kilogram of body weight causes effects. This is a determination of potency.

106. The third step is the exposure assessment. This process

measures or estimates the intensity, the frequency, and the duration of human exposure to an agent currently in the environment or makes an estimate of hypothetical exposures that might arise from the release of new chemicals into the environment.

107. The last phase is risk characterization. It is the process of estimating the incidence of health effects on various conditions of human exposure. This test examines all of the known exposures, comparing it to the potency of the material.

108. Through the use of the four-step risk assessment process the EPA determines the safe level of exposure in a human being. A calculation is actually done which determines the acceptable daily intake of a chemical. This is known as a reference dose.

109. Reference dose is based upon a battery of animal studies. The species of animal that is used is the most sensitive species. Human sensitivity is not always directly comparative.

110. Through the use of these studies a No Observed Effect Level ("NOEL") is determined. The NOEL is determined by giving various doses of Garlon 3A to the most sensitive test species and identifying the lowest dose which produces no adverse health affects (the so-called NOEL).

111. The dog was deemed to be the most sensitive animal in tests using triclopyr, the active ingredient of Garlon 3A. Dow Chemical's six-month chronic dog study determined the NOEL to be 2.5 milligrams per kilogram (mg/kg) of dog's body weight.

112. A factor of 100 was applied to the NOEL from the dog study. In other words, the 2.5 mg/kg of dog's body weight was lowered to 0.025 mg/kg human body weight. As a result of this calculation, the safe dose for humans was determined to be 0.025 mg/kg, the amount of triclopyr that a person could ingest over a lifetime without adverse effects.

113. The fact that some individuals may be extra sensitive to chemicals has been factored into the calculations through safety factors. These safety factors increase the safety margin by more than 10,000 times below the NOEL in the most sensitive animal species tested. Studies performed on laboratory animals suggest that Garlon 3A does not bioaccumulate and is rapidly excreted. A dermal study in humans suggests that it is poorly absorbed by the skin.

114. According to Dr. Theodore Farber, an EPA evaluation of the available literature is that a safe level of triclopyr is 0.5 milligrams per litre in drinking water.

115. The treatment of Lake Morey with Garlon 3A and the recommended restriction that the lake water not be used by the public for recreational, agricultural and domestic use until the level of triclopyr reaches 0.0005 parts per million (ppm) or less indicates a safety level 100 times more conservative (more protective) than the safe level of exposure identified by Dr. Farber.

116. The fact that the EPA issued an EUP allowing the use of Garlon 3A as an aquatic herbicide does not mean that this chemical is either safe or unsafe for humans. The purpose of the EUP is to determine the effect of the chemical on aquatic weeds, including watermilfoil, and on the aquatic environment.

117. The State of California Department of Food and Agriculture ("CAL EPA") conducts its own pesticide review process which is more stringent than the federal EPA program. A summarization of the CAL EPA evaluation of the available studies reveals that most indicated no oncogenic, mutagenic tetarogenic or carcinogenic effects. According to CAL EPA, there was one study in 1973 in which triclopyr was shown to have a weakly positive mutagenic effect (a rat study), but this was discounted by subsequent studies. A 1987 combined rat study of chronic toxicity and oncogenicitiy was found acceptable by CAL EPA. This study showed possible adverse effects from triclopyr, such as increased kidney weight in males at two years. However, all other available studies indicated no oncogenic, mutagenic, tetarogenic or carcinogenic effects.

118. The majority of studies outlined in the EPA Tox Oneliners and the California EPA review assessed impacts on specific physiological functions, and not on the total organism. Moreover, in formulating the "safe levels" of triclopyr, extrapolations were made cross genus (dog to human) without substantiation of the accuracy of these extrapolations.

119. Any ingredient in a pesticide formulation, other than the active ingredient, is described as inert whether or not that ingredient may be toxic to non-target species.

120. There are six inert ingredients in Garlon 3A which comprise approximately fifty (50) percent of the Garlon 3A formulation. Forty (40) percent of the formulation is water; the remaining

ten (10) percent is composed of four unknown surfactants and ethanol. The four surfactants are classified as proprietary information ("trade secrets").

121. Dr. William Bress, the Vermont Department of Health's toxicologist, performed a literature survey on the proprietary inerts. Three of these were not found in the EPA list of chemicals of toxicological concern. However, Dr. Bress concluded that these inerts did not pose a risk to human health in the setting of aquatic application in Lake Morey.

122. If inerts are included in the EPA's list of toxicological concern, they must be listed on the label of the product.

123. There have been no tests to evaluate the synergistic effect between triclopyr and other chemicals. EPA does and will conduct a test if toxicologists formulate a hypothesis or find indicators warranting such investigation. The fact that Garlon 3A (the formulation) is less toxic to test animals than the technical-grade triclopyr supports the conclusion that there are no synergistic effects between triclopyr and the inerts contained in Garlon 3A. Furthermore, according to Dr. Bress, the breakdown products of Garlon 3A when combined with chlorine do not create any chance of a chemical reaction.

124. The Vermont Department of Health, in reviewing the Town's application for approval of the use of Garlon 3A in Lake Morey, recommended the imposition of certain restrictions on the use of the lake during and following chemical treatment to meet the standard of negligible risk.

125. If post-application concentrations of Garlon 3A at the level of 0.5 ppm were found in the water supply of a Vermont municipality, the Department of Health would warn the public not to drink the water by a door-to-door notice program. It would further warn the public about the possibility of liver and kidney toxicity. Maximum contaminant levels ("MCLs") for triclopyr have not been established under the Safe Drinking Water Act.

B. <u>Public benefit to be achieved from the application of Garlon 3A</u>

126. Because of the density of the infestation of watermilfoil at Lake Morey in relation to other native species, the watermilfoil has a detrimental effect on some recreational uses of some portions of the lake.

127. It is difficult to fish in areas of dense watermilfoil

infestation. Hooks and lures may become tangled and caught in the plants.

128. Boating and waterskiing are impeded by dense watermilfoil beds. Boat propellors may become entangled in the plants and are impeded.

129. It is undesirable and potentially dangerous to swim through areas of dense watermilfoil infestation.

130. Impediments to the recreational use of Lake Morey indirectly but adversely affect the value of lakeshore real estate and the commercial operations of lakeside resort facilities and camps.

131. The spread of watermilfoil threatens to crowd out native species of plants and therefore may adversely affect wildlife habitat and the natural resource value of the lake.

132. The control of the Eurasian watermilfoil infestation at Lake Morey is therefore a public benefit.

133. Although the use of Garlon 3A is a potentially speedy and effective means of controlling the infestation of watermilfoil at Lake Morey, there are reasonable nonchemical alternatives for achieving control.

134. Although the use of Garlon 3A is a potentially speedy and effective means of controlling the infestation of watermilfoil in Lake Morey, there is more than a negligible risk to public health from exposure to the chemical through drinking water and several water-based recreational activities.

IV. CONCLUSIONS OF LAW

A. Introduction

The Town of Fairlee applied for and received from the ANR Aquatic Nuisance Control Permit #C93-01-Morey authorizing the application of Garlon 3A to selected sites on approximately 19.5 acres of Lake Morey, in Fairlee, Vermont. On the eve of treatment, before the appeal period had run, three residents of Fairlee appealed the ANR's permit decision to the Water Resources Board.

The Board, in considering this matter de novo, must stand in the shoes of the Secretary and make new affirmative findings with respect to the standards set forth in 10 V.S.A. § 1263a(e). It is not the Board's responsibility to determine what are the best means

for controlling the infestation of watermilfoil, but to evaluate the present proposal to apply Garlon 3A to determine whether there is sufficient evidence to conclude that the permit decision made by the ANR should be affirmed, reversed or modified, pursuant to 10 V.S.A. § 1269.

In approaching its task, the Board acknowledges the serious and persistent problem created by the watermilfoil infestation at Lake Morey and at other lakes and ponds in Vermont. The Board recognizes the detrimental impacts that this non-native plant has on recreational use of the lake and important natural habitat and wildlife resources. Clearly, watermilfoil fits the term "nuisance aquatic vegetation" as it is applied in 10 V.S.A. § 1263a(a).

Nevertheless, the statutory scheme of 10 V.S.A. § 1263a dictates that the Board scrutinize applications for the use of pesticides in Vermont waters more stringently than other treatment measures. Biological, mechanical and structural controls, and chemicals other than pesticides, require review for conformance with three standards: (1) acceptable risk to the nontarget environment; (2) negligible risk to public health; and (3) either benefit to or no undue adverse effect upon the public good. 10 V.S.A. § 1263a(g). In contrast, applications for the use of pesticides such as Garlon 3A for control of nuisance aquatic vegetation require conformity with a total of five standards. 10 V.S.A. § 1263a(e). While these standards include (1) and (2) above, the applicant must also prove that "there is no reasonable nonchemical alternative available" and that "there is a public benefit to be achieved from the application of [the] pesticide." [2]

Lake Morey, located in Fairlee, Vermont, is waters of the State of Vermont. See 10 V.S.A. § 1251(13); see also, Hazen v. Perkins, 92 Vt. 414 (1918). On July 6, 1993, the appellants asked the Board to consider whether the ANR's permit determination was in accord with the public trust doctrine. On September 10, 1993, the Board issued a Memorandum of Decision on Preliminary Issues in which it determined by a two-to-two vote that it would not address the public trust issue, because it lacked authority to do so. The Board may in subsequent cases revisit the question of its authority to address public trust issues.

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[2] The applicant must also demonstrate that "a long-range management plan has been developed which incorporates a schedule of pesticide minimization." This standard is not the subject of the appellants' notice of appeal and is therefore not directly before the Board for its consideration. However, see p. 32 for Board comments on pesticide minimization.

Garlon 3A is a pesticide within the meaning of 10 V.S.A. § 1263a.[3] Therefore, an applicant for the use of Garlon 3A in Lake Morey to control Eurasian watermilfoil must demonstrate and this Board must affirmatively find that the proposed pesticide application meets the applicable standards of 10 V.S.A. § 1263a(e), beginning with the standard that there are no reasonable nonchemical alternatives available.

B. Whether there is no reasonable nonchemical alternative available

The Board finds that there are reasonable nonchemical alternatives to the use of Garlon 3A available for the treatment of Eurasian watermilfoil in Lake Morey.

The Legislature has expressed its intention that non-pesticide control measures are preferable to pesticides for use in controlling nuisance aquatic vegetation. Some of the control measures historically used at Lake Morey have been only partially successful in removing watermilfoil from certain sections of the lake, and for limited periods of time. The applicant acknowledges that no measure, including the use of Garlon 3A, will completely eradicate milfoil or will significantly reduce an infestation without re-repeated application. Therefore, the goal of any program at Lake Morey can only be long-term control of the infestation.

An effective control measure is one which removes or destroys the Eurasian watermilfoil plant and its roots. Ideally, this control should be selective in its application, thereby leaving native plant species in place. It should result in as little disturbance to aquatic animal species and their habitat as possible. Some controls, such as bottom barriers, are more appropriately used in small areas of dense watermilfoil infestation; others, like hand-pulling, work best in areas of scattered density. The effectiveness of lake-wide infestation control is in large part dependent on how well each means of control is matched to the particular area of treatment. Moreover, the timing of implementation of a particular control may be critical, both in checking the growth and spread of watermilfoil plants and in minimizing the adverse effects on non-target flora

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[3] The term "pesticide" is defined in 10 V.S.A. § 1263a(b)(2) as "any substance, produced, distributed or used for preventing, destroying, or repelling nuisance aquatic vegetation" including but not limited to "unicellular organisms but does not include biological controls."

and fauna. For example, suction harvesting is not an appropriate control during the months of May and June when one can expect destruction of fish eggs and fry. In summary, a thoughtful watermilfoil control program takes into account the natural seasonal growth and reproductive cycles of plants and animals resident within a given body of water, and acknowledges the complex interrelationship between fluctuations in plant populations, including those of watermilfoil, and population rates of other life forms.

Since the discovery of watermilfoil at Lake Morey in 1991, the following control measures have been employed, alone and in combination: hand-pulling, bottom barriers, and mechanical and suction harvesting. Additional non-pesticide control measures have been employed, in some instances on an experimental basis, at other Vermont lakes. Each of these measures has its advantages and disadvantages.

According to the evidence, hand-pulling is a highly labor-intensive activity that requires the organization and participation of many volunteers to pull watermilfoil plants and roots throughout the summer season. Because these volunteers are able to pull roots only in the littoral area close to shore, divers are needed to pull the watermilfoil in areas where it grows at greater depths. Trained pullers are able to remove watermilfoil without disturbing native plants, an advantage over bottom barriers and certain other measures. Handpulling has proven to be an effective control, even reducing the size of watermilfoil populations in some areas of Lake Morey. However, this means of control has been less successful in the northern end of Lake Morey, where the infestation is particularly large and dense. In the Board's opinion, hand-pulling is a reasonable, available alternative for the control of water-milfoil in areas of scattered, low-density infestations when combined with other non-pesticide control measures.

Bottom barriers, while they provide short-term eradication of watermilfoil by impeding photosynthesis, also have the negative effect of killing all plants, including benign native species, as well as invertebrate populations in the treated areas during the period of treatment. Bottom barriers are also expensive to use and maintain in a lake as large as Lake Morey. Finally, the Town has argued that areas left exposed by treatment with bottom barriers can quickly be recolonized by watermilfoil, to the exclusion of less aggressive native plant species. The Town has provided little evidence to substantiate this claim, but if the Board accepts this premise as true, then rapid recolonization by milfoil is an actual or potential negative consequence of the application of other control measures, including the use of Garlon 3A, which reputedly decimate dense milfoil beds leaving areas of exposed lake bottom.

In sum, while bottom barriers are an available alternative for the control of watermilfoil in Lake Morey, the Board finds that they have distinct disadvantages which make them a reasonable alternative only for small, dense infestations of the lake.

Mechanical and suction harvesters can be an effective means of control of Eurasian watermilfoil in Vermont lakes and ponds. As used at Lake Morey, these devices have not been as effective a means of control as in other Vermont lakes. The particular devices used at Lake Morey removed watermilfoil plants and roots, but also resulted in the fragmentation of plants. The use of a suction harvester with a fragment barrier/silt curtain system appears to prevent watermilfoil fragments and silt from passing from the area of treatment into other portions of the lake. This technology has been developed at Hall's Lake and used in a small area of dense watermilfoil infestation during the summer months. While results of the Hall's Lake trials will not be available until this summer, preliminary indications suggest that it is an effective control measure.

The Town argues that the use of suction harvesters is expensive, slow and labor intensive, and potentially dangerous to the diver operators. The Board notes that according to the Town's figures, the use of suction harvesters is considerably less expensive per acre than the cost of bottom barriers. Moreover, the cost advantage of applying Garlon 3A for primary and follow-up treatment as opposed to two or three suction harvesters has not been demonstrated. Therefore, although suction harvesters may be slow and labor intensive in operation, so are all non-pesticide control measures identified by the Town. While the Board recognizes that professional diving presents risks to the diver, regardless of the body of water and activity involved, the standard the Board must keep in mind is whether there is a negligible risk to public health resulting from the application of the control measure. Even though expense, speed, and labor requirements are some factors to be considered in evaluating reasonableness and availability of a given alternative, these criteria alone do not eliminate consideration of a technology where the Legislature has indicated a preference for non-pesticide controls.

The Board finds that a properly operated suction harvester, especially one utilizing a fragment barrier/ silt curtain, is a reasonable, available alternative to pesticide use for limited areas of Lake Morey where watermilfoil beds are particularly dense. Operation of one or more such devices during the summer and fall months, after the period of fish spawning, can be an effective complement to other non-pesticide control measures employed at the lake.

Preliminary indications, based on the population of weevils at Brownington Pond and further research performed by Middlebury College, suggest that these insects are selective in their control of Eurasian watermilfoil and that they effectively destroy or retard the growth of plants. Moreover, weevils appear to have no negative ecological effect with respect to native aquatic plant and animal species nor do those pose a risk to human health.

The Town argues that given the lack of final test results, the use of weevils as a control is highly speculative. However, the same argument can be made with respect to the application of Garlon 3A, particularly as proposed by the Town.

The Board notes that three areas were slated for Garlon 3A treatment. See Finding 27 and Exhibit P-3E and F. These were: (1) 14.7 acres on the north end of the lake classified as "very abundant" (75-100%), abundant (50-75%) with small portions to the west which are occasional (5-25%) and uncommon (1%); (2) the east shore consisting of 2.34 acres, classified as abundant (50-75%), and (3) the area referred to as "Rosedale, Castlebar" consisting of 2.41 acres, classified as occasional (5-25%). The Board understands why the 14.7 acres at the north end of the lake would be proposed for chemical treatment due to the milfoil population density and infestation size. But it is unclear to the Board why the "Rosedale, Castlebar" and east shore portions could not be treated non-chemically. One might assume that the Town intends to "experiment" in terms of efficacy at various infestation densities with the use of Garlon 3 A. Such experimental use is not provided for in the statute. Thus, the Board must conclude that non-chemical means can and should take precedence over the use of Garlon 3A in these areas.

While the Board is unable to find that the use of weevils is a reasonable, available alternative to the use of Garlon 3A at this time, it is entirely possible that within the next year or two, results from other lake studies and information gleaned concerning the native population of weevils at Lake Morey may indicate that this biological control is actually a preferred means of containing and even reducing the infestation of milfoil at Lake Morey. Thus, the Board concludes that waiting for the results of the weevil studies is a reasonable non-chemical alternative to the application of Garlon 3A.

Although these control measures may be expensive, given that the Town's evidence indicates that Garlon 3A may be effective for as little as two years and that its efficacy is diminished where milfoil beds are less dense and water exchange rates are higher, repeated application of Garlon 3A will of necessity be expensive

too. For the foregoing reasons, the Board concludes that hand-pulling, the use of bottom barriers, and targeted harvesting with one or more improved suction harvesting devices, combined with waiting for the results of weevil studies, are reasonable, nonchemical alternatives to the use of Garlon 3A available for the treatment of watermilfoil at Lake Morey.

C. Whether there is acceptable risk to the nontarget environment in the use of Garlon 3A in Lake Morey as proposed by the permittee

The Board affirmatively finds that the application of Garlon 3A to Lake Morey, as proposed by the Town, poses an acceptable risk to the nontarget environment.

ANR staff biologists, after a comprehensive review of the available data, concluded that it was highly unlikely that non-target organisms, except as specifically noted, would be damaged or destroyed by the application of Garlon 3A in the quantities and locations proposed for treatment. The evidence indicates that Garlon 3A may adversely affect three dicot plant species found in Lake Morey, and there is little information concerning its effects on several other species. Nevertheless, the Board concludes that the proposed application of 2 mg/l (active ingredient) of Garlon 3A to limited areas of Lake Morey, and with the restrictions suggested by the Non-game and Natural Heritage Program, would result in no measurable effect, overall, on the population of native plant species in Lake Morey.

Additionally, the Board concludes that the proposed use of Garlon 3A presents an acceptable risk to native populations of fish, macroinvertebrates and other animals. The proposed dosage and timing of application, and the limited areas of treatment, make it highly unlikely that exposures to fish, macroinvertebrate, and other animal populations will be adversely affected.

Finally, the appellant argues that the application of Garlon 3A to Lake Morey would adversely impact the wetland at the north end of the lake. This wetland is contiguous to a Class Two wetland and is therefore presumed to be a protected significant wetland under the Vermont Wetland Rules. Section 4.2 of the Rules. However, in considering the evidence concerning the flow patterns between the wetland and the lake and the precautions proposed by the permittee, the Board concludes that the proposed application of Garlon 3A poses an acceptable risk to the nontarget environment,

including the wetland. [4]

Although the permittee has met its burden of proof with respect to 10 V.S.A. § 1263a(e)(2), the Board has doubts concerning the impacts of Garlon 3A on the non-target environment. If the Board were to have approved the ANR's decision to grant an aquatic nuisance control permit for the application of Garlon 3A at Lake Morey, it would have recommended that the permittee and DEC engage in long-term, community-level assessments to evaluate the pesticide's effects. The Board notes its reservation merely for the purpose of giving the permittee and DEC guidance in developing any subsequent aquatic nuisance control permit application for use of a pesticide.

D. Whether there is negligible risk to public health in the use of Garlon 3A in Lake Morey as proposed by the permittee.

The Board is not able to affirmatively find that there is negligible risk to public health in the use of Garlon 3A in Lake Morey as proposed by the permittee.

The Board acknowledges that most available data on triclopyr show no oncogenic, tetarogenic, carcinogenic and mutagenic properties, and that the concentrations proposed for milfoil treatment in Lake Morey are low in comparison with the NOELS found in the laboratory. Yet in reaching a determination of no negligible risk to public health, the fact that people come in contact with the waters of Lake Morey through recreational and domestic use increases the importance of unknowns . There are no data available on the long-term human health effects of triclopyr, MCLs for triclopyr have not been established, there is uncertainty on the meaning of "EPA established safe levels of .5 mg/l" absent MCLs, there is additional uncertainty in light of the changes made

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[4] Contrary to the appellants' assertion, it is an allowed use to apply in a significant wetland or its buffer zone a pesticide described in a written plan approved by the Secretary for control of non-native species of nuisance plants including watermilfoil. Section 6.2(q) of the Vermont Wetland Rules. Therefore, if Garlon 3A were approved for use in control-ling watermilfoil at Lake Morey, a Conditional Use Determination would not be required prior to treatment. However, since the Town has failed to convince the Board that it has met its burden of proof with respect to all five of the standards of 10 V.S.A. § 1263a(e), any effort to apply Garlon 3A without an approved aquatic nuisance control permit could subject the applicator to an enforcement action under 10 V.S.A. § 1272.

in the supplemental labels, there is no substantiation of the validity of safe levels determined through extrapolation cross-genus, and confusion exists concerning the semantics of "trivial exposure" in the Town's expert testimony. All of these factors in combination make it impossible for the Board to reach a determination of "no negligible risk to public health."

Thirty-five households use the water of Lake Morey for domestic purposes, including drinking water, and more people use the lake for recreational purposes. Given unanswered questions concerning effects of Garlon 3A, the method of application, and the characteristics of the water body itself, the Board is left with considerable doubt about the level of risk posed to public health by the pesticide's use. This doubt is reinforced by the applicator's lack of certainty regarding the rates of dispersal and breakdown of the pesticide and the Department of Health's long and intrusive list of preventative measures proposed in the absence of data about Garlon 3A. The Board is simply unwilling to abdicate its responsibility to make an independent, affirmative finding under 10 V.S.A. § 1263a(e)(3) by adopting wholesale the assurances of the Town's experts.

The permittee argues that because the application of Garlon 3A will be significantly diluted by the lake water that the likelihood of exposure to humans is almost non-existent. The Board does not accept this proposition. First, one cannot argue that a diluted substance is harmless when one has limited knowledge concerning what that substance is or what its characteristics are. Second, the permittee's applicator and chief consult, Gerald Smith of ACT, testified that he did not know at what rate or in what direction the applied Garlon 3A would dissipate. In the area of proposed pesticide application, there are few data on water movement patterns in Lake Morey and what data exist about photo-degradation rates suggest that there is considerable variation in the half-life of the pesticide, depending on water depth, time of year, geographical location, and perhaps other factors.

There are significant gaps with respect to the reported data on this pesticide's impact on human health. Garlon 3A has been registered for terrestrial use since 1979, yet there have been no long-term studies in either animals or humans to evaluate its effect on domestic water use, for example. Most of the representations concerning triclopyr's potential impact on human health are based on extrapolations from one chronic dog study and on a few mutagenetic and oncogenic studies of rats and mice. Such extrapolations may be acceptable to professional toxicologists in

assessing the risk posed by a pesticide to human health. [5]

However, the Board has an independent duty to make affirmative 10 V.S.A. § 1263a(e). Based on the evidence before it, the Board findings concerning a pesticide's compliance with the standards of is unprepared to find that triclopyr presents a negligible risk to public health.

The Board has considered the appellants' arguments concerning the inert ingredients in Garlon 3A. Although the Board is not able to draw its own independent conclusions concerning the identity and characteristics of the proprietary ingredients, the decision in this case does not require the Board to resolve the thorny question concerning whether the inerts themselves present a negligible risk to the public health.

E. Whether there is a public benefit to be achieved from the application of Garlon 3A in Lake Morey as proposed by the permittee.

The Board is not able to affirmatively find that there is a public benefit to be achieved from the application of Garlon 3A in Lake Morey, as proposed by the permittee.

The Board agrees with the Town that the spread of water-milfoil at Lake Morey impedes recreational use of the lake and may negatively impact native populations of aquatic plants and animals. The Board also acknowledges that these negative impacts may adversely affect lakeshore real estate values and commercial operations of lakeside resort facilities and camps.

Nevertheless, the Board cannot find that the proposed application of Garlon 3A meets the public benefit test established by 10 V.S.A. § 1263a(e)(5). This is because the determination of public benefit requires a weighing of many factors, not just those identified by the permittee. The Board must consider all of the

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[5] The Vermont Department of Health apparently does not have a consistent set of notice requirements with respect to pesticides. For example, Dr. Bress testified at the hearing that if post-application concentrations of 0.5 ppm of Garlon 3A were found in the water supply of a Vermont municipality, the Department of Health would warn the public not to drink the water by a door-to-door notice program and it would further warn the public about the possibility of liver and kidney toxicity. Compare this with the notice requirements in Aquatic Nuisance Control Permit #C-93-01-Morey (May 11, 1993) at #5, pp 10-11.

factors previously discussed in addition to the merits of the particular pesticide application.

The permittee's principal objective in selecting a chemical pesticide is that it can quickly, effectively, and economically reduce the densest milfoil growth to a level where nonchemical alternatives may be feasibly implemented. Garlon 3A was presumably chosen over other pesticides because of manufacturer representations that it is safe, selective in its target, and inexpensive as compared to other control measures.

If speed, efficacy and cost were the only criteria to be considered in making aquatic nuisance control permit determinations under 10 V.S.A. § 1263a, the Board might well determine that there is a public benefit to be achieved from the application of Garlon 3A as proposed by the permittee. These considerations, however, are not explicitly contained in § 1263a. Indeed, as has been stated in the discussion above, the Legislature has decided that pesticide use should be discouraged and approval should be granted only where there are no other reasonable, nonchemical alternatives available.

The Board has determined that there are reasonable, nonchemical alternatives available for the control of Eurasian watermilfoil at Lake Morey. They may not be as fast or as thorough or as inexpensive as Garlon 3A, but they nonetheless are available for use at Lake Morey. Moreover, results concerning the efficacy of weevils as a biological control of Eurasian watermilfoil will be available beginning as early as this summer.

Given the significant deficiencies in the record concerning the chemical components and effects of Garlon 3A on public health, the Board is unable to find that the application of this pesticide provides a public benefit, where other reasonable, nonchemical controls are available.

F. Conclusion

The Board acknowledges the magnitude of the effort and commitment of community members, especially Town officials and the officers of LMPA, in fighting the spread of watermilfoil at Lake Morey. The Board also recognizes that these persons have volunteered a great deal of time in preparing their cases in support of the approval of Garlon 3A for use at Lake Morey. However, based upon the facts and law in this matter, the Board is not able to affirm the decision of the ANR authorizing the application of Garlon 3A to Lake Morey.

V. ORDER

The decision of the ANR granting Aquatic Nuisance Control Permit, #C93-01-Morey, is hereby reversed. Said permit is null and void.

Dated at Montpelier, Vermont, this 12th day of April, 1994

Vermont Water Resources Board
by its Vice-Chair

Mark DesMeules

Concurring:

William Boyd Davies
Mark DesMeules
Stephen Dycus
Ruth Einstein
Jane Potvin