

Berlin Pond Watershed Conservation Plan



Commissioned by the Montpelier and Berlin Conservation Commissions
Prepared by the Vermont River Conservancy
February 2002

DRAFT Berlin Pond Watershed Conservation Plan
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EXECUTIVE SUMMARY

To protect the City of Montpelier's water supply, over a century of restrictions on development, access, and recreational activity have allowed Berlin Pond and its surrounding wetlands and forestlands to evolve into a unique natural area, one unparalleled in central Vermont. Berlin Pond, however, is more than just the water supply for the City of Montpelier. The area is a valuable habitat area, one that provides important scenic values, and a quiet, undisturbed place in which to enjoy nature.

The quality of Berlin Pond drinking water supply and the ecological health of the Berlin Pond natural area are both affected by activities in the Berlin Pond watershed. The Berlin Pond watershed contains a diversity of habitats and human land uses. Over the long term, the many values and benefits to humans and wildlife provided by Berlin Pond and its watershed are highly susceptible to cumulative threats associated with development, such as loss of open space, habitat fragmentation, increased traffic, and stormwater pollution.

The purpose of the **Berlin Pond Watershed Conservation Plan** is to provide an integrated set of recommendations to governing bodies towards protection of the drinking water supply **and** the ecological values of Berlin Pond, its wetlands and watershed. The Montpelier and Berlin Conservation Commissions commissioned the study and organized a 12-member Advisory Committee to guide the writing of the plan.

In the plan, **Current Uses and Public Use Suggestions** (Section III.) are analyzed for their potential impact on seven **Conservation Goals** (Section II.) identified by the committee (see **Threats**, Section IV.) The **Recommendations** (Section V.) set forth in the plan address these threats.

The City of Montpelier, Town of Berlin, and non-governmental partners should strive to increase awareness of regulations protecting Berlin Pond. While acknowledging a limited public desire on the part of some to boat, fish, or swim in the waters of Berlin Pond, these uses and associated activities are generally inconsistent with the seven Conservation Goals defined in the plan. Wildlife observation, while it certainly has the potential to harm plants and animals in the watershed and at the pond, is generally consistent with the seven Conservation Goals, provided visitors are prevented from visiting fragile areas or nest sites. The City of Montpelier, Town of Berlin, and non-governmental partners should also foster greater awareness among visitors and residents of the unique and fragile community and ecological resources found at Berlin Pond and should encourage community stewardship of these resources. To this end, the City of Montpelier, Town of Berlin, and non-governmental partners should coordinate adequately funded efforts in the areas of Community Relations and Public Outreach, Land Protection, Research and Monitoring, and Recreation Management.

Summary of Recommendations

I. Community Relations and Outreach (see page 32)

1. Increase awareness of regulations protecting Berlin Pond.
2. Increase awareness of ecological importance of area.
3. Educate landowners and recreational visitors about implications of land use and activities.

II. Land Protection and Conservation (see page 33)

1. Work with willing sellers to acquire and/or conserve priority tracts. Priority tracts include properties at risk of current or future development that
 - protect and buffer tributaries,
 - protect scenic or recreational values, and
 - link habitats.
2. Work with the City of Montpelier to place permanent conservation restrictions on its shoreline and watershed properties.

III. Research and Monitoring (see page 34)

1. Monitor populations of uncommon species.
2. Continue species inventory work.
3. Monitor breeding populations

IV. Recreation Management (see page 35)

1. Manage wildlife observation and recreation activities on roads around the Pond.
2. Manage recreation activities in watershed uplands.

V. Implementation (see page 36)

1. Coordinate efforts.
2. Secure funding for implementation.

I. Background

Berlin Pond: a Special Place

In 1884, the City of Montpelier began using Berlin Pond as its public water supply. As fears grew that agricultural and recreational uses of surrounding lands were threatening the quality of this new drinking water source, both the State Board of Health and the City of Montpelier initiated measures to protect the water from activities that might pollute it.

The Board of Health imposed prohibitions on swimming and boating in the 250-acre pond and activities along its 13 tributaries. The City of Montpelier began to purchase the lands around the pond, and by 1925, owned most of the Berlin Pond shoreline. Several court cases upheld the prohibition of swimming, fishing, and boating in Pond waters.

Over a century of restrictions on access and recreational activity have allowed Berlin Pond and its surrounding wetlands and forestlands to evolve into a unique natural area, one unparalleled in central Vermont. Berlin Pond is more than just the water supply for the City of Montpelier. The area and its environs are a valuable habitat area, one that provides important scenic values, and a quiet, undisturbed place in which to enjoy nature.

Increasingly, throughout Vermont, development pressure threatens undeveloped lake shores. Only a very few large Central Vermont ponds have retained their undeveloped shorelines. There are no structures on the shoreline of Berlin Pond (with the exception of a small pump station), and roads come close to the Pond in only a few places. A 1992 study of lakes 20 acres in size or greater found that Berlin Pond was one of only a few large water bodies with a high percentage of undeveloped shoreline. Berlin Pond stands out as a pond of intact and healthy natural communities with an undeveloped shoreline.

Berlin Pond hosts a very diverse community of aquatic plants. Its open waters and high-quality wetlands attract migratory waterfowl and provide nesting habitat for many species of birds. The pond serves as breeding habitat for a number of sensitive species. In 1999, the National Audubon Society's Vermont State Office officially designated Berlin Pond as a Vermont Important Bird Area (IBA), one of only four areas chosen in the state at that time.

There are numerous ponds in the vicinity of Berlin Pond where recreational activities are allowed. Thirty-four lakes and ponds (ranging from 23 to 849 acres) found within a 20-mile radius of Berlin Pond allow fishing, swimming, or boating, or all three, and some allow camping (See appendix). Nearly 60% of these also allow internal combustion engines. Few, if any of these water bodies are as ecologically significant as Berlin Pond.

Activities in the Watershed affect Berlin Pond water quality and the ecological health of the Berlin Pond natural area.

Water enters Berlin Pond in three ways. It enters as precipitation, as subsurface flow (groundwater), and as water that flows over the land of the watershed.

A “watershed” is all the land where surface flow of water ends up in the same “receiving” water, in this case, Berlin Pond.

The quality of Berlin Pond drinking water supply and the ecological health of the Berlin Pond natural area are both affected by activities in watershed. The Berlin Pond watershed contains a diversity of habitats and human land uses. There are wetlands and forests and meadows; there are trails and roads; there are residential dwellings. Most of the watershed, however, is presently undeveloped and rural.

Recently, the City of Montpelier commissioned a Source Protection Plan (SPP) for the Berlin Pond (raw water supply for City of Montpelier). The SPP was prepared by Dufresne & Associates, PC for the City of Montpelier. The SPP was prepared as required under the Vermont Water Supply Rule—Chapter 21, subchapter 7—in order for the Montpelier Filtration Plant to receive its operating permit. As such, the SPP focuses on drinking water protection and does not consider the ecological value of Berlin Pond. The SPP also does not fully address the cumulative impacts of potential development within the watershed, nor does it address recreational use in the watershed.

Over the long term, the many values and benefits to humans and wildlife provided by Berlin Pond and its watershed are highly susceptible to the cumulative threats associated with development, such as loss of open space, habitat fragmentation, increased traffic, and stormwater pollution.

In recent years, studies have quantified the relationship between development and the health of water bodies in developing watersheds, indicating a decrease in water quality with increasing development of the watershed. In urban lakes and ponds, higher stormwater pollutant loads are the major cause of water quality impacts. The ability of municipalities to control common behaviors and practices in urbanizing areas are imperfect at best.

The construction and coming-on-line of the new water filtration plant does not obviate the need to protect the source of Berlin Pond waters. Furthermore, the presence of the plant does not protect the ecological value of the Pond waters, wetlands, and shoreline as important and recognized natural resources from threats such as increased development within the watershed.

The Purpose, Development and Use of

the Berlin Pond Watershed Conservation Plan

The purpose of the Berlin Pond Watershed Conservation Plan is to provide an integrated set of recommendations to governing bodies towards protection of the drinking water supply and the ecological values of Berlin Pond, its wetlands and watershed. The Montpelier and Berlin Conservation Commissions commissioned the study and organized a 12-member Advisory Committee to work with the Vermont River Conservancy in the writing of the plan.

The Advisory Committee represents a diversity of interests and expertise in water quality, wildlife conservation, and recreation. The Committee includes representatives who reside in the watershed, serve on commissions in the City of Montpelier and the Town of Berlin, or otherwise are familiar with Berlin Pond, its history, functions, and values.

Through the Plan, the Advisory Committee hopes to accomplish the following vision:

To protect and maintain the complex association of open waters, wetlands, and upland communities of the Berlin Pond Watershed, over the long-term, as a place where human uses of the watershed sustain or enhance the biodiversity and undeveloped nature of the Pond and are consistent with the ecological health and the rural character of the watershed.

The Berlin Pond Watershed Conservation Plan is intended to supplement and complement the Source Protection Plan for Montpelier's Water Supply (SPP) and the Montpelier Water Conservation Plan.

The Plan should also be read in the context of statutes, decisions, and existing regulations regarding Berlin Pond and the Berlin Pond watershed.

The Vermont River Conservancy prepared the Berlin Pond Watershed Conservation Plan under the guidance of the 12-member Advisory Committee. The Plan begins with a **Background Section (Section I.)** followed by a set of **Conservation Goals (Section II.)** identified by the Advisory Committee. The Plan then reviews current uses and suggested uses (see **Current and Public Use Suggestions (Section III.)**), analyzing them for their potential threat to the conservation goals (see **Threats to Conservation Goals, Section IV.**). Lastly, the Plan recommends a set of strategies and actions that are intended to help achieve conservation goals (see **Recommended Strategies and Actions, Section V.**).

II. Conservation Goals

The Berlin Pond Watershed Conservation Plan is a planning document focused on conservation. This section of the plan lists and explains objectives for seven conservation goals as developed and refined by the Advisory Committee. Clearly outlined goals direct the planning effort to minimize threats to the pond and its watershed.



Conservation Goals:

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1. Maintain and enhance the undisturbed nature of Berlin Pond waters, the undeveloped nature of the Berlin Pond shore lands, and the rural nature of the watershed.

Objectives

- Maintain the undisturbed nature of Berlin Pond waters with respect to human presence, sound, movement, stirring of bottom sediments, and presence of aquatic plants and wildlife.
- Maintain and/or increase vegetation along the Berlin Pond shoreline to achieve target of high-quality forest or wetland communities.
- Maintain an appropriate ratio of undeveloped to developed acreage in the watershed

2. Protect water quality in the Berlin Pond Watershed.

Objectives

- Maintain current nutrient levels or reduce nutrient loading in Pond waters
- Minimize sedimentation in Pond and tributaries
- Minimize and prevent introduction of pathogens, toxic chemicals and pesticides to Pond waters.

3. Maintain suitable habitat for rare and uncommon species, such as common loon (*Gavia immer*)

Objective

- Maintain suitable habitat for nesting loons to maintain or increase incidence of successful loon nesting on the Pond. Improve loon-nesting success over the long term.

- pied-billed grebe (*Podilymbus podiceps*)

Objective

- Maintain suitable habitat for nesting pied-billed grebes to maintain or increase incidence of pied-billed grebe nesting success in Pond wetlands.

- osprey (*Pandion haliaetus*)

Objective

- Maintain suitable habitat for nesting osprey to increase incidence of osprey nesting success.

- sora (*Porzana carolina*)

Objective

- Maintain suitable habitat for nesting sora to maintain or increase incidence of sora nesting success in Pond wetlands.

4. Identify, maintain, and encourage natural communities in the Berlin Pond Watershed.

Objectives

- Maintain the current diversity of aquatic plant communities.

- Maintain a dynamic mosaic of wetland types (scrub-shrub wetlands, wet meadows, pond-side marshes, northern white cedar swamp) and forest community types and ages within the Berlin Pond watershed where natural processes and natural disturbance regimes can occur.
- Maintain or re-establish robust buffers and forested habitat around vernal pool communities.
- Allow reversion of plantations to native forest communities.

5. Protect general wildlife habitat in the Berlin Pond Watershed

Objectives

- Maintain sufficiently intact and connected natural communities.
- Minimize fragmentation of large forest plots within the watershed.
- Identify and protect important corridors between Pond waters, wetlands and forested uplands.
- Identify and protect vernal pool habitat and sufficient acreage of surrounding uplands for migratory amphibians that breed in vernal pools.

6. Protect scenic vistas and scenic qualities of the Berlin Pond Watershed

Objectives

- Maintain quality of scenic views of the Pond.
- Maintain and improve scenic views of the forested watershed and ridgeline.

7. Maintain areas in the vicinity of Berlin Pond and the Berlin Pond shore land and watershed for environmental education, ecological research, and low-impact recreation activities that are consistent with the above goals

Objectives

- Designate potential areas important to environmental education, ecological research, and low-impact recreation activities that are consistent with conservation goals.
- Protect and ensure the proper management of these areas.

III. Current Uses and Public Use Suggestions

This section is divided into

- A. Summary of Citizen's Vision for Berlin,*
- B. Public Comment: Berlin Pond Waters, Wetlands, and Public lands around the shoreline, and*
- C. Public Comment: Berlin Pond watershed uplands”*

*The section catalogs current human uses and reviews a variety of uses that have been suggested by the public for Berlin Pond waters, shoreline, and watershed. The evaluation of public opinion included consulting the “**Citizen's Vision for Berlin,**” and solicitation of public opinion through written comment sheets and a public hearing.*

*The **Citizen's Vision for Berlin** was a planning effort by the Berlin Planning Commission to assess planning goals and develop a strategy for the future. Community meetings and a questionnaire gave Berlin residents an opportunity to voice opinions about the priorities for Berlin.*

The Advisory Committee also solicited public comment through written forms and a public hearing. Participants were asked to comment about their interest in using Berlin Pond, the shoreline, and the watershed for various activities, including “no use.”

*In this section, “**Berlin Pond waters, wetlands, and publicly-owned lands around the shoreline**” refer to approximately 615 acres of land owned by the City of Montpelier, a small parcel owned by the Town of Berlin, and portions of the Brookfield and Mirror Lake Roads.*

*“**Berlin Pond watershed uplands**” refers to all other public and private lands within the watershed boundaries.*

A. Citizens' Vision for Berlin

The Berlin Planning Commission began a process in March of 1999 to reassess planning goals and develop a strategy for the future.

The effort was received enthusiastically with many residents participating. Residents discussed and debated the future of Berlin in a number of community meetings. In addition, 137 questionnaires were returned, often representing two or more Berlin residents.

The Berlin Citizen's Vision, the result of these community meetings and questionnaires, found that Berlin residents felt very strongly about protecting natural resources. The report also emphasized restricting urban growth and sprawl and improving recreation opportunities for residents – the highest percentage thought bike and hiking trails were the most important recreational needs.

An issue that Berlin residents felt particularly strongly about was the need to protect Berlin Pond and the Irish Hill Ridgeline.

B. Current Uses and Public Use Suggestions for

Berlin Pond waters, wetlands, and public lands around the shoreline

Participants at a public meeting and respondents to a questionnaire were asked to comment about their interest in using Berlin Pond, waters and public lands around the shoreline for various activities, including “no use.”

1. *Drinking water. The City of Montpelier uses Berlin Pond waters for raw drinking water. Berlin Pond stores in excess of 1.5 billion gallons of water and has an approximate surface area of 260 acres. The water receives treatment at a new facility that uses a package system of adsorber clarifiers and mixed media filters. Withdrawal is capped at 1.7 million gallons of water per day (MGD) at present.

2. Recreation. Current or suggested recreational uses include a broad range of activities.

a. *Fishing.* Fishing is prohibited at Berlin Pond. Five participants at the public meeting and twelve respondents to public comment sheets expressed an interest in fishing at Berlin Pond. Most participants and respondents, however, expressed the belief that fishing should not be allowed at Berlin Pond.

b. *Boating (hand launchable, non-motorized).* Boating of any type is prohibited at Berlin Pond. Four participants at the public meeting and thirteen respondents to public comment sheets expressed interest in boating (hand-launchables) at Berlin Pond. Most participants and respondents, however, expressed the belief that hand-launchables should not be allowed at Berlin Pond.

c. *Powerboat, electric motor.* Boating of any type is prohibited at Berlin Pond. Two participants at the public meeting and two respondents to public comment sheets expressed interest in boating using electric motor only at Berlin Pond. Most participants and respondents, however, expressed concerns about use of boats with electric motors at Berlin Pond.

d. *Powerboat, internal combustion.* Boating of any type is prohibited at Berlin Pond. Participants at the public meeting and respondents to public comment sheets did not express interest in boating with internal combustion engines at Berlin Pond. The great majority of meeting attendees and respondents expressed concerns with the concept of boats with internal combustion engines at Berlin Pond. Although there has been rumor of interest in powerboat use at Berlin Pond, public opinion seems to overwhelmingly oppose the idea.

e. *Personal Watercraft.* Personal watercraft use is prohibited at Berlin Pond. Participants at the public meeting and respondents to public comment sheets did not express interest in personal watercraft use at Berlin Pond. Although there has been rumor of interest in personal watercraft use at Berlin Pond, the participants and respondents overwhelmingly oppose such use.

f. *Swimming.* Swimming is prohibited at Berlin Pond. Three participants at the public meeting and four respondents to public comment sheets indicated an interest in

swimming. Most participants and respondents expressed the belief that swimming should not be allowed at Berlin Pond.

g. *Osprey platform*. In the summer of 1999, the Department of Fish and Wildlife (VT DFW), Berlin Conservation Commission and Montpelier Conservation Commission obtained approval from the City of Montpelier to put up an osprey platform. The groups erected the platform on the pond in late October. The Berlin Development Review Board notified the groups in November 1999 that they had jurisdiction and that a permit was required. VT DFW applied for a permit and met with the Board in December 1999 and January 2000. The Board issued a permit in April that required moving the platform from the site opposite the pump house to a location at the south end of the pond. The Board further conditioned the permit requiring that the platform would need to be hidden from view as much as possible and that VT DFW would have to post roadside "no stopping, no parking" signs. The Department couldn't meet these conditions and dismantled the platform in April 2000 until a time when a better resolution might be reached. There is still interest by VT DFW and the two conservation commissions to erect an osprey platform somewhere on the pond.

h. *Wildlife observation*. Wildlife observation, birdwatching in particular, is already a very popular activity on the roads around Berlin Pond. Berlin Pond is a designated "Important Bird Area" (IBA) by the National Audubon Society because of the presence of unique habitats, species of concern, and the importance of the site for bird breeding and the congregation of migratory species. Numerous other local, regional, and statewide groups also recognize the site for its ecological significance. These include Central Vermont Audubon Society, Vermont Institute for Natural Science, and the Vermont Nongame and Natural Heritage Program, among others. The roads around Berlin Pond see frequent visitation by birding groups who come to watch breeding and migratory birds. Nearly all participants at the public meeting and respondents to the public comment sheet listed wildlife observation as an important desired use. There have been suggestions at various times that wildlife observation stations be established to channel recreational use around the pond.

i. *Hiking/walking/running—road*. Hiking, walking, and running on roads around Berlin Pond are all current uses.

j. *Hiking/walking/running—trail*. There have been suggestions at various times that a nature trail or educational trail be established to channel recreational use around the pond. Several participants and respondents, however, commented that they were not in favor of off-road walking, hiking, or running on public lands around the Berlin Pond shoreline.

k. *Biking—road*. Biking on roads around Berlin Pond is a current and relatively popular use.

l. *Biking—trail*. There was no strong indication from participants at the public meeting or respondents to public comment sheets that off road biking on public lands around the Berlin Pond shoreline was a desired use. Several participants and respondents, however, did comment that they opposed off-road biking near the Berlin Pond shoreline.

n. *Ice skating.* Under “other uses” two respondents to the public comment sheets mentioned their interest in ice-skating on Berlin Pond ice in the winter.

o. *“No recreational use of waters or shoreline”.* Many participants at the public meeting expressed concern with any recreational use of pond waters or shoreline. Twenty-one respondents to the public comment sheets opposed any recreational use of Berlin Pond waters or shoreline except for passive enjoyment of scenic values, and/or observation from appropriate vantage points on the shoreline.

3. *Research and Education. There is interest by several groups to study the use of Berlin Pond waters, wetlands and public lands around the shoreline by rare and uncommon species. There is also interest by groups for educational study of natural resources of Berlin Pond, including natural communities and populations of plant and animal species that use the Pond.

4. Development

a. *Residential or commercial.* Although there was no suggestion that any group proposes residential or commercial development of the shoreline of Berlin Pond, shorelines in central Vermont are extremely popular places for development. Although public ownership that has protected the land around Berlin Pond up to now, how the land will be used in the future, or whether all the land will even remain under City ownership (and protection) are always up to the discretion of each Montpelier City Council and Mayor. The fate of the land cannot now be guaranteed, as future elected officials may not share a commitment to the perpetual protection of these lands for water quality, open space, and wildlife values. Unless formally protected by conservation restrictions, the Berlin Pond shoreline could easily become at risk of development in the future.

b. *Boat access.* Any proposed use of boats on Berlin Pond (see above) would require development of infrastructure for parking and for boat access.

c. *Fishing access.* Any proposed use of Berlin Pond for fishing (see above) could require development of infrastructure for parking or for, at a minimum, foot access to Berlin Pond waters at some points along the shoreline.

C. Current Use and Public Use Suggestions for the Upland Watershed of Berlin Pond

Participants were asked to comment about their interest in using the uplands of the Berlin Pond watershed for various activities, including “no use.” “Berlin Pond watershed uplands” includes all public and private lands within the watershed boundaries that are not Berlin Pond waters, wetlands, or public lands around the Berlin Pond shoreline.

1. **Residential areas.** According to the SPP, the Berlin Pond watershed includes 294 property parcels located either completely or partially within the watershed. There are currently 181 private residences in the watershed. Some of these residences have buried fuel storage tanks. Many have subsurface septic systems. The use of pesticides, herbicides, fertilizers, and hazardous materials (such as oil and gasoline or household solvents) that might find their way into groundwater or stormwater runoff is undetermined.

2. ***Residential or commercial development.** The Berlin Pond watershed is located near the much larger population and employment centers of Barre and Montpelier. The State of Vermont is the area’s largest employer. The Town of Berlin is a stable residential community with good access to regional employment. The mountainous topography and predominance of large tracts of woodland make the town an attractive place to live.

The Berlin portion of the watershed is zoned either “Highland Conservation” or “Rural Residential”. Collectively, these zones allow agricultural and forestry uses, one-family dwellings, public and private outdoor recreation, camps, wildlife refuge, accessory use, home occupation, and professional residence-offices and cemeteries. Collectively, with the granting of a conditional use permit by the Development Review Board, these zones might also allow business offices, planned residential developments, schools, religious institutions, state or municipal buildings or facilities, flea markets, private clubs, and licensed daycare homes for children.

The Northfield portion of the watershed is zoned “Conservation and Forestry,” “Secondary Agricultural,” or “Rural Residential.” Collectively, these zones allow single family dwellings, accessory buildings, windmills for private use, forestry and agriculture, planned residential developments, public and private utilities, public outdoor recreation, sand and gravel pits, and cemeteries. Some of these would require a conditional use permit.

The rural nature of the watershed, proximity to employment centers, proximity to public wooded lands, proximity to Berlin Pond, and the existence of good to extraordinary views put 15-20% the watershed at high risk of residential development. Pressure for additional development of single-family homes in the watershed could increase in coming years.

3. **Agriculture.** Very little commercial farming still occurs in the watershed despite the presence of prime agricultural soils. According to the SPP there is one agricultural operation (livestock). Gardening at private residences is the primary agricultural use

within the watershed. Increased development would likely increase the loss of woodland and the incidence of lawns and gardens.

4. *Forestry. From a recent scan of aerial photographs, it appears that about 85% or 4675 acres of the Berlin Pond watershed is forested. The western half of the watershed, including Irish Hill, is dominated by northern hardwoods with minor components of softwoods scattered throughout the lower elevations. The eastern half of the watershed appears more evenly balanced between hardwoods and softwoods. Approximately 30% (1650 acres) of the watershed is in public ownership and another 10% is private land enrolled in Vermont's Current Use Appraisal Program.

All forest land in the watershed is natural second growth or plantation. Forestry activities in the watershed have been typical of almost any other in the central Vermont area. The typical timber sale might involve 25 to 50 acres and be cut on a selection basis. A 1 to 3 man crew would perform the cutting with a skidder or crawler tractor, and a forestry professional would have input on 30% - 40% of these operations.

Recently, however, there were several heavy cuts along the upper elevations of Irish Hill. Approximately 550 affected acres have recently been brought into public ownership and are now conserved lands that have or soon will have responsible forest management plans.

5. Recreation. Current or suggested recreational uses include a broad range of activities, each with varying degrees of impact depending on location, frequency, and intensity of the activity.

a. **Hiking/walking/running--road.* Hiking, walking, and running on roads in the upland watershed of Berlin Pond are all current uses.

b. **Hiking/walking/running—trail.* Hiking, walking, and running on roads in the upland watershed of Berlin Pond are all current uses. There is an extensive network of informal trails on both public and private lands in the watershed. Trails on Irish Hill/Paine Mountain are described in William E. Osgood's "Paine Mountain Guidebook". Darling Road is a class four trail, as designated by the Town of Berlin.

c. **Biking—roads.* Biking on roads around Berlin Pond is a current use.

d. **Biking—trails.* Biking on trails in the upland watershed of Berlin Pond is a current use. The Advisory Committee received communication from a mountain biking organization suggesting that there is considerable interest in mountain biking on present or future trails on Irish Hill.

e. **Wildlife observation.* Wildlife observation is a current use in the upland watershed of Berlin Pond. Excepting only a few, participants at the public meeting and respondents to the public comment sheet all listed wildlife observation in the upland watershed of Berlin Pond as a desired use.

f. **Hunting.* Hunting on Irish Hill is very popular current use.

g. **ATV and dirtbike.* ATV and dirtbike use is popular on Irish Hill among local residents and is done either by permission of landowners or is unauthorized.

i. **Snowmachine.* Snowmachine use is popular among local people on Irish Hill and is done either by permission or is unauthorized.

6. Roads and Motor Vehicles. Numerous roads exist in the watershed, from class 4 roads to Interstate 89, which bisects the watershed. As described extensively in the SPP, trucks carrying substantial amounts of hazardous materials travel I-89 daily. In addition, there are secondary roads, including several class 2 and 3 gravel roads within the watershed that service traffic, among other vehicles, from fuel delivery trucks.

Many public meeting and survey respondents mentioned a perceived increase traffic on several of the roads surrounding Berlin Pond (along Brookfield Road, Paine Turnpike south, and Mirror Lake Road). Participants also cited parking problems at certain locations along these same roads as a problem, one that had the potential to worsen.

Some pond residents have expressed displeasure in particular about birdwatchers stopping, parking, and scoping within or too close to travel lanes in the roads.

7. Research and Education. Research at Berlin Pond has included water quality monitoring and ecological inventory work. Educational use has included a small number of educational programs about natural history and the annual Berlin Pond elementary school “Berlin Pond Walk”.

IV. Threats to Conservation Goals

This section of the Plan identifies and evaluates the degree to which current or suggested uses threaten or could potentially threaten the seven Conservation Goals described in Section II. Analysis of these potential threats, and their impact on the 7

Conservation Goals, led to the recommendations for conservation strategies and actions in the Section V.



A. Threats Posed by Potential Use of Berlin Pond waters, wetlands, and public lands around the shoreline

The following section discusses threats that potential uses might pose to Berlin Pond waters, wetlands, or publicly owned lands around the Berlin Pond shoreline. Many but

not all of the listed potential uses are prohibited under existing regulations, so discussion of potential threats is hypothetical.

Pond or Shoreline Activity	Potential Threat To Conservation Goal If Implemented						
	U n d i s t r i b u t e d n a t u r e o f p o n d	W a t e r q u a l i t y	S e n s i t i v e s p e c i e s	N a t u r a l o b j e c t s	W i l d l i f e h a b i t a t	S c e n i c v i s t a s	R e s e a r c h e d u c a t i o n l o w - i m p a c t
* (denotes current use)	1	2	3	4	5	6	7
*Drinking Water Use	Yes	No	Yes	Yes	No	No	No
Recreation							
Fishing	Yes	Yes	Yes	Yes	No	Yes	No
Boating (hand-launchable, non-motorized)	Yes	Yes	Yes	Yes	No	Yes	No
Powerboat, electric motor	Yes	Yes	Yes	Yes	No	Yes	No
Powerboat, internal combustion	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Jetski	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Swimming	Yes	Yes	Yes	No	No	Yes	No
Osprey platform	Yes	No	No	No	No	Yes	No
*Wildlife observation	Yes	Yes	Yes	No	No	Yes	No
*Hiking, walking, running—existing roads	No	No	No	No	No	No	No
Hiking, walking, running—trail	Yes	Yes	Yes	No	No	No	No
*Biking—road	No	No	No	No	No	No	No
Biking—trail	Yes	Yes	Yes	Yes	Yes	Yes	Yes
*Research and Education	No	No	No	No	No	No	No
Development							
Residential or commercial	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Boat access	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fishing access	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Threats Posed by Potential Use of Berlin Pond waters, wetlands, and public lands around the shoreline

1. *Drinking water. Berlin Pond waters are currently used for drinking water, posing no threat to conservation goals. Increased withdrawal of water beyond certain limits, however, would pose a threat to the undisturbed nature of the Pond, sensitive species, natural communities, wildlife habitat, and scenic vistas. Drawdowns in excess of 1.68 mgd would have undesirable consequences to the natural condition of Berlin Pond. Water fluctuations would threaten waterfowl and wildlife food sources and habitat, wetland communities, and plant diversity. Approximately 30 acres of wetland along pond shoreline would experience the greatest impact from excessive water removal. Excessively low pond levels would reduce the open-water available to migrating waterfowl and remove nesting habitat. Fluctuations during late fall and early winter could decrease access to food supply and dwellings of beavers and muskrats. Increased drawdowns would also threaten the highly productive shallow water littoral areas, which in turn would negatively impact mussels and aquatic insects. Late fall drawdowns could allow frost to penetrate hibernating areas and reduce the survival of hibernating reptiles and amphibians as well as perennial emergent and aquatic plants that are not adapted to freezing (Berlin Zoning Board of Adjustment, 1996).

According to the Berlin Zoning Board of Adjustment report, “water withdrawals greater than 2.19 mg could make it extremely difficult for common loons to nest successfully on the pond. A water level drop of one foot or more during incubation could strand the loon nest, making it impossible for the adult loons to reach their eggs” (Berlin ZBA, 1996).

Drawdowns beyond acceptable levels that extend into winter are likely to have serious adverse impacts on deep marsh and aquatic vegetation communities.

2. Recreation. *It should be noted that there are numerous ponds in the vicinity of Berlin Pond where many of the various recreational activities suggested for Berlin Pond are allowed. Thirty-four lakes and ponds (ranging from 23 to 849 acres) found within a 20-mile radius of Berlin Pond allow either fishing, swimming, or boating, or all three, and some allow camping (See appendix). Nearly 60% of these also allow internal combustion engines. Few, if any are as ecologically significant as Berlin Pond. Many recreational uses suggested for Berlin Pond would pose a significant threat to one or more of the conservation goals identified in Section II.*

a. *Fishing.* Fishing, whether from the waters of Berlin Pond or the shoreline (if it were to become legal, would threaten the undisturbed nature of the pond and shoreline, water quality, and sensitive species. To a lesser extent, fishing might also threaten natural communities and scenic vistas. The greatest threat would occur if fishing were to be permitted from boats (see 2.b, c, and d below). Pond waters and shoreline have been undisturbed since the late 1800s, and to permit fishing, even from the shoreline, would alter this, threatening habitat of sensitive species. The common loon, listed as endangered in Vermont, visits Berlin Pond virtually every year. Loons have nested on

Berlin Pond, successfully fledging one chick twice, in 1990 and 1992. The common loon is highly sensitive to human disturbance and experiences nesting failure as a result of human activities (Ream, 1976, Heimberger et al., 1983, Titus and Van Druff, 1981). Research has shown that anglers fishing off shore can have essentially the same negative impact on wildfowl as boats in that they create an area where birds won't enter (Liddle and Scorgie, 1980).

There is the possibility that some anglers would mistreat the resource through unacceptable behaviors such as the use of lead sinkers or the depositing of shoreline litter that frequently accompanies fishing.

Lead sinkers pollute the water and if ingested by waterfowl can cause bird deaths (Finely and Dieter, 1978). Lead poisoning from ingestion of fishing sinkers has been identified as the cause of death for half of the dead loons necropsied in New England studies (Pokras, et al., 1992).

The allowance of fishing would also be very likely to increase use of surrounding roads, increasing traffic around the pond, disturbing local residents.

b. *Boating (hand launchable, non-motorized)*. The use of hand-launched boats, were their use to become legal at Berlin Pond, would threaten the undisturbed nature of pond and shoreline, sensitive species, and, to a lesser extent, natural communities and scenic vistas. Surprisingly, canoes, kayaks, and rowboats can potentially disturb wildlife as much as power boats, because they can reach secluded areas where waterfowl nest, surprising sensitive species (Parren, personal communication). The 1992 Breeding Status study of common loons in Vermont reported that canoeists on Green River Reservoir were coming too close to chicks on several occasions (Renfrew and Rimmer, 1992).

Although less so than motorized boats, hand-launched boats would also require infrastructure for launching, further threatening conservation goals.

c. *Powerboat, electric motor*. Powerboats with electric motors, if ever their use became legal at Berlin Pond, would threaten the undisturbed nature of pond and shoreline, sensitive species, and to a lesser extent, natural communities and scenic vistas. As with hand-launched boats, powerboats with electric motors might enable users to surprise sensitive species. Boats could introduce and increase the spread of aggressive invasive exotic species such as water chestnut, Eurasian water milfoil, and purple loosestrife, among others, from infested waters.

d. *Powerboat, internal combustion; Personal Watercraft*. Powerboats with internal combustion engines, if ever their use became legal at Berlin Pond, would threaten the undisturbed nature of pond and shoreline, water quality, sensitive species, natural communities, and scenic vistas. The most obvious impact of this use would be water, air, and noise pollution, negatively affecting humans and wildlife alike. Powerboats can cause shoreline erosion, eutrophication, and mechanical disturbance to aquatic vegetation and bottom sediments, disturbing fish and aquatic life, in addition to above surface species (Hammir and Cole, 1998). It is well documented that boat engines, particularly two-stroke engines, are a source of water pollution. Two-stroke engines can discharge between 20-40% of the fuel used directly into the water (Muratori, 1968). Two-stroke engines from motor boats can deposit contaminants that degrade ground and surface waters, negatively impacting aquatic life (Ruzycki and Lutch, 1998). Boat

engines discharge a variety of hydrocarbon compounds directly into the water. Research has shown that even small levels of hydrocarbon pollution can cause chromosomal damage, retard growth and development, disrupt normal biological functions, and kill fish (Ruzycki and Lutch, 1998). Other contaminants from motor vehicle exhaust include carbon monoxide, Methyl-tert-butyl ether (MTBE), nitrous oxides (NOx) and particulate matter (White and Carrol, 1998). The effects of these vary, but have been known to cause a reduction of zooplankton populations, a decrease in fish growth rates, enzyme function, immune response, and reproductive impacts (Balk, et al., 1994). Also, the nitrogen found in nitrous oxides can be a limiting agent in aquatic systems and contribute to eutrophication. Noise pollution is another source of disturbance caused by powerboats.

e. *Swimming*. Swimming in Berlin Pond, if ever it became legal at Berlin Pond, would have the potential to threaten the undisturbed nature of pond and shoreline and sensitive species. Swimming would also increase traffic and parking problems and require resources to ensure safety and enforcement. Swimming, and a tendency to desire the removal of vegetation in swimming areas, would not be compatible with the high incidence and important diversity of aquatic plants in the pond.

f. *Osprey platform*. There has been some concern in Berlin that an osprey platform, if not appropriately located, would threaten the undisturbed nature of the pond and would increase traffic problems on surrounding roads.

g. **Wildlife observation*. Wildlife observation activities have the potential to create or exacerbate traffic and parking problems on surrounding roads. Wildlife observation activities, at certain levels of activity, and if occurring in certain areas, could threaten sensitive species.

h. **Hiking/walking/running—road*. Increased use of surrounding roads for walking and running, at certain levels of use, could threaten the undisturbed nature of the pond and create traffic and parking problems.

i. *Hiking/walking/running—trail*. Use of trails on public lands around the Berlin Pond shoreline could threaten the undisturbed nature of the pond and shoreline and sensitive species.

j. **Biking—road*. Increased use of surrounding roads for walking and running, at certain levels of use, could threaten the undisturbed nature of the pond and create or exacerbate traffic and parking problems.

k. *Biking—trail*. Use of trails on public lands around the Berlin Pond shoreline could threaten the undisturbed nature of the pond and shoreline and sensitive species.

3.*Research and Education. Research activities, if not appropriately undertaken and managed, could potentially threaten sensitive species. Educational activities, at certain use levels, could create or exacerbate traffic and parking problems.

4. Development

Any residential development of the public lands around the Berlin Pond shoreline, if ever allowed, would negatively impact the seven conservation goals identified in Section II.

While development of an individual lot in the upland areas of the Berlin Pond watershed might seem insignificant, development of even a single lot along or near the Berlin Pond shoreline could have a disastrous effect upon sensitive species, natural communities, scenic vistas, water quality and the undisturbed nature of the pond waters and shoreline.

Sensitive species are attracted to Berlin Pond largely because of its size and undeveloped shoreline. Noise and activity associated with even small amounts of shoreline development could disturb sensitive species and result in rejection of Berlin Pond as breeding or migratory habitat.

Development of any type along the shoreline of Berlin Pond would alter its value as a popular scenic vista.

Development of any type along the shoreline of Berlin Pond would alter the undisturbed nature of pond waters and the shoreline. Berlin Pond has only one structure (the pumphouse) close to the shoreline. Only a handful of similar-sized ponds in the Winooski River Basin have as high a percent of undisturbed (by structures) shoreline as Berlin Pond. Peacham Pond, Curtis Pond, Forest Lake, Lake Greenwood, Sabin Pond, Valley Lake, and Wrightsville Reservoir all have a higher percentage of shoreline development than Berlin Pond. Only Gillette Pond and Shelburne Pond have less development than Berlin Pond and each is partially or wholly protected and in State (Gillette Pond) or non-profit (Shelburne Pond—The Nature Conservancy) ownership.

Development of any type along the shoreline of Berlin Pond would degrade water quality in a number of ways. The ability of a municipality to control common behaviors and practices at private residences (i.e. removal of vegetation, application of fertilizers and pesticides, dumping or spillage of vehicular fluids, improper disposal of household toxics, just to name a few) is limited at best. Because of this, it is always cheaper and more effective in the long run to avoid generating pollution than it is to clean it up later. Research on stormwater management for drinking water supplies has determined that the single most important tool in reducing the impacts of urban stormwater are the minimization of impervious surface areas and pollution prevention through source reduction and effective land use planning.

Residential development of a single site could easily open up the Pandora's Box of additional development. Everyone is familiar with a lakeshore that has been overbuilt. Along many Vermont lakeshores, the density of residential development is extreme. While it is public ownership that has protected the shoreline of Berlin Pond up to now, how the land will be used in the future, or whether all the land will even remain under City ownership (and protection) are always up to the discretion of each City Council and Mayor. Unless the Berlin Pond shoreline is protected through formal and perpetual legal measures, development of the shoreline will remain a lingering threat.

B. Threats Posed by Potential Use of Watershed Uplands

The following section discusses threats that potential uses of the watershed uplands might pose to conservation goals.

Upland Watershed Activity	Potential Threat to Conservation Goal of Implemented						
	U n d i s t u r b e d n a t u r e o f p o n d	W a t e r q u a l i t y	S e n s i t i v e s p e c i e s	N a t u r a l c o m m u n i t i e s	W i l d l i f e h a b i t a t	S c e n i c v i s t a s	R e s e a r c h e d u c a t i o n l o w - i m p a c t
	1	2	3	4	5	6	7
Residential or Commercial Development	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Agriculture	No	Yes	Yes	Yes	Yes	No	No
Forestry	No	Yes	Yes	Yes	Yes	Yes	Yes
Recreation							
Wildlife observation	No	No	No	No	No	No	No
Hiking, walking, running—existing roads	No	No	No	No	No	No	No
Hiking, walking, running—trail	No	No	No	No	No	No	No
Biking—existing roads	No	No	No	No	No	No	No
Biking—trail	Yes	Yes	Yes	Yes	Yes	No	No
Hunting	No	No	No	No	No	No	No
ATV	Yes	Yes	Yes	Yes	Yes	No	Yes
Dirtbike	Yes	Yes	Yes	Yes	Yes	No	Yes
Snowmachine	Yes	Yes	Yes	Yes	Yes	No	No
Research and Education	No	No	No	No	No	No	No
Roads/Motor Vehicles	Yes	Yes	Yes	Yes	Yes	Yes	No
Development							
Residential or commercial	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Threats Posed by Potential Use of Watershed Uplands

1.*Residential or commercial development. The Source Protection Plan addresses the threats current land uses pose to the water quality of Berlin Pond. The SPP, however, does not fully address the implications of increased development of the watershed.

Increased development in the Berlin Pond watershed would threaten water quality, the undisturbed nature of Berlin Pond, the rural feeling of the watershed, and scenic vistas. Over the past decade, numerous studies have linked increasing development with water quality degradation (Center for Watershed Protection, Article 25). The threat lies in the cumulative effect of altering a rural landscape, gradually, to an urban or suburban landscape and the accompanying increase in roads, traffic, and impervious surface areas.

It is well documented in the literature that development has a profound influence on water quality (Center for Watershed Protection, Article 63). While development of an individual lot might not seem significant, the long-term effect resulting from cumulative development should not be underestimated. Stormwater runoff from roads can seriously degrade water quality by increasing the concentrations in receiving waters of pathogens, nutrients, oxygen demanding materials, suspended solids, chlorides, metals (such as copper, lead, cadmium, chromium, zinc, and arsenic), synthetic organic compounds (such as pesticides and polycyclic aromatic hydrocarbons), petroleum hydrocarbons, and trash and debris. Many of these pollutants are derived from motor vehicles. Delivery of these pollutants from developed land to surface waters is very efficient because much of the opportunity for chemical or biological absorption or breakdown of pollutants in soil or vegetation has been lost.

In recent years, research has firmly established the relationship between development and the health of receiving waters that are used as drinking water supplies, indicating impairment of water quality with increasing development of the watershed. Although pathogens may be filtered out of drinking water supplies, filtration does not solve all water quality problems associated with development. Elevations in total phosphorus can lead to excessive algal blooms, causing taste and odor problems and formation of a cancer-causing agent THM (Tri-Halo-Methanes). Heavy metals that accumulate on paved surfaces are easily washed into stormwater and are of great concern because of their ability to contaminate drinking water supplies. Pesticides that find their way into water supplies, even in low concentrations, can pose severe health risk to humans.

The ability of a municipality to control common behaviors and practices in urbanizing areas (application of fertilizers and pesticides, dumping or spillage of vehicular fluids, improper disposal of household toxics to name a few) is imperfect at best. Because of this, it is always cheaper and more effective in the long run to avoid generating pollution than it is to clean it up later. Research on stormwater management for drinking water supplies has determined that the single most important tool in reducing the impacts of urban stormwater are the minimization of impervious surface areas and pollution prevention through source reduction and effective land use planning.

2.* Agriculture/Lawncare/Garden. Agriculture is a permitted use in both the Rural

Residential and Highland Conservation zones of the Berlin zoning ordinance. Although there is little commercial agriculture in the watershed at present, increased agricultural use could, potentially, threaten water quality.

Many landowners in the source protection area use fertilizers and or pesticides on lawns and gardens. These uses, and any increases in the current levels of use, pose a threat to water quality, sensitive species, and wildlife. Pesticide/herbicide/fungicide delivery to streams can occur through runoff, drift and deposition onto impervious surfaces, and through inappropriate disposal or sprayer cleaning. Even low concentrations can harm downstream aquatic plants. The greatest risk of toxicity lies with a relatively few insecticides such as diazinon and chlorpyrifos. The toxicity of diazinone, for example, to geese, songbirds, and amphibians is well documented. (Shueler, 1995; CWP Technical Note 57).

3.*Forestry. Certain forestry activities, if not properly managed, have the potential to threaten water quality, scenic vistas, and wildlife habitat. These include heavy cutting, cutting on steep slopes, cutting within riparian zones or vernal pool buffers, and excessive creation or poor design of skid trails, log landings, and truck roads.

a. *Heavy cutting.* Excessive cutting can cause excessive nutrient loss through leaching; increase the rate of snowmelt and storm runoff (increasing erosion); adversely affect the forest floor habitat affecting herbaceous plants, amphibians, insects, fungi, mosses, and soil microbes; reduce the amount of mature or late-successional habitat; create even-aged stands that do not retain diverse structural characteristics; and threaten scenic values.

b. *Timber harvest within riparian zones or vernal pool or other wetland buffers.* Forestry activities that can affect water quality include construction of roads, landings, and skid trails; stream and wetland crossings; handling of slash; removal of forest cover; spilling of petroleum products; and application of chemicals. The most important aspect of protecting water quality is maintaining the integrity of wetlands and riparian areas.

Timber harvest activities in the vicinity of riparian areas and wetlands can result in habitat alterations detrimental to wildlife species that depend on these wetlands. This is particularly true of vernal woodland pools. Vernal woodland pools are particularly at risk because they only contain water for a part of the year and may not be recognized as wetlands. Loss of shade around the pools and heavy equipment impacts to the pool areas and surrounding buffers, can be particularly harmful.

c. *Miscellaneous forest practices.* Excessive construction of skid landings and roads or poor design of skid landings and roads can threaten water quality. Timber harvest or road/skid landing construction on steep slopes can lead to excessive erosion and increased storm runoff. Other factors that potentially threaten conservation values are the size of forestry equipment and the time of year of harvest. Removal of deer wintering areas, mast trees, and cavity trees, dens, and snags can harm important food and habitat for many species of mammals and birds. Removal of dead and down woody material in various stages of decay can inhibit critical forest system functions.

4. Recreation

- a. **Wildlife observation.* Increased use of uplands for wildlife observation is could exacerbate traffic and parking problems.
- b. **Hiking/walking/running road/trail.* Increased use of surrounding roads and trails for hiking, walking, and running in watershed uplands, at certain levels of use, could exacerbate traffic and parking problems and increase erosion.
- c. **Road biking/*mountain biking.* Increased use of surrounding roads and trails for biking in watershed uplands, at certain levels of use, could exacerbate traffic and parking problems and increase erosion.
- d. **Hunting.* Increased use of surrounding road and trails were increased hunting to occur in watershed uplands, at certain levels of use, could exacerbate traffic and parking problems.
- e. **ATV/dirtbike.* Off-road motor vehicle use in the watershed has the potential to harm plant and wildlife habitat, wetlands, and water quality through soil displacement and compaction, air and water pollution, noise pollution, and vegetation damage. If not properly managed, use of the watershed by ATVs, dirtbikes, and other off-road motor vehicles could lead to serious erosion problems, soil compaction problems, damage of small wetlands, destruction of vegetation, and disturbance of wildlife. Certain off road motor vehicles generate excessive noise and can disturb wildlife that depend on quiet. Off road motor vehicle use can also cause substantial damage to plants, particularly when the vehicles leave designated trails. Off-road motor vehicles may also leak fuel, oil, antifreeze, and other chemicals. Many are powered by highly inefficient two-stroke engines, so any fuel/oil combination not burned efficiently as the vehicle operates, including toxic fuel additives, is emitted directly onto the ground.
- f. **Snowmachine.* When not properly managed, snowmachine use in the watershed has the potential to threaten wildlife and water quality. Two-stroke engines from snowmachines discharge up to one-third of their fuel unburned into the environment, threatening air and water quality. Certain levels of use of snowmachines in the watershed could introduce significant levels of toxic pollutants into the snowpack whose effect might be magnified in sudden release during snowmelt (Ingersoll, et al., 1997) (Shaver, et al., 1988). Snowmachines are also capable of operating at high speeds and can generate excessive noise.

5. Roads/Motor Vehicles. Roads and motor vehicles threaten the water quality at Berlin Pond, and secondarily threaten the undisturbed nature of the pond, sensitive species, natural communities, wildlife habitat, and scenic vistas. The threats come from the potential for spills or illegal disposal of toxic chemicals or fuel; the potential for prolonged and cumulative delivery of vehicular fluids through stormwater runoff; road maintenance activities or inactivities; and increases in noise, traffic, and parking pressure.

V. Recommendations

Conservation Strategies and Actions



Conservation Strategies and Actions

This section recommends broad actions to preclude or mitigate stresses which currently or potentially threaten conservation goals for Berlin Pond and the Berlin Pond Watershed.

I. Community Relations and Outreach (see page 32)

1. Increase awareness of regulations protecting Berlin Pond
2. Increase awareness of ecological importance of area.
3. Educate landowners/recreation users about implications of land use.

II. Land Protection and Conservation (see page 33)

1. Work with willing sellers to acquire and/or conserve priority tracts. Priority tracts include properties at risk of current or future development that
 - link habitats
 - protect and buffer tributaries
 - protect scenic or recreational values
2. Work with City of Montpelier to place permanent development restrictions on its shoreline and watershed properties. Work also with Berlin, Northfield, and Williamstown selectboards to institute additional measures to protect lands.

III. Research and Monitoring (see page 34)

1. Monitor populations of rare, threatened, or endangered species
2. Complete species and population inventories for noteworthy taxa
3. Monitor breeding populations

IV. Recreation Management (see page 35)

1. Manage wildlife observation and other recreation on roads around the Pond.
2. Manage recreation activities in upland.
3. Explore establishing designated wildlife observation areas.

V. Implementation (see page 36)

1. Coordinate efforts.
2. Secure funding for implementing actions.

I. Community Relations and Outreach

1. Increase awareness of regulations protecting Berlin Pond

Residents of local communities as well as visitors to the watershed should be fully aware of the regulations governing Berlin Pond. There is at present a lack of understanding of these regulations, their history and purpose, and of the various jurisdictions responsible for their monitoring and enforcement.

Recommended action: The City of Montpelier and Town of Berlin should develop and a summary or regulations, to distribute with educational materials about the Berlin Pond water supply and natural area/ecological values.

2. Increase awareness of the importance of the Berlin Pond Natural area, species, ecological systems, and public water supply.

Residents of local communities as well as visitors to the watershed should be fully aware of the ecological importance of the Berlin Pond Natural area and watershed.

Recommended actions: The City of Montpelier, Town of Berlin, and other partners should organize periodic public events about the pond and its significance. The City of Montpelier, Town of Berlin, and other partners should develop an educational pamphlet that explains the ecological importance of the Berlin Pond Natural Area and the need for drinking water supply source protection, perhaps in parallel with educational materials about regulations governing Berlin Pond. The City of Montpelier, Town of Berlin, and other partners should also investigate the possibility of establishing and maintaining a nature trail with wildlife observation posts at appropriate locations around the Pond.

3. Educate landowners and recreational visitors about land use and recreational activities that affect conservation goals.

Watershed landowners and those that visit the pond and watershed for recreation and wildlife observation need to be educated about the implications of their land use and recreational activities on the conservation goals identified in this report. As noted in the source protection plan, landowners need to understand the implications of underground storage tanks or activities such as fertilizer application or the use of pesticides. Those who use the watershed for recreation, whether it is bird watching from the Mirror Lake Road or mountain biking on Irish Hill should understand the implications of their activities on the watershed and on local residents.

Recommended action: the City of Montpelier and Town of Berlin should cooperate to develop educational programs that inform residents and recreational users about water supply source protection and protection of the Berlin Pond Natural Area.

II. Land Protection and Conservation

1. Work with willing sellers to acquire and/or conserve priority tracts.
Priority tracts include properties at risk of current or future development that

- **link habitats**
- **protect and buffer Berlin Pond tributaries**
- **protect scenic or recreational values**

Conservation organizations, the Berlin and Montpelier Conservation Commissions and other partners should continue their work with willing landowners to permanently protect priority tracts through fee-simple purchase or the purchase of development rights. 550 acres have recently been conserved on Irish Hill, much of it within the watershed.

Additional parcels that link habitats, protect pond tributaries, and protect scenic or recreational values should have highest priority for protection. Land protection and conservation partners should examine and prioritize parcels in the watershed for potential conservation, contact landowners, develop strategies for implementing conservation efforts, and set in motion the conservation of high priority parcels.

Recommended actions: The Vermont Land Trust, Berlin Conservation Commission, Montpelier Conservation Commission should continue ongoing conservation efforts.

2. Work with City of Montpelier to place permanent development restrictions on its shoreline and watershed properties.

In 1999, the Vermont Land Trust and Montpelier Conservation Commission met to discuss long-term protection of Montpelier's City lands around Berlin Pond. The two groups believe that City land around the pond is such a very high quality resource that it deserves protection beyond simple municipal ownership. While it is this public ownership that has protected the land up to now, how the land will be used in the future, or whether all the land will even remain under City ownership (and protection) are always up to the discretion of each City Council and Mayor. Because the special character of these lands is so widely recognized, they should be protected through a formal and perpetual commitment to their importance to water quality, open space, and wildlife values. A permanent conservation easement, donated to the Vermont Land Trust with its vast experience in this field would solidify the protection of these values forever.

Recommended action: The Vermont Land Trust and Montpelier Conservation Commission should work with the City of Montpelier to place permanent development restrictions on its shoreline and watershed properties.

III. Research and Monitoring

1. Monitor populations of rare and uncommon species.

The waters and wetlands of Berlin Pond provide important habitat for a number of rare and uncommon bird species, including common loon (state endangered), pied-billed grebe (special concern), and sora (special concern), among others. The Central Vermont Audubon Society and the Vermont Institute for Natural Sciences should take the lead in monitoring individuals and populations of noteworthy birds and other taxa. Other rare and uncommon species may be found in the watershed.

Recommended action: The Central Vermont Audubon Society and VINS should coordinate additional monitoring of rare and uncommon species and devise ways to inform land managers, planners, land conservation organizations, and those responsible for water supply decisions with good solid data on these species to promote sensible, land-use planning and fact-based habitat management.

2. Continue to update species inventory work

Although there have been very comprehensive efforts within certain taxa (birds, aquatic plants) species inventory work for the Berlin Pond waters, wetlands, and watershed is incomplete. It would be helpful to gather additional data with regards to mammals, amphibians and reptiles, fish (including non-game fish), invertebrates, and plants. There may be additional rare and uncommon native plants and animals in the watershed that have not yet been discovered.

Recommended action: Central Vermont Audubon and VINS should coordinate additional inventory work in the watershed.

3. Monitor breeding populations

The waters of Berlin Pond, its wetlands, and watershed provide important breeding habitat for birds and other taxa. It would be helpful to have data with regards to use of public lands in the watershed by breeding birds and amphibians.

Recommended action: Central Vermont Audubon and VINS should coordinate additional work to monitor and inventory breeding populations in the watershed.

IV. Recreation Management

1. Manage wildlife observation activities and other recreational activities on roads around the Pond.

Much of the public land around the Pond is off limits to recreation. Brookfield Road, Mirror Lake Road, see significant traffic related to recreation. This has created a need to

give clear direction to those who come to Berlin Pond to observe wildlife, or otherwise use the roads around the pond (for running, hiking, dog-walking, etc.) with regard to parking and other activities.

While acknowledging a limited public desire on the part of some to boat, fish, or swim in the waters of Berlin Pond, these uses and associated activities are generally inconsistent with the seven Conservation Goals. Wildlife observation, while it certainly has the potential to harm plants and animals in the watershed and at the pond, is generally consistent with the seven Conservation Goals, provided visitors are prevented from visiting fragile areas or nest sites.

Recommended actions: Members of the Montpelier and Berlin Conservation Commissions, or their appointee, should periodically and regularly visit the pond to observe and talk with those using the area. A committee consisting of local residents, Conservation Commission members, wildlife observation enthusiasts, runners/walkers and representatives from other such groups should form to make recommendations to the Town of Berlin and City of Montpelier regarding parking areas and educational signage. The City of Montpelier, Town of Berlin, and other partners should also investigate the possibility of establishing and maintaining a nature trail with wildlife observation posts at appropriate locations around the Pond.

2. Manage recreational activities in upland.

The management of recreational activities in the upland watershed of Berlin Pond is under a number of jurisdictions, including the State of Vermont, Town of Berlin, and City of Montpelier, the Vermont Land Trust, and the Vermont Housing & Conservation Board. Land managers should develop thoughtful management plans for public properties and should communicate with one another with regards to management issues such as off road motor vehicles, mountain bikes, trails, and forest practices.

Recommended action: Berlin Conservation Commission and State of Vermont Department of Forests, Parks and Recreation, in consultation with the Vermont Housing & Conservation Board and the Vermont Land Trust, should develop or update management plans for public lands in the watershed.

V. Implementation

1. Coordinate and integrate SPP effort, water conservation effort, ecological protection efforts and land protection efforts.

There has been little coordination or communication between the several efforts and initiatives to protect and manage the resources of Berlin Pond and its watershed. It is

important to avoid redundancy in efforts or confrontations the inevitably result when groups attempt to take action at cross-purposes. For instance, the SPP recommends that the City of Montpelier apply for a conditional use permit that allows for increased water withdrawals from Berlin Pond, a recommendation that could have serious negative implications for the Berlin Pond natural area. There are many opportunities for groups and individuals to work together and coordinate the multi-benefit protection of the watershed.

Recommended actions: The Berlin and Montpelier Conservation Commissions should take the lead in devising ways to increase coordination and communication between the Source Protection Plan, the Berlin Pond Watershed Conservation Plan, the Montpelier Water Conservation Plan, and the Important Bird Area (IBA) Program. This could take the form of a series of meetings or an afternoon forum or conference. There should be formal efforts undertaken to involve watershed residents, citizens, and recreational users in these forums or meetings.

2. Secure funding for implementing the above.

Implementation of many of the actions and recommendations in this Plan will require funding and dedication of human resources.

Recommended actions: The two municipalities and various conservation and recreation groups should meet to discuss ways to pool efforts and share information, resources, and access to funds.

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