Prospect Lake/ Tod Creek Action Plan:
Protecting Water Quality in the Watershed

PHOTOS: SHELAGH LEVY

SAANICH PLANNING DEPARTMENT

ENDORSED BY COUNCIL AUGUST 14, 2001

Acknowledgements

This Action Plan could not have been undertaken without the contribution of time and effort by a large number of community members. Since the first meetings in 1995, residents have attended meetings, open houses, kitchen table discussions, and responded to questionnaires and inquiries. Long time residents have been an important source of community information.

We would like to express our appreciation to all those who have been involved. In particular, we appreciate the efforts of the group of residents who attended one or more of the Review Committee meetings, and who were able to help in the difficult task of making the final revisions to the strategy.

Rick Appleby
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Russ and Valerie Nielson
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Dave & Judy Wallace

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MESSAGE FROM THE CHAIR

The first meeting of what was to become the Review Committee for the Prospect Lake/Tod Creek Watershed Action Plan - Draft was called by Saanich Planning Department members, Pam Hartling and Adriane Pollard for October 27, 1999. The stated purpose was to meet and organize a committee for reviewing the draft plan which had been presented to the public at two general meetings held in May and September, 1999. The people present asked that the membership of the committee remain open and that we should attempt consensus as we discussed the issues of concern. Over the course of the next eight months we met usually every second week in order to discuss the plan, the issues brought up at the Public Meetings and issues arising as we worked. Approximately 50 people attended the meetings of the Review Committee, some only when we discussed areas of particular concern to them, but many on a regular basis.

The Draft Plan covered many issues relating to land use and water quality in the watershed. As we attempted to make sense of the actions outlined in the plan we realized that we needed to educate ourselves about the needs for and implications of some of the actions called for. To this end we invited various experts to come to our meetings and explain issues to us. These included Rick Nordin, Provincial limnologist from Ministry of Environment, Lands & Parks (MELP) who has been testing the water quality of the lake over a number of years, Erwin Dyck and Gary Gibson of the Capital Health Board to talk about septic systems, Jim Sandwith of Woodwyn farms to talk about agricultural methods that are sensitive to water quality protection, and Al Kohut, Manager of groundwater, MELP, who shocked us with the information that there is no comprehensive legislation (Act) to protect groundwater. This last concerned us as approximately 60% of the properties in the watershed rely on groundwater for domestic use.

With the information gained from these speakers as well as our own knowledge and research we have attempted to reach consensus on the recommendations in the plan. This involved some heavy discussion at times which was often resolved by further research or an invitation to an expert. The plan as it has evolved reflects the combined thoughts of the Review Committee members on the issues addressed. The most contentious issue is probably the amendment we propose for the Tree Preservation Bylaw. Some people feel the suggestions are too stringent and others feel they are not nearly strong enough to protect the environment we live in. The recommendations the plan proposes are middle of the road. Although the proposed set back from water courses originally caused concern the Development Permit proposal and the grandfathering clause seemed to answer these concerns to the satisfaction of most.

Our heartfelt thanks go to Pam Hartling and Adriane Pollard for their patience and understanding as we struggled to make the recommendations in this plan our own. Ongoing education is necessary to make our vision a reality, but we have come a long way under the tutelage of Pam and Adriane.

Mary Haig-Brown
Chair, Review Committee

1 Community Vision to the Year 2020

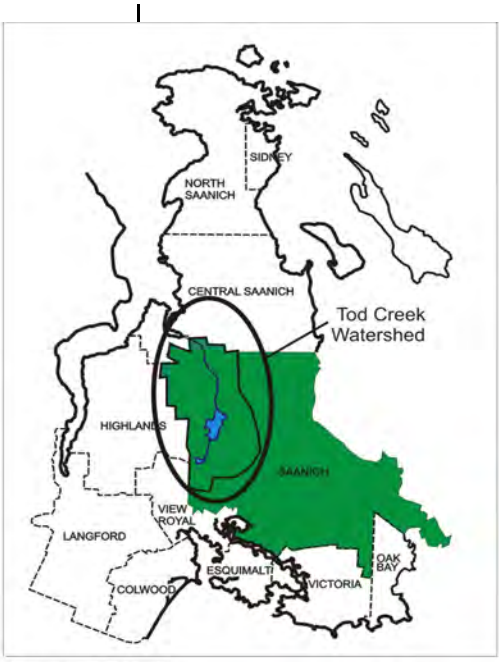
The Prospect Lake/Tod Creek Watershed remains a rural area with its accompanying peace and quiet. The forests are healthy and maturing, and native plants have replaced introduced ones. Natural park areas are maintained and enhanced, including a new natural park at Heal's Rifle Range. Activities at the Hartland Landfill are designed to have no negative impact on the watershed. Tod Creek is restored to its natural form and supports indigenous fish populations. Prospect Lake is clean – there is a high quality of on-site disposal so that no nutrients or coliforms enter the lake. Wildlife populations are flourishing. People are swimming, windsurfing, canoeing and kayaking. There is very little or no motorized boat traffic on the lake.

There are many small farms and some home-based businesses which provide a variety of products, services and work opportunities to residents. The youth centre and its outdoor sports area are popular with local teenagers. Some controlled residential development has occurred on non-farming property in the area, allowing more people to enjoy living in this rural setting. There is no high density development, and homes are built with little or no impact on the surrounding environment. The roads in the area have maintained their rural character. Traffic has not increased because of the presence of public transit. Trails adjacent to commuter routes and accessing park areas accommodate cyclists, pedestrians and horses.

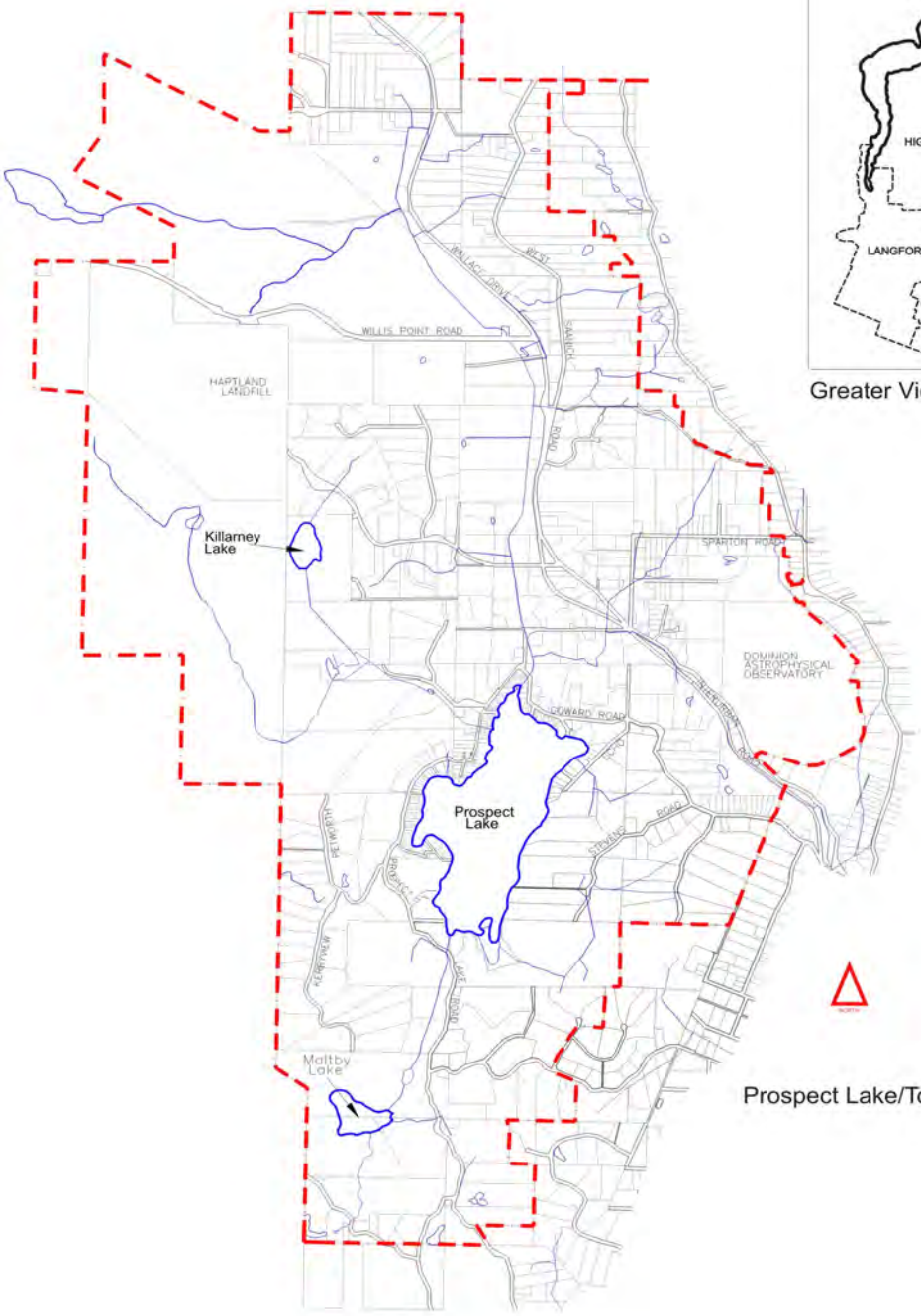
Many changes have occurred over the past 25 years to make the Prospect Lake/Tod Creek area a healthier watershed and more sustainable community with a high quality of life...and the Loon has returned.

This vision statement reflects ideas of workshop participants in 1995 and 1996, with a few revisions by the Review Committee in 1999.

The statement represents the broad desire of the participant group for the study area, and became a reference point for the more specific, detailed strategies which were to follow.



Greater Victoria



Prospect Lake/Tod Creek Watershed

Map 1

Study Area

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Rev: 01/02/09

2 The Action Planning Process

The Purpose of the Action Plan

The purpose of the Action Plan is to provide goals, objectives and strategies for land use within the watershed to protect and restore water quality. Improvements in water quality will take time, however, it is important that action begin as quickly as possible. The Implementation and Priorities section lays out the critical activities, lead organizations, and time lines for ensuring that progress will be made.

An Overview of the Process

In a letter dated October 11, 1994, the Prospect Lake and District Community Association outlined concerns about the decline in water quality in Prospect Lake. They requested that an action plan be undertaken using a watershed approach (see Appendix 1).

In 1995, Saanich Council endorsed a work program to identify issues and propose possible solutions to the Prospect Lake water quality problem. The project began in 1995 with a public involvement process that included eight public meetings, a youth workshop and questionnaires for business owners and agricultural operators. Between 1997 and 1999, the project was put on hold for the completion of an inventory of environmentally significant areas for all of Saanich. The atlas was completed in January 1999. A draft Action Plan was prepared, and presented at two public meetings/open houses in May and September 1999. The response from the community was strong - changes were requested to focus and simplify the plan, and to remove any unnecessary regulation.

An open Review Committee made up of local residents was established to advise the Planning Department on changes to the draft. Between October 1999 and June 2000, the Committee met 17 times to discuss the document. On June 6, the Committee endorsed a revised strategy. It was presented to the public at an open house on June 27, 2000. Appendix 2 provides a chronology of events and details of public notification.

A Watershed Approach

Water quality problems come from many sources, some around the lake, and others in the higher reaches of the watershed. There are many creeks that flow into Prospect Lake and they carry the excess nutrients and pollutants of the lands around them. If the intent is to protect and improve water quality in Prospect Lake, a watershed approach must be taken. The water quality of the creeks, and fish and wildlife habitat, can also be expected to benefit from the Action Plan.

See Appendix 3 for Frequently Asked Questions (FAQs).

The Saanich Environmentally Significant Areas Atlas, which was produced in 1999, is a snapshot in time. Errors in the data, watercourse locations, and watercourse names are being corrected to improve the atlas. The atlas is used as a flagging tool and staff are aware that what is actually 'on the ground' prevails.

Copies of the atlas are available for viewing at the Planning Department and public libraries.

Community Direction
The Review Committee identified principles to direct the second revision of the Action Plan:

- simplify the document
- add flexibility to measures
- focus to the key issues
- address water quality concerns not local area plan issues
- use a watershed approach
- make the watershed the basis for a local area plan
- prioritize actions
- balance regulation, education, and incentive.

3 The Prospect Lake/Tod Creek Watershed

General Description of the Watershed Study Area

Defining the Watershed Study Area
A watershed boundary follows the height of land and generally not property lines. The watershed boundary used for the purposes of this plan was modified slightly to correspond to property lines to enable the application of planning tools and techniques.

The Prospect Lake/Tod Creek Watershed is located in the north west portion of the District of Saanich within the Rural Saanich Local Area and outside the Urban Containment Boundary (see Map 1). While it is situated primarily in Saanich, its boundaries include portions outside Saanich's jurisdictions: the Districts of Highlands and Central Saanich.

The watershed in Saanich covers an area of 23 km² and drains into the Saanich Inlet via its main outflow, Tod Creek. There are approximately 21 kms of watercourses, 29 known wetlands, numerous ponds, and three lakes.

State of Water Quality in the Watershed

Watershed
The area of land, which may or may not be under forest cover, draining water, organic matter, dissolved nutrients, and sediments into a lake or stream. The topographic boundary, usually a height of land, that marks the dividing line from which surface streams flow in two different directions.

From existing research, Prospect Lake appears to be very fragile. Water quality problems have been inconsistently documented over the years, and identify Prospect Lake as eutrophic. This means that the lake is characterized by high levels of nutrients and low oxygen levels resulting in odours, algae blooms, excess aquatic plants and low biodiversity. It appears from data that the lake may have been eutrophic for over a century, which indicates a sensitivity to cultural modifications in the watershed. Phosphorous levels have been a recurring problem in the lake over the past few decades. Common sources of excess phosphorous are septic fields, animal waste, fertilizer, and detergent. The state of water quality in Prospect Lake has been an ongoing concern of residents and government agencies.

Tod Creek, the main stem and outflow from Prospect Lake, has been the subject of some study over the years. Water quality is affected by agricultural land use and the lack of riparian vegetation. The presence of livestock in the creek and lack of fencing is a concern. In addition to water quality, low summer flows and high water temperatures have negative impacts on fish and fish habitat.

The water quality of other watercourses in the watershed is equally significant because of the interconnectedness of the aquatic environment. Little data is available, although analysis of sampling of inflow streams by the provincial limnologist (lake specialist) of the Minsitry of Environment, Lands and Parks is expected to be available later in 2001.

Water quality is the basis for every objective, strategy and action in this plan. Water quality is a reflection of the condition of the environment of the watershed. Any improvements to water quality will also be expected to result in improvements to fish populations, habitat, and biodiversity.

The following paragraphs examine the condition of the watershed, as it pertains to water quality, from a number of sources: the Saanich Environmentally Significant Areas Atlas, recent research reports and government publications, local community members, and government specialists.

Watershed Condition

Riparian Areas

In any watershed, the loss of the natural buffer along watercourses, including riparian vegetation and trees, contributes to declining water quality. In the Prospect Lake/Tod Creek Watershed, 35% of the riparian areas along streams have little-to-no riparian vegetation (see Figure 1). Around Prospect Lake, 34% of properties on Prospect Lake have little-to-no riparian vegetation.

Riparian areas are those connected with or immediately adjacent to the banks of a stream or other body of water.

These areas are where the vegetation and microclimate conditions are products of the combined presence and influence of perennial and/or intermittent water, associated high water tables, and soils that exhibit some wetness characteristics.

Figure 1: State of Riparian Vegetation in the Watershed

	Vegetation largely intact	More than half vegetated	Less than half vegetated	Almost no vegetation
Streams (by length)	15%	31%	19%	35%
Prospect Lake waterfront (by property)	17%	15%	34%	34%
Other lakes	100%	0%	0%	0%

*data summarized from the 1997 ESA inventory; figures are approximate

In 1998, the Environmental Atlas inventory team walked most of the streams and rowed past shoreline properties and noted many contributing factors to water quality problems: garden debris, livestock in streams, fill, riding rings, blasting, draining of wetlands, channelization, lack of overhanging vegetation, erosion, run-off from stables and roads, garbage, trails, culverts, pipes, and clearing of riparian vegetation. Occasionally, some restoration works and pristine vegetation were noted.

Biodiversity is the variety, distribution, and abundance of different plants, animals, and micro-organisms, the ecological functions and the process they perform, and the genetic diversity they contain at local, regional, or landscape levels of analysis.

Diversity is a measure of the complexity of an ecosystem; older, more stable communities have higher diversity.

Wetlands

Wetlands, like riparian areas, are important to biodiversity. Wetlands are also important to water quality as they store, cool, and purify water. Freshwater wetlands are often classified as bogs, fens, swamps, marshes, and open water. Left in their natural state, wetlands have considerable influence on the state of water quality in a watershed.

In the Prospect Lake/Tod Creek watershed, there are 29 mapped wetlands, and many more unmapped. Most of Prospect Lake itself can be considered an open water wetland as submerged vegetation can be found in its shallow waters. Most of the wetlands that are connected to a lake or watercourse system are marshes dominated by rushes and submerged vegetation. Most of the pocket wetlands in upland areas are swamps and are characterized by shrubs and trees that thrive in moist soils.

Groundwater

Not much information is available on the quality or quantity of groundwater in the watershed, or the geography of the aquifer. There is no licensing required for groundwater use in British Columbia, and no groundwater legislation. Groundwater provides as many as 60% of properties in the watershed with drinking water. Several property owners have reported contamination of their wells. One source of contamination is known to be farm animal waste within the well capture area.

Lakefront Development and Impervious Cover

Impervious cover is a layer of hard surface that promotes run-off rather than infiltration of water into the soil. While natural rock outcrops and bedrock are impervious cover, they are not used in calculating percent impervious cover or assessing impacts. Impervious cover can be:

- a roof of a house or shed
- a driveway, path, or patio
- compacted soils.

Although impervious surfaces themselves do no generate pollution, they are the major contributor to the change in the hydrological cycle that drives many of the physical changes affecting streams.

Small lot subdivision around Prospect Lake dates back to the early 1900s, prior to the application of zoning. Few new lots have been created in the past 15 years; subdivision has resulted in the registration of only six waterfront lots around Prospect Lake in this time period. However, the trend toward redevelopment of the small lakefront lots and its impact on water quality is a concern. This trend to replace small cottages with large permanent residences is demonstrated in building permit data and through community observation.

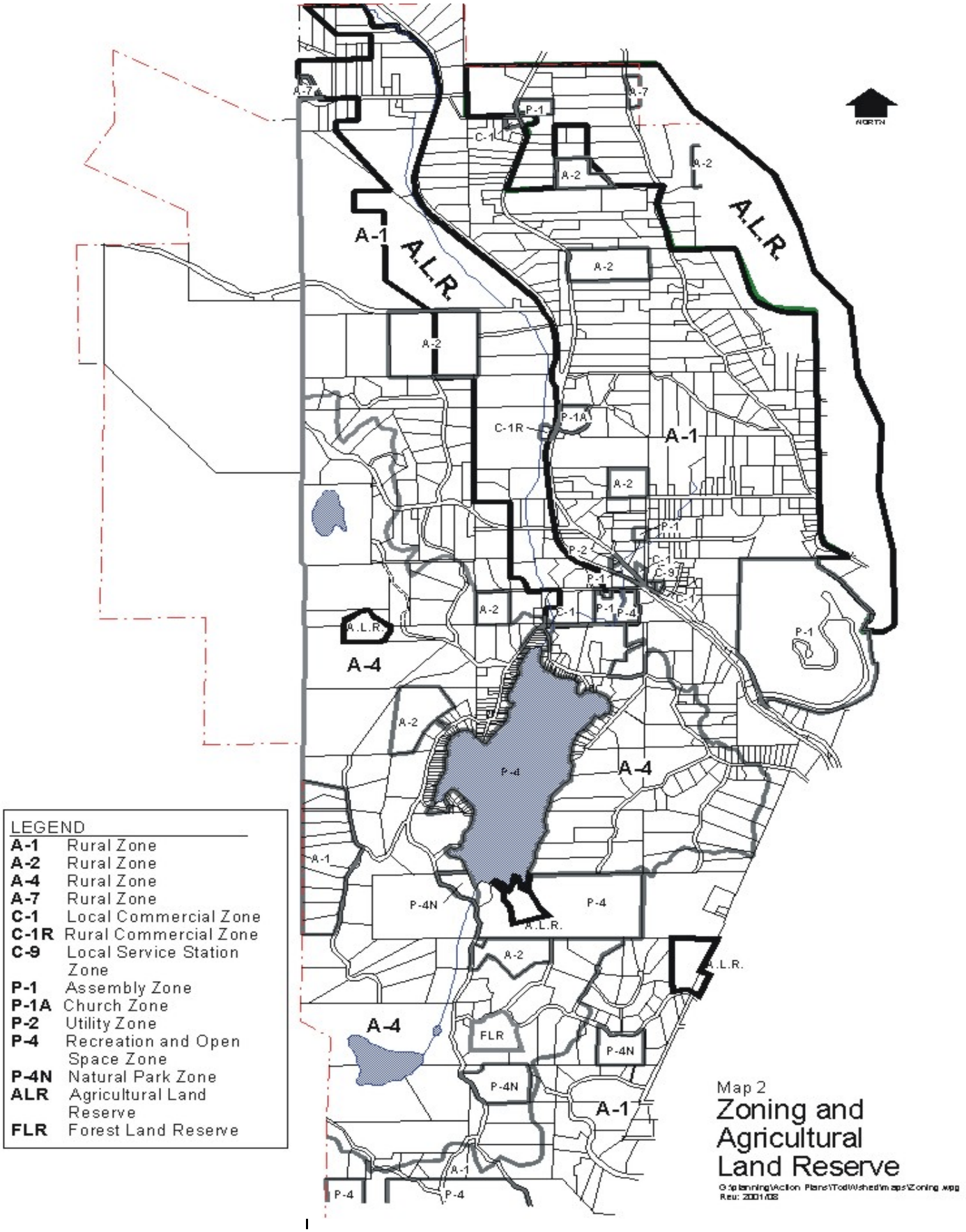
Generally, the loss of natural vegetative cover due to development and the associated use of hard surfacing (impervious cover) contribute to poor water quality. This is a particular concern around Prospect Lake because of slope and soil conditions. While a comprehensive study of impervious cover for the lakefront has not been undertaken, a preliminary study has shown that most properties range between 25-35% impervious cover. Some properties exceeding this value have extensive driveways and parking areas.

Land Use

Land use in the watershed is primarily rural residential and agricultural with some commercial "nodes" (see Map 2). Typical lot sizes vary from 500 m^2 lots around Prospect Lake to 2 ha to 4 ha rural lots and larger.

Land development policy has been relatively effective at keeping land use in the watershed "rural" and minimizing urban growth pressures. As a result of the Urban Containment Boundary (UCB) and the Agricultural Land Reserve (ALR), subdivision and rural servicing are limited and lands designated "agricultural" are protected.

Zoning throughout the watershed allows for a wide range of rural residential and agricultural uses. While this provides opportunities for large rural lots, it is not appropriate for the small lots fronting Prospect Lake where agricultural practices such as the keeping of animals can put added strain on water quality.



Map 2
Zoning and Agricultural Land Reserve

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Rev: 2001/08

Agriculture is the primary resource-based economic activity in the watershed. There were 62 properties assessed "farm" according to BC Assessment data for 1997 and of these, over half were in the ALR (see Map 2). Farms in the watershed tend toward small farm sizes and low farm sales.

Upland Vegetative Cover

Upland Vegetative Cover is natural forest cover within the watershed. This includes all trees and other plants (including ground cover) occupying a forest site.

Upland vegetative cover in a watershed is important to water quality in terms of purification, storage, and other key components of the hydrological cycle. Conversely, disturbed lands contribute to pollution and excess run-off reaching tributaries and Prospect Lake. While there are large expanses of agricultural lands, the majority of the Prospect Lake/Tod Creek watershed is mixed and coniferous forest interspersed with Garry oak meadows and rock outcrops.

In the upland areas and away from Prospect Lake, properties are generally larger and the percentage of impervious cover is far lower. It is important to maintain this ratio. Recent research indicates a strong link exists between total impervious cover and degradation (of form and function) of streams and wetland ecosystems, particularly fish habitat. The research indicates that the degradation threshold is passed at about 5 to 10% watershed impervious cover (May et al, 1997, and Booth and Jackson, 1997).

4 Objectives and Strategies

The goal of the Action Plan is to provide a set of measures to protect and improve declining water quality in the Prospect Lake/Tod Creek Watershed.

Through the work of the Review Committee, four objectives were identified:

A Maintain and Restore Riparian Areas
B. Support Community Stewardship Education
C. Keep Nutrients and Pollutants out of Surface and Groundwater
D. Minimize Run-off into Watercourses

The following recommended strategies represent the key activities needed to see an improvement in water quality in the watershed. Section 5 described the implementation and priorities for these recommended activities.

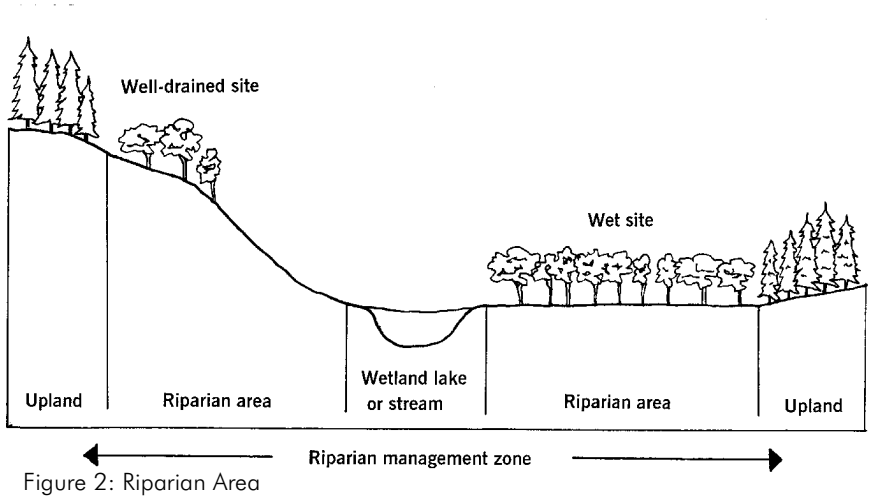


Figure 2: Riparian Area

Many strategies involve simply increasing the coverage of existing bylaws from a limited number of watercourses, to all watercourses. This single action will go a long way in improving water quality and simplifying standards for property owners.

The Watercourse Bylaw (Saanich Bylaw No. 7502) defines a watercourse as:

(i) a river, stream, creek, waterway, lagoon, lake, spring, swamp, marsh or other natural body of fresh water, or

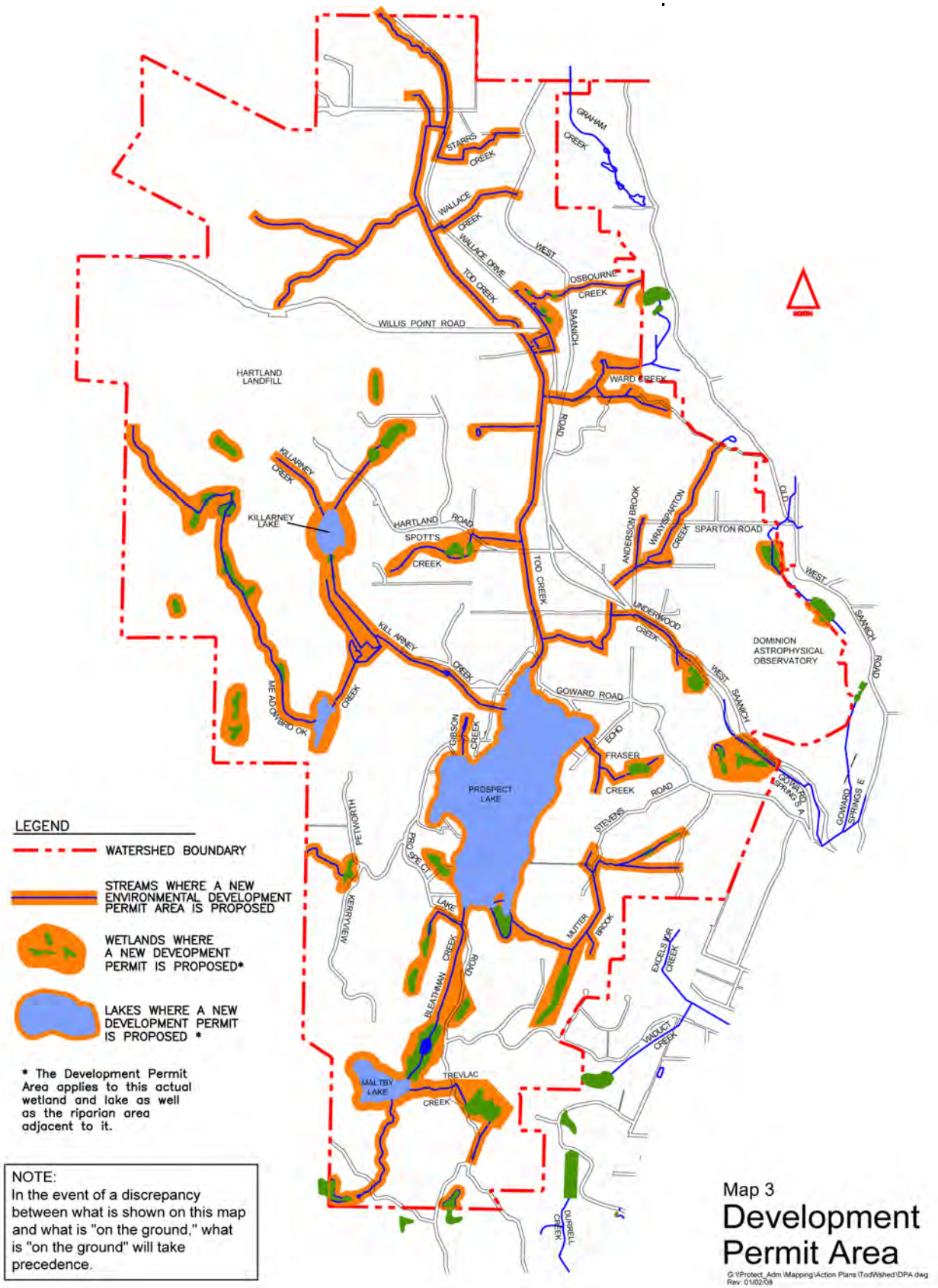
(ii) a canal, ditch, reservoir or other man-made surface features

in which water flows constantly, intermittently or at any time.

Objective A

Maintain and Restore Riparian Areas

Riparian areas are located beside creeks, lakes, and wetlands and are distinguished by their vegetation as a reflection of soil moisture, slope, microclimate, and other factors. These areas of transition from watercourse to upland have a direct influence on the health of the aquatic environment. In themselves, riparian areas are noted for their high biodiversity (varieties and combinations of plants and animals) and are considered highly vulnerable to alteration. As shown in Figure 2, the adjacent upland area needs to be managed as well because it affects the health of the riparian vegetation and, therefore, water quality.


LEGEND
WATERSHED BOUNDARY
STREAMS WHERE A NEW ENVIRONMENTAL DEVELOPMENT PERMIT AREA IS PROPOSED
WETLANDS WHERE A NEW DEVEOPMENT PERMIT IS PROPOSED*
LAKES WHERE A NEW DEVELOPMENT PERMIT IS PROPOSED *
* The Development Permit Area applies to this actual wetland and lake as well as the riparian area adjacent to it.
NOTE:
In the event of a discrepancy between what is shown on this map and what is "on the ground," what is "on the ground" will take precedence.
Map 3
Development Permit Area
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Rev: 01/02/08
PROSPECT LAKE
KILLARNEY LAKE
MALTBY LAKE
HARTLAND LANDFILL
WILLIS POINT ROAD
HARTLAND ROAD
SPARTON ROAD
GOWARD ROAD
WEST SAANICH ROAD
DOMINION ASTROPHYSICAL OBSERVATORY
STARRS CREEK
GRAHAM CREEK
WALLACE CREEK
WALLACE DRIVE
TOD CREEK
OSBOURNE CREEK
WARD CREEK
KILLARNEY CREEK
SPOTT'S CREEK
ANDERSON BROOK
WRANSPARTON CREEK
UNDERWOOD CREEK
MEADOWBROOK CREEK
GIBSON CREEK
ECHO
FRASER CREEK
STEVENS ROAD
PETWORTH
HERRIVIEW
MUTTER BROOK
EXCELSIOR CREEK
BLEATHMAN CREEK
VIADUCT CREEK
TREVLAC CREEK
DURRELL CREEK
GOWARD SPRINGS E
GOWARD SPRINGS A

A healthy riparian area acts to protect water quality in many ways, such as:

- holding soils in place and keeping sediments out of the water
- filtering pollutants in the surface and subsurface flows of water
- keeping the water cool to control algae production
- naturally promoting evaporation and infiltration and reducing run-off to watercourses.

Strategy 1 Establish a Development Permit Area (DPA)

The Development Permit Area (DPA) is a regulatory tool which allows a close look to be taken at the areas next to important natural features such as streams, lakes, and wetlands when development occurs. It provides some flexibility in the way that a desired result is achieved and it involves approval of Council. Several other jurisdictions including District of Highlands, Kelowna, Nanaimo and the District of North Vancouver, use Development Permit Areas to set development standards to protect Environmentally Sensitive Areas.

The recommended Development Permit Area would apply when a building permit is required for some types of construction, alteration or addition, and with a rezoning or subdivision application (see Appendix 5). The DPA would apply to areas within properties containing the set of inventoried streams, lakes and wetlands identified in the community planning process (see Map 3). Based on characteristics of the watercourses, they were defined as either "major" or "minor." The Development Permit Area guidelines for the 30 m impacted area are summarized below (the full text is in Appendix 5):

- allows flexibility based on site conditions
- sets a goal of a 15 m or more buffer for major watercourses and lakes
- sets a goal of a 7.5 m or more buffer for minor watercourses and wetlands
- requires protection and restoration of riparian vegetation
- exemptions for some minor renovations and landscaping
- a reduced fee for an environmental DPA
- agricultural activity in the Agricultural Land Reserve is exempt.

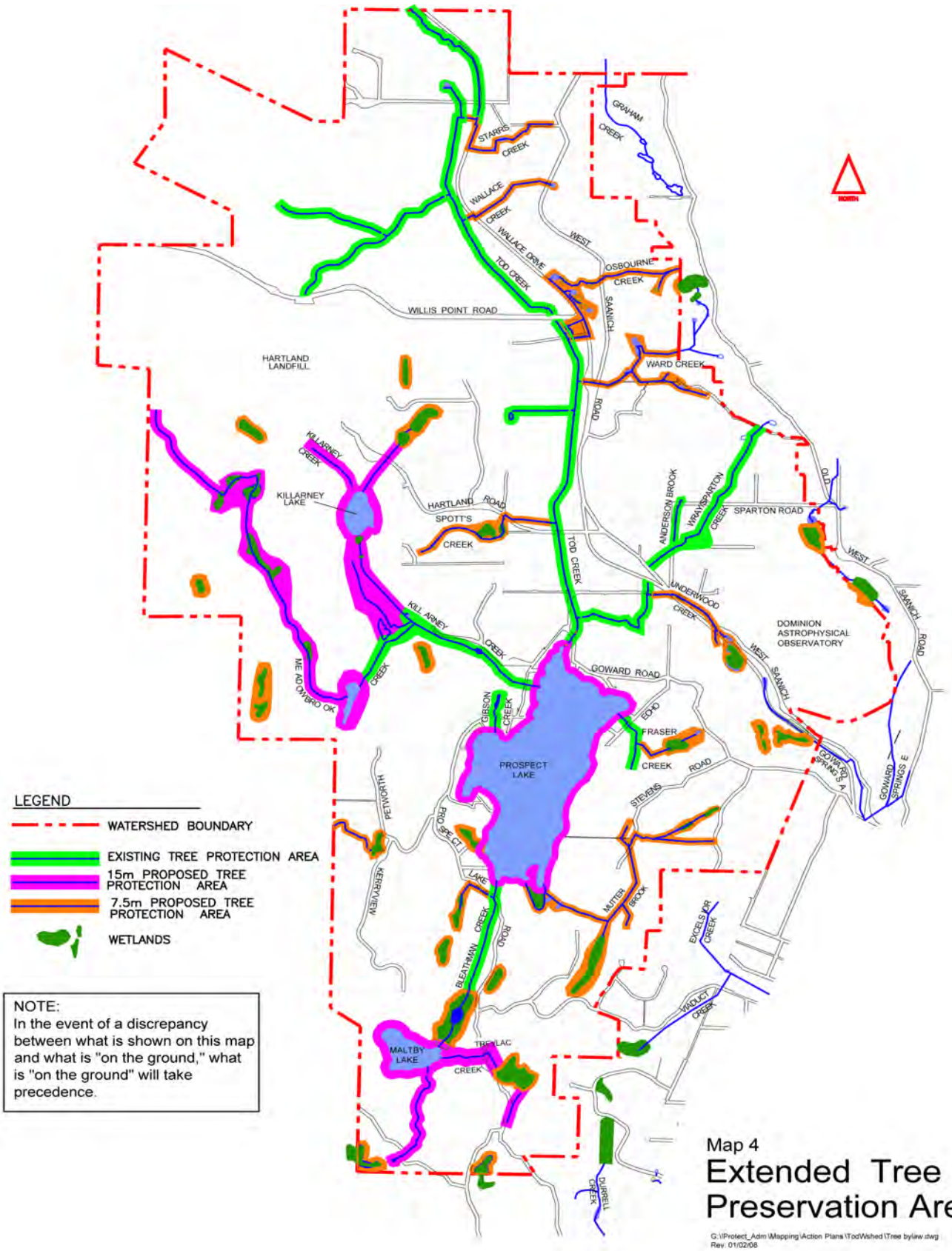
There are a couple of limitations to a DPA: it applies *only* to the inventoried watercourses (although bylaw amendments could allow future additions, deletions or changes); and it applies *only* to new construction.

The Review Committee strongly recommends a reduced fee for this environmental DPA due to hardship, and because protection of watercourses will benefit the wider community. They also felt a lower fee was an important incentive in encouraging property owners to comply. Examples of this are the City of Victoria where no fee is required, Nanaimo where a fee of $100 is assessed for single family lots or for stream enhancement projects, and the Highlands where the fee is $250.

New Streamside Regulations
The new Streamside Protection Regulation of the Fish Protection Act, passed by Cabinet on January 19, 2001, requires local governments to establish streamside protection and enhancement areas within five years of the enactment of the regulation. It is expected that this Plan will go a long way to meeting the expectations of these new regulations.

Major vs Minor Watercourses
The Review Committee was supportive of protecting watercourses but felt the smaller and often ephemeral (seasonal) streams did not warrant the same buffer as larger streams. Major streams were defined as those which flow year round most years, whereas minor streams were defined as those which did not flow year round.

Major watercourses are identified as Tod Creek, Meadowbrook Creek, Killarney Creek, Bleathman Creek, Trevlac Creek, Prospect Lake, Killarney Lake and Maltby Lake. Minor watercourses are all others identified in Map 3.


LEGEND
WATERSHED BOUNDARY
EXISTING TREE PROTECTION AREA
15m PROPOSED TREE PROTECTION AREA
7.5m PROPOSED TREE PROTECTION AREA
WETLANDS
NOTE:
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NORTH
GRAHAM CREEK
STARRS CREEK
WALLACE CREEK
WALLACE DRIVE
WEST
OSBOURNE CREEK
TOD CREEK
WILLIS POINT ROAD
SAANICH
HARTLAND LANDFILL
WARD CREEK
KILLARNEY CREEK
KILLARNEY LAKE
HARTLAND ROAD
SPOTT'S CREEK
ANDERSON BROOK
WRAY/SPARTON CREEK
SPARTON ROAD
OLD
WEST SAANICH ROAD
UNDERWOOD CREEK
DOMINION ASTROPHYSICAL OBSERVATORY
MEADOWBROOK CREEK
GOWARD ROAD
GIBSON CREEK
EOHD
FRASER CREEK
PROSPECT LAKE
STEVENS ROAD
GOWARD SPRINGS
PROSPECT LAKE
KEREYAVIEW
MUTTER BROOK
EXCELSIOR CREEK
BLEATHMAN CREEK
VIADUCT CREEK
MALTBY LAKE
TRE-LAC CREEK
DURRELL CREEK
Map 4
Extended Tree Preservation Areas
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Rev: 01/02/08

Strategy 2 Extend the coverage of the Tree Preservation Bylaw

The Tree Preservation Bylaw recognizes the importance of trees in riparian areas, but not all riparian areas in the watershed are currently covered by the bylaw. The bylaw applies only to those watercourses identified in the Watercourse Bylaw (Schedule B).

The purpose of the strategy is to keep the riparian area intact as much as possible for bank stability, maintaining water temperature, filtering run-off, and minimizing erosion. The proposed amendment would extend coverage of an amended tree bylaw to all inventoried streams, lakes and wetlands as shown in Map 4.

The following activity is recommended:

- prohibit tree cutting without a permit within 15 m of major watercourses and lakes, and 7.5 m of minor watercourses and wetlands
- include saplings in the definition of "trees" to protect new growth
- create an exemption for tree cutting for ecosystem management, within the allowable annual quota
- agricultural activity in the Agricultural Land Reserve is exempt..

Strategy Implementation
Adoption of this plan is only a first step. Implementation of specific bylaw amendments will require further public consultation through the bylaw amendment process which can include advertisements, public meetings, Committee of the Whole, and public hearings. This process can provide for further fine tuning of policy and regulations.

Strategy 3 Offer a property tax incentive

There is potential for tax relief to property owners who dedicate the riparian parts of their property to conservation trusts. No other municipality is using this tool in this manner although a number are considering it. North Vancouver has several properties under conservation covenant.

It is recommended that a property tax exemption program for riparian areas be initiated that would:

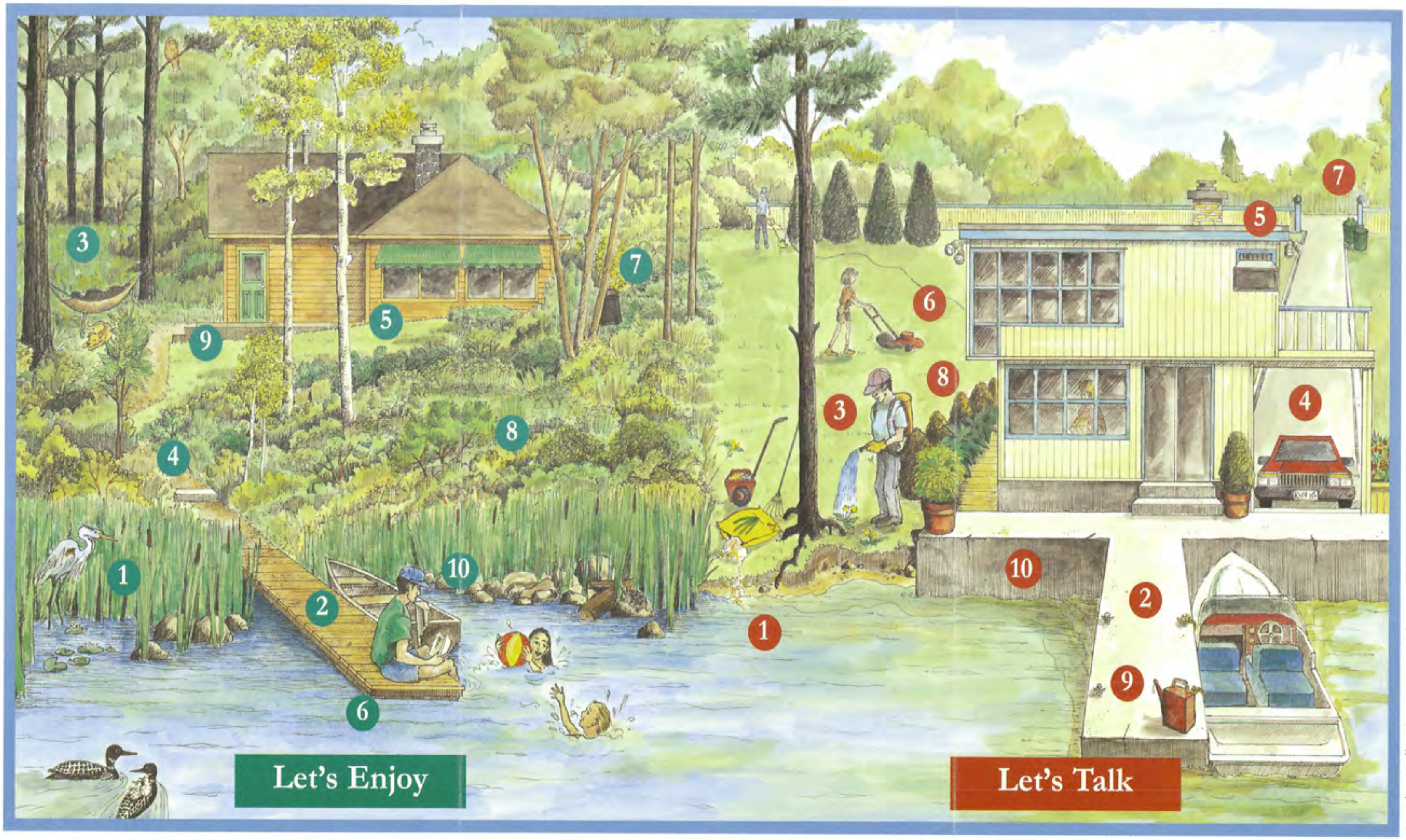
- offer a tax break for the portion of the property in an riparian area
- be subject to a conservation covenant (held by a land trust).

Because there is no precedent for this tool, tax, liability and property assessment issues would need to be assessed.

Objective B

Support Community Stewardship Education

Community education about stewardship will provide landowners in the Prospect Lake/Tod Creek watershed opportunities to increase their awareness and understanding of maintaining and enhancing the natural environments on their properties. Through stewardship education, the community will be able to participate actively to protect and restore riparian areas, lakes, and stream water quality.



1. Natural shoreline — great wildlife habitat.
2. Small floating dock — low impact on "ribbon of life."
3. Septic system far from the shore — reduces water pollution.
4. Narrow, gravelled footpath — less chance of erosion.
5. Trimmed trees and adjustable awnings — natural air conditioning with view maintained.
6. You work less — relax more!
7. Kitchen compost — improves your soil's quality.
8. Low-maintenance native plants — provide shoreline buffer.
9. Building — set back from shore and in character with setting.
10. Well-maintained motor — electric, or modern 4-stroke outboard, operated with low wake near shore.

1. Bare shoreline — subject to erosion.
2. Solid dock — destroys wildlife habitat, alters currents, causes erosion elsewhere.
3. Fertilizer spills and chemical run-off from lawn — damage water quality.
4. Paved lane — pollution-laden runoff flows to water.
5. No shade trees — overworked air conditioner adds to electric bill.
6. Removal of natural vegetation — more work for you and more runoff.
7. Collecting lawn clippings — deprives soil of nutrients.
8. Ornamental shrubs — require chemicals and extra work.
9. Poor fuel management — spills are deadly.
10. Hardened shoreline — eliminates "natural filter," degrades water quality, and blocks wildlife access.

Strategy 4 Promote Stewardship through "Awareness Zone" Program

Community education is vital because protection of the environment through regulation is limited. Increasing community understanding and awareness is the foundation to a successful Action Plan. Saanich has an Environmental Education Officer who can lead such initiatives and work with the community on completing a strategic plan.

It is recommended that an Awareness Zone education program be initiated that would include the following elements:

- a stewardship and education program on protecting the riparian area including vegetation not protected under the Local Government Act
- an identified 30 m "awareness zone" for all streams, lakes and wetlands
- a community conservation stewardship group
- education and training for bylaw enforcement and other municipal staff.

Community outreach would be supported with promotional material such as brochures and signs. Figure 3 is a brochure produced by the Living by the Water Project and clearly illustrates the benefits of riparian stewardship.

Stewardship is caring for the land and associated resources so that healthy ecosystems can be passed on to future generations.

Strategy 5 Develop a community stewardship water testing program

A comprehensive community testing program will give more confidence to implementing strategies in the Action Plan that minimize pollution, and increase awareness by community members. The data gathered will provide important information about the source of contaminants and how to tailor solutions (see also Strategy 7).

It is recommended that a community testing program be supported that would include:

- continued water quality sampling at Prospect Lake and inflows by community stewardship group to determine sources of pollution
- nutrient testing at septic fields, visual analysis, and random septic system testing
- promoting stewardship of surface and groundwater through a "pledge" as part of the Awareness Zone program.

The provincial limnologist hopes to expand his previous work with community volunteers to test water quality at Prospect Lake and its inflows. Limited budgets will require additional financial support.

Stewardship Water Sampling
Nutrient testing by provincial limnologist Rick Nordin and volunteer Art Dimock includes samples for bacteriology (coliforms and fecal streptococcus) and water chemistry (nitrogen, ammonia, total N, dissolved and total phosphorous, and some heavy metals).

Strategy 6 Support stewardship by agricultural producers

Good farm management planning and implementation of sustainable farming techniques are supported. It is recommended that the following activities be supported:

- community education including demonstration farms by stewardship groups
- completion of farm management plans
- distribution of best farm practices information.

Objective C

Keep Nutrients and Pollutants out of Surface and Groundwater

Eutrophication is the natural, but more commonly, human-induced addition of nutrients (especially nitrogen and phosphorous) to a body of water, resulting in high organic production rates that may overcome the natural self-purification process.

Eutrophication produces several undesirable effects, including algal blooms, seasonally low oxygen levels, and reduced survival opportunities for fish and invertebrates. Excess nutrient inputs are frequently derived from sources of pollution on the adjacent lands.

Nutrients, mainly phosphorus and nitrogen, can cause water quality problems. Phosphorus has been identified as the nutrient in Prospect Lake affecting water quality. The Ministry of Environment recommends that phosphorous levels be reduced in Prospect Lake. Excess nutrients can cause:

- excessive aquatic plant and algae growth
- low oxygen, which causes odours
- low oxygen, which reduces survival of fish and other aquatic life
- eutrophication.

Prospect Lake has been identified as a eutrophic lake and is sensitive to excess nutrients. Phosphorous levels in the lake have exceeded standards for aquatic life, drinking water and recreational use many times in the past (see Appendix 4). Figure 4 shows sources of non-point pollution that can degrade water quality. The potential sources of nutrients that enter Prospect Lake or its inflow streams are:

- septic systems (eventually, nutrients from all septic tanks will reach adjacent waterbodies)
- lawn or agricultural fertilizers
- pet or livestock waste
- decomposing grass clippings and leaves
- detergents from sources such as laundry and car washing soaps.

The following strategies will help to keep new contaminants from entering Prospect Lake, Tod Creek and their inflow streams. This is an important step in giving the watercourses an opportunity to restore themselves.

The District of Muskoka in Ontario, is known for its many lakes surrounded by cottages and forests. Using the principle that all nutrients in the soil of the watershed will eventually reach a waterbody, Muskoka has placed limits to development specific to each lake's characteristics. This limits the number of new lots and allows comprehensive site plan control during development.

Nonpoint Source Pollution

Urban Runoff

Pet wastes, yard debris, paints, vehicle emissions, used or unwanted motor vehicle fluids, car-washing residues, oil and grease from driveways and roadways, litter, fertilizers, pesticides, and household hazardous chemicals are some urban pollutants that can be carried by water running over land and paved surfaces. This water can flow into storm drains and reach local waterbodies, without being treated in any way.

Agriculture

Fertilizers, herbicides, pesticides, along with parasites and bacteria from livestock waste can run off farmland and pollute surface water or seep into the ground and pollute groundwater. Livestock movement near and in streams can erode stream banks and destroy fish habitat.

Onsite Sewage Systems

Onsite sewage systems which are not properly maintained can cause drainfields to become plugged and cause partially treated wastewater to surface on your lawn and/or flow to nearby waterbodies. Wastewater from improperly constructed or located sewage systems can also pollute groundwater.

Our Actions All Add Up!

Boating

Sewage, garbage, dishwater, cleaning and refinishing products, and fuel leaks from boats can all damage water quality.

Strategy 7 Stop nutrients from septic systems from entering watercourses

It is highly probable that effluent from on-site septic systems is a major contributor to poor water quality at Prospect Lake and its inflows. The extent of the problem is not known as there is no data with which to quantify it. Data collection is an important step toward determining a solution to the septic system problem. Water quality testing is needed to determine the source and location of nutrients, and septic system testing is needed to determine how many systems are malfunctioning.

Shared Responsibility
Improving a septic system problem around Prospect Lake and its inflows is a shared responsibility among the Ministry of Health, Capital Health Region, the District of Saanich, and local residents. Cooperation between jurisdictions, education, and voluntary action are needed to address gaps in the application of existing legislation.

Some nutrient testing has been done on Prospect Lake and its inflows by Rick Nordin, the Ministry of Environment's limnologist, along with a community volunteer. The results of the testing which began in 1998 are expected to be available soon (2001). A community water quality committee formed from the Review Committee has met with the provincial limnologist and outlined a plan for further testing pending funding.

A series of measures are proposed that are designed to keep nutrients from septic fields from entering watercourses. The measures taken will be based on results of nutrient testing described in Strategy 5. This is a long term goal which requires immediate action.

The following activities are recommended:

- amend the Watercourse Bylaw to include "excess nutrients" as a pollutant
- based on nutrient testing results, consider responses including one or more of the following depending on the severity of the problem:
    a) for *new and upgraded septic systems*, create Best Management Practices (BMPs)that might include:
        - amending the Subdivision Bylaw to include new standards for on-site sewage disposal (Local Gov't Act s. 747.1 (d))
        - amending the Building Code to require a higher minimum standard for on-site sewage disposal (Local Gov't Act s. 694.1 (b))
        - lobbying to have the Ministry of Health adopt higher minimum standards; AND/OR

    b) for *existing septic systems*, create Best Management Practices (BMPs) that might include:
        - developing a Maintenance Bylaw pilot project for the area around Prospect Lake to require regular pumping of septic tanks (Local Gov't Act s. 550)
        - a public information campaign on proper use and functioning
        - support for a dye test program; OR

    c) investigate the possibility of a community collection system for the Prospect Lake lots such as a small-pipe, closed loop system (see Appendix 6).

Excess nutrients means nutrients in high concentrations that have a negative affect on water quality.

Nutrient Testing and CHR
The mandate of the Capital Health Region (CHR) is to control pathogenic bacteria (fecal coliform) for the protection of public health. There is no mandate to test for other nutrients coming from septic systems which may be concentrated enough to cause a negative impact on water quality. Dye testing by CHR is only partially effective in addressing water quality impacts from septic systems.

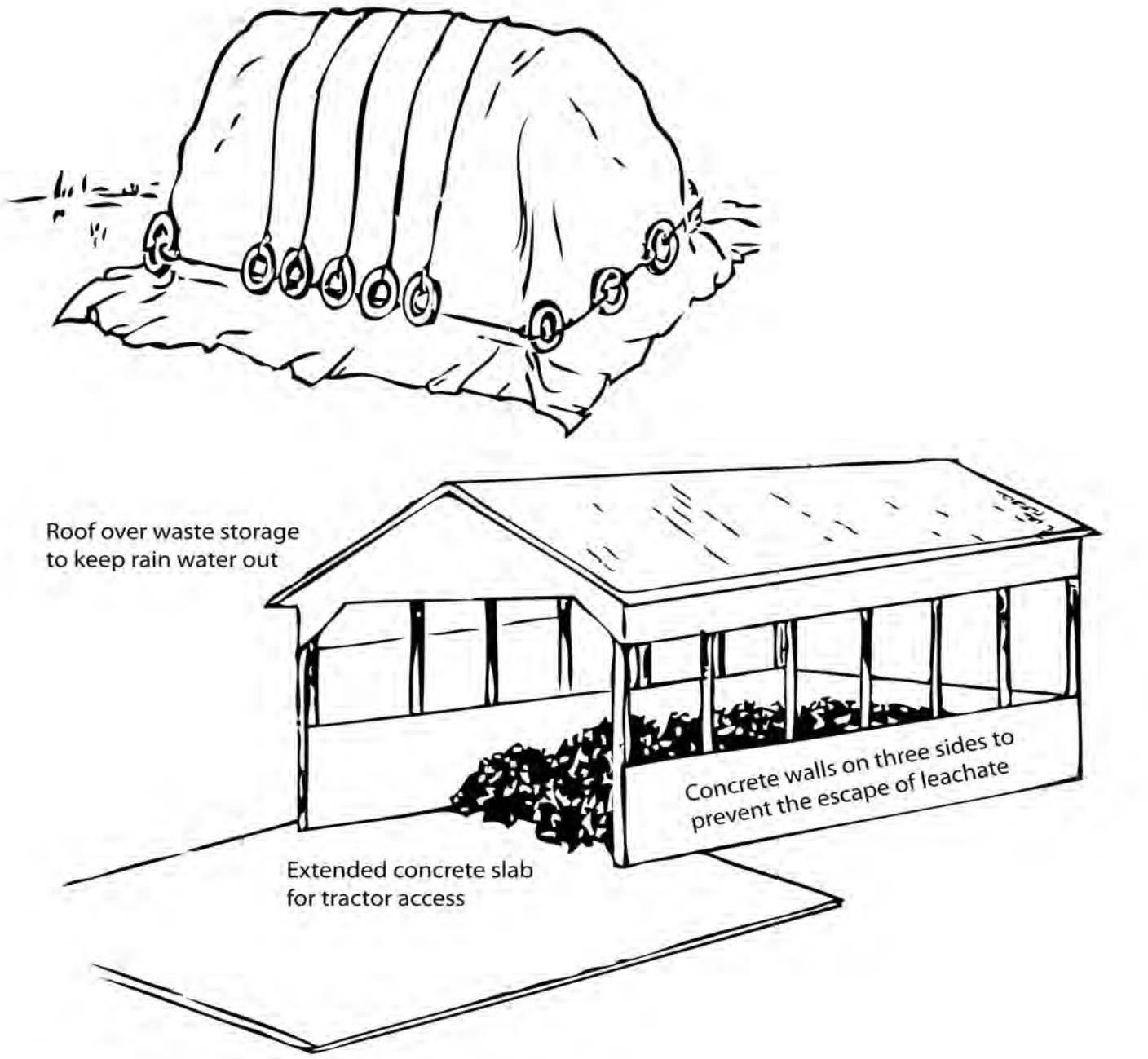


Figure 5: Manure Storage Facilities
Source: "An Introduction to Handling Horse Manure"
Hourse Council of British Columbia, BC Ministry of Agriculture

Strategy 8 Reduce impact from agricultural waste

Another source of nutrients is agricultural waste. As many as 60% of properties in the watershed rely on groundwater for drinking water. Contamination of wells and groundwater by livestock can be a difficult and expensive problem to fix. Several properties are experiencing this problem and are forced to rely on bottled water. The source of the problem is often the density of livestock and their proximity to a well capture area.

Poor or poorly located manure storage is part of the issue. Stored manure is highly concentrated and toxic. If not properly stored, it can leach into surface and groundwater (see Figure 5).

The following actions are recommended:

- set up task force on agriculture within the watershed
- consider amending the Animal Bylaw to control the density of livestock
- consider farm bylaws to control manure storage, and work to keep livestock out of watercourses
- support the agricultural industry's adherence to the provincial Code of Agricultural Practices and the Environmental Guidelines for Waste Management.

Docks
Docks have been the subject of many recent discussions between municipalities, non-governmental organizations, Fisheries and Oceans Canada, and the Ministry of Environment, Lands, and Parks. The main issues are the cumulative impacts to water quality, habitat, and passive recreation.

Docks are controlled by many jurisdictions. First, a dock affects the surface of a waterway and is therefore subject to the Navigable Waters Protection Act. An approval is required by the Coast Guard. The application is referred to Fisheries and Oceans Canada or Environment Canada for an assessment of impacts to habitat. Second, depending on who owns the foreshore, the municipality may prohibit structures (such as dock footings). In Saanich, this has been applied only to marine waters. Finally, if the dock has footings on a lake bed owned by the province, then provincial approval is required as well.

Objective D Minimize Run-off into Watercourses

In a natural forested ecosystem, there is virtually no run-off or sediment reaching watercourses. Once trees and other vegetation are removed - and more so when impervious cover is added - run-off increases dramatically. Excess run-off scours creeks, and the sediment erode banks, cover fish habitat, and carry pollutants held in the soil. Since the water is moving quickly off the land, excess run-off is associated with flooding after rains and dry streams in the summer.

Impervious cover increases run-off and pollutants reaching water bodies. There is a direct correlation between an increase in impervious cover in a watershed, and the success of fish reproduction and overall stream health. Recent research indicates that impacts begin when a watershed exceeds 10% impervious cover (see Figure 6). Controlling impervious cover and reducing the opportunities for run-off are important parts of the strategy.

Strategy 9 Apply building setbacks to more watercourses

The purpose of building setbacks is to keep impervious surfaces (roof, driveway, patio) and household pollutants away from watercourses and to allow room for a healthy riparian area. The Zoning Bylaw applies building setbacks to those watercourses identified in the Watercourse Bylaw. The list of watercourses, however, is limited and many others are omitted.

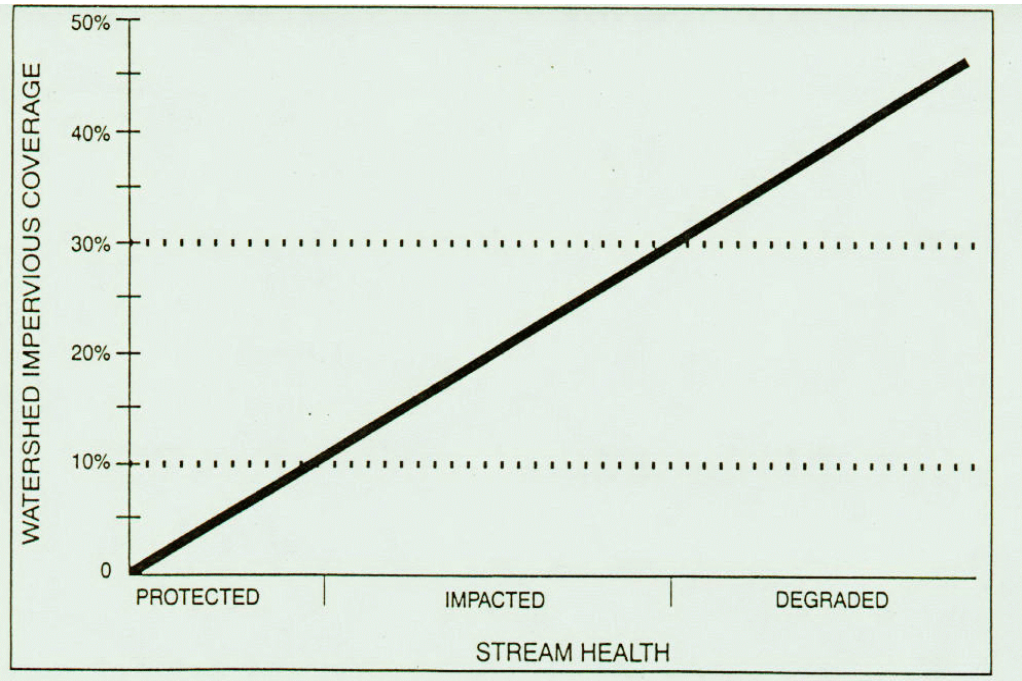


Figure 13: Relationship of imperviousness to stream health
Source: Journal of American Planning Association 1996

This strategy would amend the bylaw to apply to all inventoried watercourses, including lakes and wetlands (see Map 5). Structures sited within a setback or proposed setback would become non-complying, or "grandfathered." This means that in the event of fire or other natural disaster, the structure can be re-built in its original location.

The following actions are recommended:

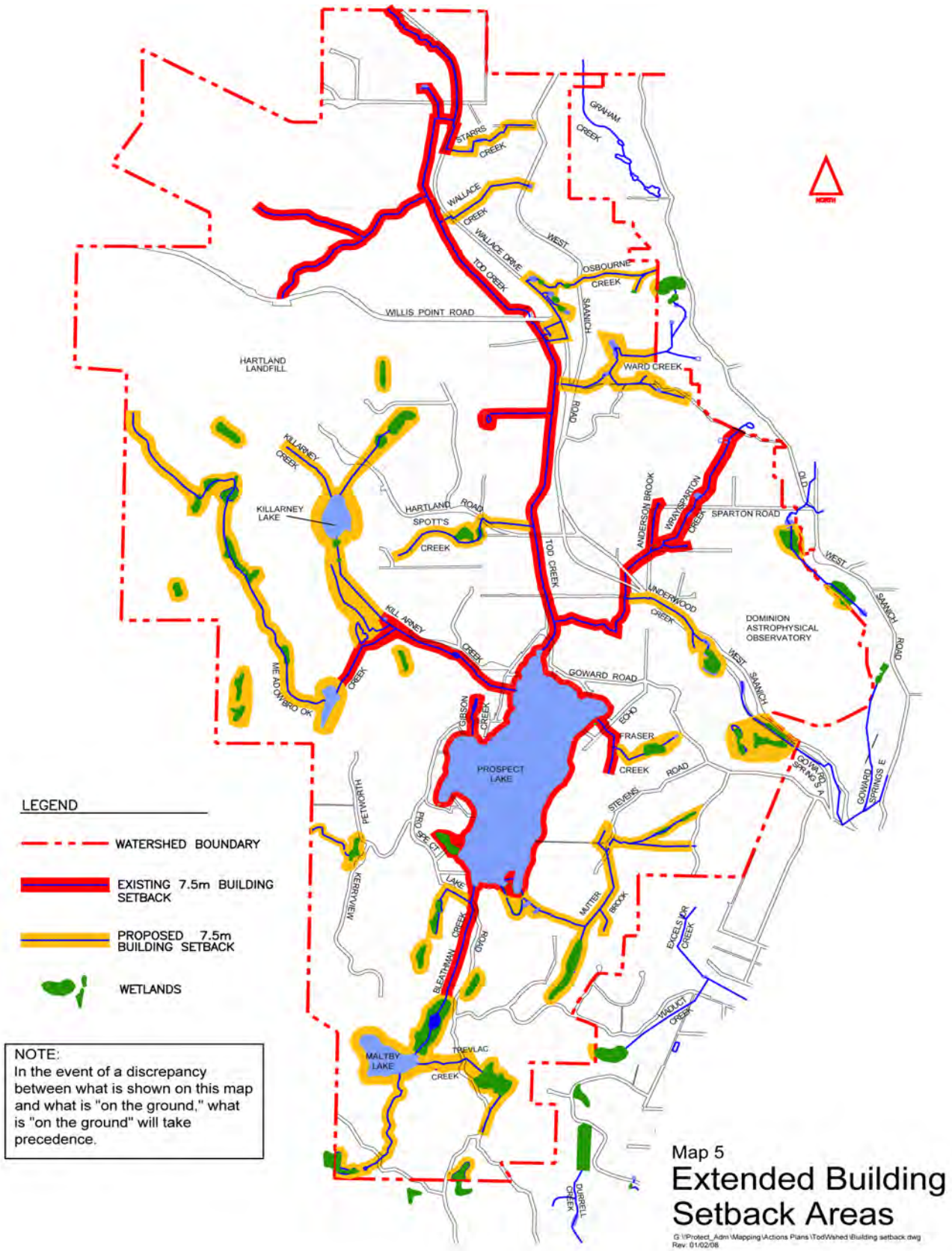
- amend the Zoning Bylaw to include a 7.5 m setback for all inventoried streams, lakes and wetlands
- amend Section 3 of Zoning Bylaw to "grandfather" non-complying sitings to permit rebuilding in case of a fire or other disaster (this would not apply to voluntary demolition).

Strategy 10 Control uses and hard surfacing close to Prospect Lake

The small lots around Prospect Lake are zoned A-1 Rural. Agricultural activity, which is unsuitable for this location, is permitted under the zoning. The zoning should be amended to remove agriculture as a permitted use to better reflect the rural lakefront residential use.

Limits to impervious cover will have a positive long term impact on run-off into Prospect Lake and inflows. The maximum level proposed is based on an evaluation of existing lots and the amount of hard surfacing.

Board of Variance
The Board of Variance can hear applications to vary setbacks if the regulation is causing a hardship. This would most likely apply to smaller lots. In most cases consideration under the Development Permit Area designation will address concerns.


LEGEND
WATERSHED BOUNDARY
EXISTING 7.5m BUILDING SETBACK
PROPOSED 7.5m BUILDING SETBACK
WETLANDS
NOTE:
In the event of a discrepancy between what is shown on this map and what is "on the ground," what is "on the ground" will take precedence.
NORTH
GRAHAM CREEK
STARRS CREEK
WALLACE CREEK
WALLACE DRIVE
WEST
OSBOURNE CREEK
TOD CREEK
SAANICH
WILLIS POINT ROAD
HARTLAND LANDFILL
WARD CREEK
ROAD
KILLARNEY CREEK
KILLARNEY LAKE
HARTLAND ROAD
SPOTT'S CREEK
ANDERSON BROOK
WRAYSPARTON CREEK
SPARTON ROAD
OLD
WEST
SAANICH ROAD
UNDERWOOD CREEK
DOMINION ASTROPHYSICAL OBSERVATORY
KILLARNEY CREEK
MEADOWBROOK CREEK
GOWARD ROAD
GIBSON CREEK
PROSPECT LAKE
FRASER CREEK
ROAD
STEVENS
GOWARD SPRING
GOWARD SPRINGS E
HUMMELT
KERRYVIEW
LAKE
MUTTER BROOK
EXCELSIOR CREEK
BLEATHMAN CREEK
ROAD
TODVICT CREEK
MALTBY LAKE
TREVLAC CREEK
DURRELL CREEK
Map 5
Extended Building Setback Areas
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Rev: 01/02/08

The following actions are recommended:

- establish a new lakefront zone for the area identified on Map 6
- set a maximum impervious cover of 35%
- remove agriculture as a permitted use
- establish guidelines for impervious cover in the Development Permit that would apply to all inventoried streams, lakes, and wetlands.

For those keeping farm animals, such a use would be considered non-conforming. This would mean that one would be permitted to maintain the use, but once it is discontinued, it would no longer be legal.

Strategy 11 Minimize run-off from agricultural activity

The agricultural activity in the Prospect Lake/Tod Creek watershed is not extensive, however, it does not take large commercial farming to cause damage to streams, lakes and wetlands. The practices used on small hobby farms can have a considerable impact on the health of the aquatic environment. Run-off from agricultural activities can be toxic and highly concentrated and can include fertilizers, pesticides, hog fuel, and animal waste.

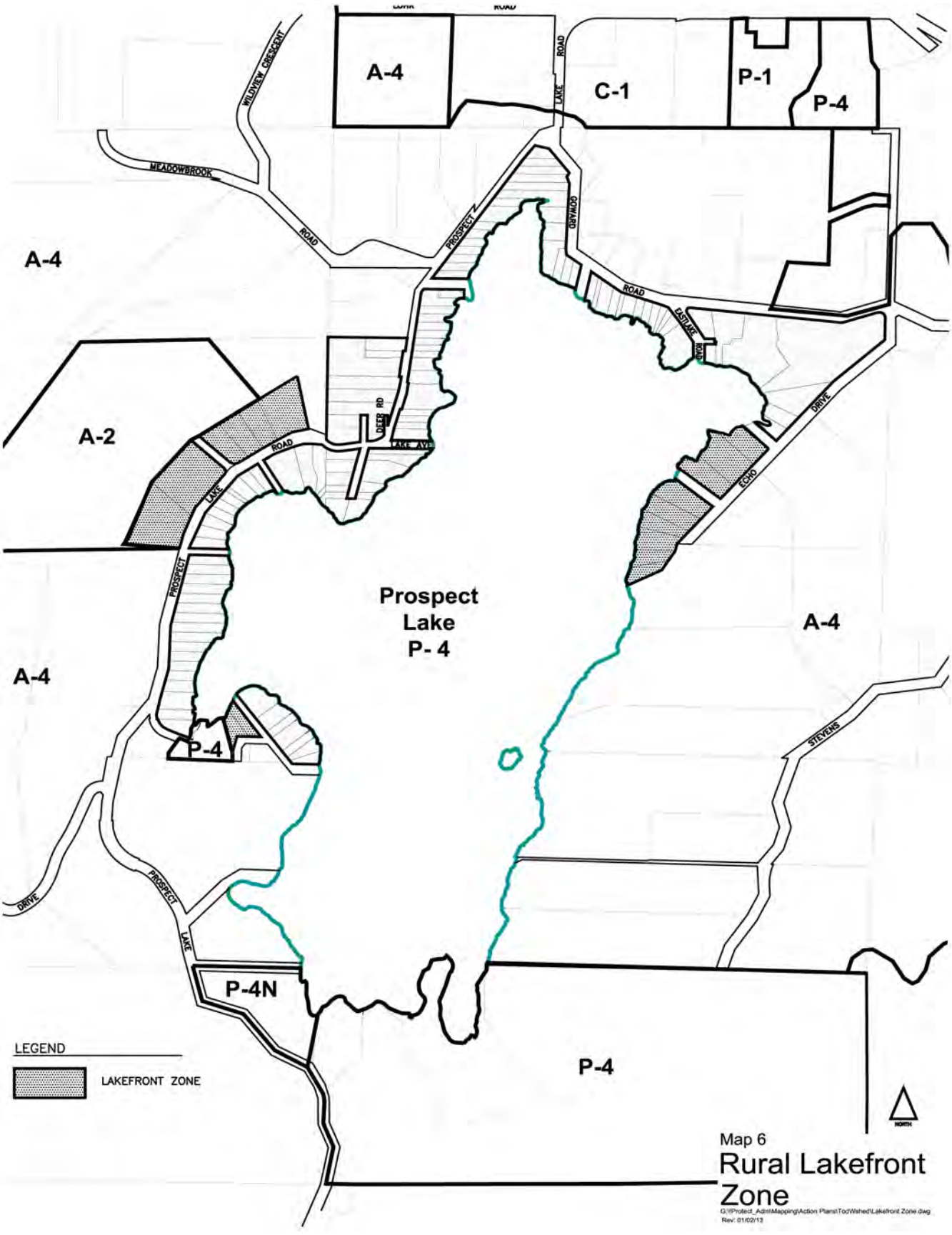
A healthy riparian area that buffers watercourses from agricultural activity is essential. This buffer would provide a filtering function that keeps agricultural contaminants out of the water, provides shade to keep the water cool and controls algae growth, and promotes natural evaporation and infiltration, thereby reducing run-off.

Actions are proposed that provide opportunities for riparian restoration and for increasing awareness of techniques that are consistent with sustainable agriculture. The following actions are recommended:

- support riparian planting programs and education
- endorse the results of discussions between Ministries of Agriculture and Environment, Lands and Parks on riparian and watercourse protection.

Strategy 12 Amend Tree Preservation Bylaw

Tree cover throughout the watershed is important to water quality. Vegetated areas act as sponges for water storage, absorbing moisture during wet periods and slowly releasing it during periods of dryness. Vegetated areas also filter pollutants (preventing them from entering surface or groundwater) and help to minimize erosion and sedimentation.



Map 6
Rural Lakefront Zone

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Rev: 01/02/13

The Tree Preservation Bylaw permits limited tree cutting (three trees per acre annually) on rural residential parcels, and allows the entire allocation for a given parcel to be taken in one area.

The Committee recommends that opportunities for clear cutting be limited by amending the Tree Preservation Bylaw to require that the annual cut be applied on a grid system. This would mean that allocations could not be consolidated.

The following actions are recommended:

- repeal the right to consolidate the annual three-tree-per-acre cut to one area (outside the Agricultural Land Reserve and Forest Land Reserve)
- include diseased and dying trees in the annual allocation.

The Review Committee wished to go further, and recommended that the fine for and enforcement of violations be increased. At the Open House, these recommendations were some of the more controversial issues.

ALR and FLR
The Agricultural Land Reserve and Forest Land Reserve are lands that have been designated by the Province for resource production. The conditions set out in the various Acts will take precedence over municipal bylaws.

Strategy 13 Amend Deposit of Fill Bylaw

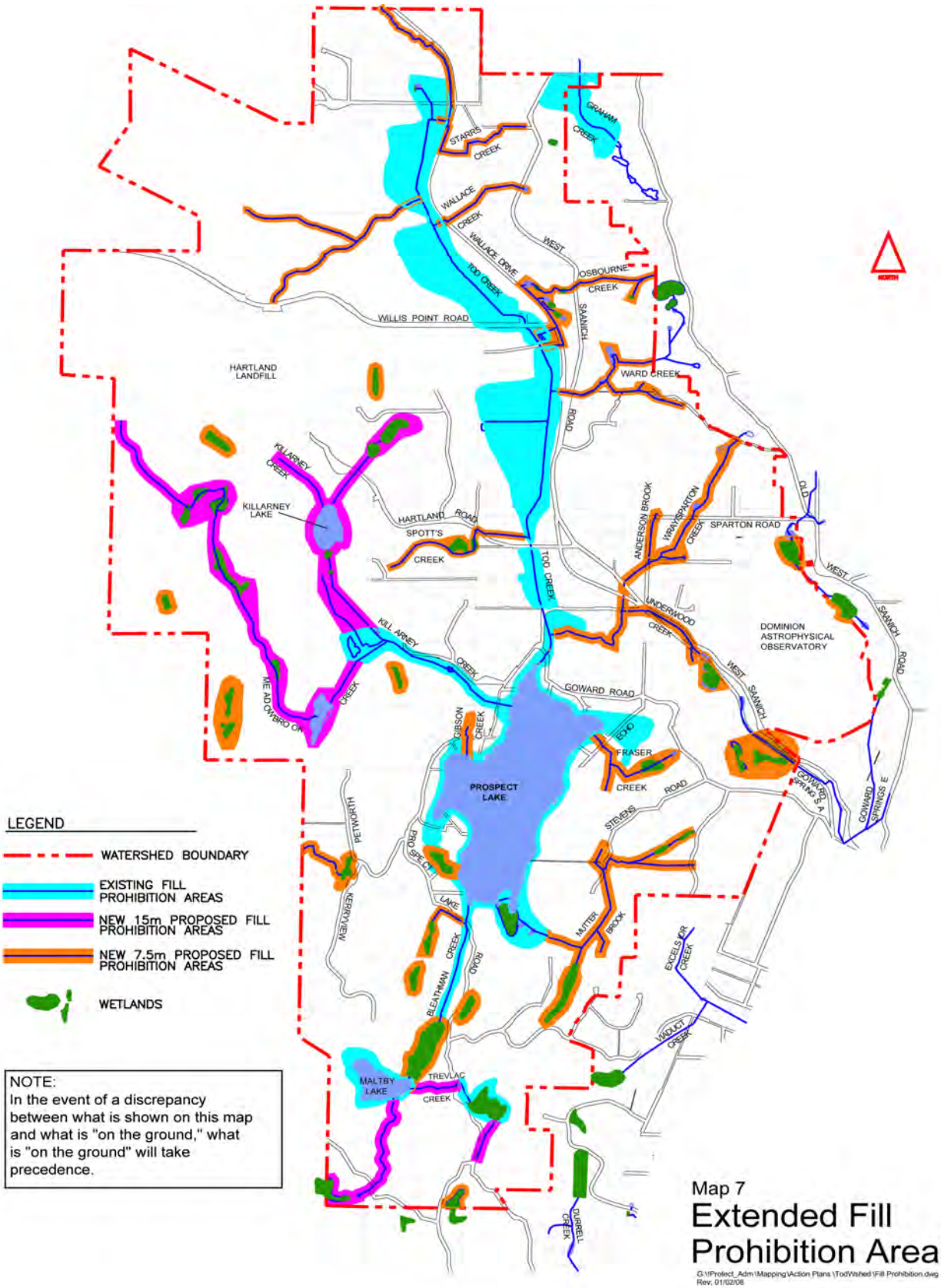
Changes are proposed to the Deposit of Fill Bylaw to extend its coverage in the Prospect Lake/Tod Creek watershed. The Deposit of Fill Bylaw sets out the areas where no fill is permitted. Currently, the Watercourse Bylaw does not permit "the filling in of any watercourse." The purpose of this strategy is to expand the Bylaw to include the prevention of disturbance to inventoried riparian areas in order to protect bank stability, minimize erosion and prevent sediment from entering watercourses (see Map 7).

The following actions are recommended:

- extend the fill prohibition area to all inventoried streams, lakes and wetlands
- establish a 15 m no-fill area for major watercourses and lakes (except where a greater setback exists based on an established floodplain, i.e. Prospect Lake, Tod Creek), and 7.5 m no-fill area for minor watercourses and wetlands
- include exemptions for property and agricultural access.

An interdepartmental working group of Saanich staff was established in 2000 to update the Deposit of Fill Bylaw including environmental considerations and will be proposing bylaw changes to Council. This group is in a position to consider the above proposed measures.

Local Area Plan Process
The planning process in Saanich is layered: General Plan, Local Area Plan and Action Plan. They can be undertaken in any order. The Rural Saanich Local Area, which is due to be updated in 2001, has been divided into four watersheds. The Prospect Lake/Tod Creek Watershed is one of those areas. Information in this Plan will feed into the Local Area Plan process and the most specific policies in the hierarchy will take precedence. Planning is ongoing and always evolving to meet changing needs.


LEGEND
WATERSHED BOUNDARY
EXISTING FILL PROHIBITION AREAS
NEW 15m PROPOSED FILL PROHIBITION AREAS
NEW 7.5m PROPOSED FILL PROHIBITION AREAS
WETLANDS
NOTE:
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HARTLAND LANDFILL
KILLARNEY LAKE
PROSPECT LAKE
MALTBY LAKE
DOMINION ASTROPHYSICAL OBSERVATORY
WILLIS POINT ROAD
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SPARTON ROAD
GOWARD ROAD
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KILLARNEY CREEK
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ANDERSON BROOK
VRAY/SPARTON CREEK
UNDERWOOD CREEK
KILLARNEY CREEK
MEADOWBROOK CREEK
GIBSON CREEK
FRASER CREEK
PETWORTH ROAD
STEVENS ROAD
MUTTER BROOK
EXCELSIOR CREEK
VIADUCT CREEK
BLEATHMAN CREEK
TREVLAC CREEK
DURRELL CREEK
GOWARD SPRINGS A
GOWARD SPRINGS E
Map 7
Extended Fill Prohibition Areas
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Rev. 01/02/08

5 Implementation and Priorities

Now that the strategies and actions for improving water quality in the watershed have been identified, the actions need to be put together in a plan that recognizes budgets, investment of time and effort, and importance of the action in the context of other actions. Adoption of the Action Plan by Council does not automatically mean that all proposed changes to regulations, standards, and commitments can be considered accomplished. Adoption of the Action Plan can be considered the kick-off to a series of processes to implement the changes proposed. The recommended approach is to begin with actions that are easily accomplished, or are vital and must begin immediately. These actions will be followed by second priority actions, and actions that rely on the successful completion of other actions. As a result, the time lines are approximate and subject to change.

Type of priority:

E Can be completed relatively easily and quickly
VIP Very Important Priority, needs to begin immediately
MP Moderate Priority, begin when VIP's are underway
Step Part of a series of steps with some dependencies

Strategy	What needs to be done	Lead	Timeline	Priority	Funding	Measure of Success
1. Establish a Development Permit Area	DPA guidelines (see Appendix 5) can be adopted by Council along with Action Plan. Adopt a fee structure.	Planning Dept	Spring 2001- with adoption by Council	E	n/a	DPA adopted by Council and Appendix "N" of OCP Bylaw amended
2. Extend coverage of Tree Preservation Bylaw	Initiate a working group of Saanich Parks, Planning, community representatives	Planning and Parks Depts	Begin after VIP's	MP	n/a	Bylaw is amended
3. Property tax incentives	Investigate a Saanich property tax program to allow property owners to apply after obtaining a conservation covenant	Saanich, property owner	Begin after VIP's On-going	MP	n/a	A program is established offering a tax break for riparian protection

Strategy	What needs to be done	Lead	Timeline	Priority	Funding	Measure of Success
4. Promote stewardship through "Awareness Zone" program	Saanich Planning works with community stewardship group to develop a program. Saanich staff undergo training.	Saanich Environmental Education Officer	On-going	VIP	Planning/ Environmental Services budget for community education and staff training	Plan developed, training programs delivered, landowners undertake stewardship initiatives
5. Develop a community stewardship water testing program a. comprehensive water quality testing b. nutrient testing at septic fields c. Awareness Zone Pledge	a. Community stewardship group to liaise with MELPfor water quality testing and analysis b. Investigate techniques and funding c. See strategy # 4	Community, Saanich (with RHD, MELP and outside agencies)	On-going Some testing already completed - analysis is expected in spring 2001	VIP	a. Some funding in small amounts required b. Funding required (could be expensive); or graduate students research c. See strategy # 4	a. Water quality testing continues and sources of pollution identified b. Extent of pollution from septic fields identified c. Landowner takes pledge
6. Support stewardship by agricultural producers	Promote agricultural stewardship as part of Awareness Zone and community stewardship group activities	Saanich Environmental Services, Community, Ministry of Agriculture	On-going	Step (with # 4)	Some funding required for educational outreach and planning materials	Farms plans, demonstration projects, stewardship initiatives by farmers

Strategy	What needs to be done	Lead	Timeline	Priority	Funding	Measure of Success
7. Stop nutrients from septic systems entering watercourses a. Amend Watercourse Bylaw to include "excess nutrients" as a pollutant b. New BMP bylaw for new and upgraded systems and/or; new BMP bylaw for existing systems c. Community collection system	a. Interdepartmental working group prepares amendment b and c. Get results of nutrient testing program (see Strategy 5) b. Draft new bylaw(s) with staff working group c. Seek expert advice on best system; apply for funding	Saanich Planning, Saanich Engineering Services (with RHD and MELP)	a. Begin in 2001 b. Dependent on testing c. Dependent on testing	a. E b. Step c. Step	a. n/a b. Staffing require-ments c. Could be expensive, funding sources and creative financing required	a. Bylaw amended b. Bylaw(s) adopted and implemented c. Funding secured and system in place
8. Reduce impact from agricultural waste a. Set up agriculture task force to brainstorm solutions b. Amend animal bylaw c. Consider farm bylaws	a. With the review of the Rural Saanich Local Area Plan b. Draft amendment to bylaw if necessary (see # 8a) c. Consult with Ministry of Agriculture and operators and draft if necessary (see # 8a)	Saanich Planning, Peninsula Agricultural Commission, Ministry of Agriculture	a. 2001 b. 2002 c. After LAP (see # 8a)	a. MP b. Step c. Step	Task force may need funding	a. Task force reports findings b. Bylaw amended c. New bylaw adopted if necessary
9. Apply building setbacks to more watercourses	Interdepartmental working group prepares amendment	Saanich Planning	2002	E	n/a	Zoning Bylaw is amended
10. Control uses and hard surfacing close to Prospect Lake	Draft new zoning amendment and consult with community	Saanich Planning	2002	E	n/a	New lakefront zone is established

Strategy	What needs to be done	Lead	Timeline	Priority	Funding	Measure of Success
11. Minimize run-off from agricultural activity a. Riparian planting b. Endorse agricultural watercourse policy	a. Work with community stewardship group to support riparian planting projects b. Receive recommendations from province and support implementation	Saanich Planning, community, other agencies	a. Begin in 2001 b. Dependent on province	a. VIP b. n/a	Seek funding from outside agencies	a. Stewardship groups and property owners undertake riparian planting program b. Agricultural watercourse policy implemented in Saanich
12. Amend Tree Preservation Bylaw	See strategy #2	Planning and Parks Dept	See strategy #2	MP	n/a	Bylaw is amended
13. Amend Deposit of Fill Bylaw	Interdepartmental working group prepares amendment	Saanich Planning	Already underway with completion in 2002	E	n/a	Fill bylaw is amended, and exemptions are included

APPENDICES

APPENDIX 1

149 Goward Rd.
RR 7
Victoria, B.C.
V8X 3X3

October 11, 1994

Mayor and Council
The Corporation of the District of Saanich
770 Vernon Ave.
Victoria, B.C.
V8X 2W7

To Whom It May Concern:

RE: Prospect Lake Watershed

I am a member of the Prospect Lake Community Association Executive Committee, and have been asked by them to request that Saanich Council give serious and speedy consideration to developing a comprehensive local area plan for the entire Prospect Lake watershed.

I have observed the lake and its surroundings, both above and below the surface, for over 45 years and have lived at least a part of each of those years on the lake. I am well versed in the local building codes and practices, both the written and the reality, and also have considerable experience in water and wastewater systems.

The reason for this request is due to the rapid decline in the lake environment of recent years - far beyond that due to any natural causes. This decline is increasing in speed every year. I have seen the lake regress from relatively weed free drinkable waters to one so polluted and weed choked that swimming is unsafe in many areas.

Facts to support this request:

1) Pollution, in terms of the total lake environment, takes many more forms than the simple fecal coliform counts that seem to be the singular focus.
2) Even though the lake is shallow and holds relatively little water, it is estimated that the watershed renews only about 1/3 of its volume per year. What is not generally recognized is that much of this water is becoming ever more polluted by improper development/use of the watershed.
3) By mid summer no life can exist below about 15 to 20 feet due to a lack oxygen.

4) The green surface algae blooms were virtually unknown as little as 15 years ago. Today, at times, they cover large areas of the lake.
5) The limited slime growth (up to about 3/4 inch in length) on submerged snags and other underwater features has increased in the last 5 years to enormous self supporting " slime balls " measuring 20' across and from the bottom to the surface in 15 feet of water.
6) Municipal and private stormsewer systems are being increasingly led directly to the lake in pipes and barren ditches rather than in natural watercourses.
7) Present GVRD health department regulations do not recognize many of the harmful pollutants reaching the lake from waste disposal systems, and are seriously deficient in many other aspects of how permits are granted.
8) Current building codes make no attempt at reducing domestic water use which, of course, would reduce wastewater.
9) Present regulations allow large increase in the size of existing structures (therefore potential for increased numbers of inhabitants and wastewater) with no upgrading of wastewater management.
10) Many lakeside properties will soon require major renovation or renewal of existing structures and under current regulation this will, without question, result in further environmental damage.
11) The last inspection of new waste disposal systems is generally before the system is even in use, and it is virtually impossible to force inspection of existing systems unless there is observable " raw running sewage " escaping.
12) Prospect Lake is only about 1600 meters long by 600 meters wide.
13) Provincial regulations allow the leasing of 6500 square feet of lake surface by every property on the lake, with only municipal regulations to govern structures. Saanich has no specific regulations to govern waterborne structures on Prospect Lake.
14) There is no limit to the size of boats on the lake.
15) There are few laws to govern the boating activities, and those that do are frequently ignored with virtual impunity from prosecution.
16) The noise, high speed and random operation of the recent wave of personal watercraft (jet-skis) is particularly disturbing to many lakeside residents.
17) Exhaust emissions from larger motorboats are many times that allowed for cars and waste oil from bilge pumping and two cycle exhaust causes frequent oil slicks.
18) Many seagulls still use the lake for bathing following feeding at the Hartland dump. Goose emissions threaten to deliver the final blow.
19) Many native species have become extinct in and on the lake in just the last few years, to name but a few; the native cutthroat trout, through the destruction of its breeding habitat; stickleback, due to the recent

introduction of catfish; freshwater clams have been killed off by lack of oxygen and choking weedbeds; northern loons and western grebes found the ever increasing frantic activity and loss of habitat too much.
20) Prospect lake is a visual reminder of what is happening to its watershed, but often one needs to look just below the surface to see the full impact.

In just a few years this lake has gone from a clean relatively weed free quiet body of water to what often resembles a large stormsewer catchbasin complete with orange traffic cones ringing the shore and a public swimming beach judged the most polluted on the peninsula.

We feel that a local area plan specific to the Prospect Lake watershed could be the first step in saving this priceless, municipal attribute.

In light of situations such as the foregoing item #10, it would seem that immediate action in certain areas is vital.

In conclusion, we trust this matter will receive the attention that it truly deserves. If the facts as presented need further clarification, or you wish further assistance please contact me.

We look forward to your reply and further discussion on this critical matter.

Respectfully,

Rick Todd
PROSPECT LAKE COMMUNITY ASSOCIATION

APPENDIX 2

CHRONOLOGY OF EVENTS INCLUDING PUBLIC PARTICIPATION

	Events	Notification
October 11, 1994	Letter received from the Prospect Lake Community Association requesting a local area plan for the watershed	n/a
November 7, 1994	Report to Council regarding the need to review and priority	n/a
November 21, 1994	Committee of the Whole reviews priority	n/a
February 8, 1995	Inquiry sent to CRD Health regarding watershed	n/a
February 22, 1995	Response from CRD regarding environmental issues	
March 2, 1995	Report to Council regarding studies for area	n/a
June 14, 1995	Public Meeting #1	Times-Colonist Saanich News
July 19, 1995	Public Meeting #2	Mailout
August 23, 1995	Public Meeting #3	Mailout
September 27, 1995	Public Meeting #4	Mailout
October 25, 1995	Public Meeting #5	Mailout
November 23, 1995	Public Meeting #6	Mailout
Winter 1995-96	Survey of agricultural and business communities	
January 16, 1996	Public Meeting #7	Mailout
March 27, 1996	Youth Workshop	
March 28, 1996	Public Meeting #8	Mailout
April 1, 1996	Community Outreach findings released	n/a

Summer 1996	Environmentally significant areas inventory started	n/a
May 1999	Draft Action Area Plan (AAP)	n/a
September 29, 1999	Open House and Public Meeting to review Draft AAP	Times-Colonist
October 27, 1999	Review Committee Meeting #1	Mailout to RC
November 17, 1999	Review Committee Meeting #2	Mailout to RC
November 30, 1999	Review Committee Meeting #3	Mailout to RC
January 11, 2000	Review Committee Meeting #4	Mailout to RC
January 25, 2000	Review Committee Meeting #5	Mailout to RC
February 8, 2000	Review Committee Meeting #6	Mailout to RC
February 22, 2000	Review Committee Meeting #7	Mailout to RC
March 7, 2000	Review Committee Meeting #8	Mailout to RC
March 21, 2000	Review Committee Meeting #9	Mailout to RC
March 27, 2000	Review Committee Meeting #10	Mailout to RC
April 11, 2000	Review Committee Meeting #11	Mailout to RC
April 25, 2000	Review Committee Meeting #12	Mailout to RC
May 2, 2000	Review Committee Meeting #13	Mailout to RC
May 16, 2000	Review Committee Meeting #14	Mailout to RC
May 23, 2000	Review Committee Meeting #15	Mailout to RC
May 30, 2000	Review Committee Meeting #16	Mailout to RC
June 6, 2000	Review Committee Meeting #17	Mailout to RC
June 27, 2000	Open House - Revised AAP	Times-Colonist Notices on Mailbox Stations Mailout to RC

APPENDIX 3

Frequently Asked Questions (FAQs)

About new strategies in the Prospect Lake/Tod Creek Watershed Action Plan

1. Is there really a water quality problem with Prospect Lake?

Yes, Prospect Lake appears to be very fragile and water quality problems have been documented over the years.

It has been established that Prospect Lake is eutrophic, meaning it has a high level of nutrients which causes algal blooms, low oxygen levels, and reduced habitat capabilities. It appears from data that the lake may have been eutrophic for over a century, which indicates a sensitivity to cultural modifications in the watershed. Phosphorous levels have been a recurring problem in the lake over the past few decades. Common sources of excess phosphorous are septic fields, farm waste, fertilizers, and detergents.

2. If the water quality problem is in the lake, why have other areas in the watershed been included in the Action Plan?

Water quality problems can come from many sources, some around the lake, and others in the higher reaches of the watershed. There are many creeks that flow into the lake and they carry the excess nutrients and pollutants of the lands around them. If the intent is to protect water quality in Prospect Lake, a watershed approach must be taken. The water quality of the creeks can also be expected to benefit from the Action Plan.

3. How will this Action Plan impact my use or the value of my property?

This plan attempts to provide a more even playing field for property owners. Currently, only some creeks have building setbacks, tree cutting limitations, while others have a no fill policy. In the plan, all creeks will have setbacks for buildings, fill, and tree cutting based on the size of the creek. This will cause some houses to become *existing non-complying structures*, however they will be *grandfathered* for reconstruction and the property value is not expected to change. It is also possible that the Action Plan will actually increase values because the quality of the area will be protected.

The overall plan is to include all creeks within a Development Permit Area which will initiate a flexible process of negotiation and assessment for major construction or alterations to the land. The intent is to ensure protection of watercourses and their riparian areas.

4. I have a creek running through my property and the Development Permit Area means a 60 m swath that I can't touch, right?

No, it means that should you wish to develop in that area, you may need a development permit to ensure that the environment is not damaged. There are a lot of things that do NOT require a development permit, which *may* include gardening, landscaping, fences, accessary buildings, sundecks, and trails. Come and talk to us.

5. **I don't agree with the names of creeks on the map or where they are located. Where did this information come from? What about creeks that aren't on the map?**

The creek information on the map came from an inventory completed by Saanich in 1997 and published in our Saanich Environmentally Significant Areas Atlas and Inventory in 1999. We are aware that there are mistakes in the Atlas. Some of the creeks that were incorrectly mapped or missing may be remapped this summer. The important thing to remember is that maps are always being updated, and what is actually "on the ground" is the bottom line.

The naming of creeks is not as straightforward as it might appear. There are a number of sources of names including those commonly used in the community, the provincial Water Branch where water licenses are obtained, and the Geographics Data Branch of BC. The Geographic Data Branch is the "official" source, but even they do not have all creeks named. Part of the process of this Action Plan will be to get some community input on official and unofficial names of creeks and possibly to provide Geographics Data Branch with a set of creek names that reflects the community's interest.

6. **Why don't we just wait for provincial and federal regulations for creeks to be passed instead of having our own Action Plan?**

At this point, it is impossible to say when or if the regulations will come or what they will look like. However, we can say that the community can establish its own plan now and have more control over protecting the watershed. Most people would agree that waiting for action would be a waste of time.

7. **How do these new regulations apply to land with the Agricultural Land Reserve (ALR)?**

Agricultural activity in the ALR is exempt from municipal land use regulations. However, agricultural producers are required to adhere to the provincial Code of Agricultural Practices and the Environmental Guidelines for Waste Management.

Non-agricultural activity within the ALR, on the other hand, would be encouraged to comply with the proposed voluntary and regulatory strategies contained in the Action Plan to protect water quality.

APPENDIX 4

PROSPECT LAKE WATER QUALITY WORKING GROUP REPORT

Background:

The Water Quality Ad Hoc Committee was formed as a working group to the Prospect Lake – Todd Creek Watershed Action Plan Review Committee. The working group was tasked with researching information concerning the water quality of Prospect Lake. The purpose of this research is to ensure that any action steps ratified by the Review Committee are limited to what can be reasonably supported in fact. Specifically, the working group was asked to answer the following questions:

Question 1. What data exists at present regarding the water quality of Prospect Lake?

Question 2. Are there critical gaps in the data? If so, what further data is required?

Question 3. How much of the missing data can be acquired within the time frame of the Review Committee's work?

Question 4. What further information and direction should we provide to Rick Nordin?

Findings of the Working Group:

Answer to Question 1.

Existing research on Prospect Lake was collected by the working group. Adriane Pollard (Environmental Coordinator for Saanich) offered to summarize the information into a brief report. Adriane was asked to catalogue the information according whether it was quantitative or qualitative in nature and then to match any conclusions reached in the documents to the relevant water quality concerns noted in the Action Plan. ***Adriane's report is attached as Appendix-1.***

Some important conclusions noted in Adriane's summary report:

- Water quality data for the lake is patchy, making it difficult to draw firm conclusions about the lake's present state.
- Lake is eutrophic and may have been so for more than 140 years. This means that the lake has a low tolerance for nutrient loading.
- Phosphorus is a limiting nutrient for algae growth in the lake (meaning that algae growth is dependent upon the relative abundance of this element). Phosphorus levels have exceeded standards for both aquatic life, drinking water and

recreational use in the past. Potential sources of phosphorus include septic fields, farm waste, fertilizer and detergent amongst others. Specific sources of phosphorous entering Prospect lake, and their relative contributions, have yet to be determined.

- In addition to Phosphorous, other nutrient levels have surpassed acceptable standards from time to time. Again, without better data and more continuity in the monitoring of nutrient levels in the lake, it is difficult to draw firm conclusions regarding the magnitude and impacts of this source of pollution.

Answer to Question 2.

Sufficient research exists to document the fragile character of the lake (advanced eutrophic) and that nutrient loading continues to be a concern. Further research and monitoring is required to determine the following:

a) the specific sources of nutrient loading;
b) given the Lake's advanced state of eutrophication, what impact can we expect if nutrient levels remain high, as some residents fear?
c) what reasonable steps can be taken in the short term to reduce excessive nutrient levels within the lake?
d) do heavy metal elements, such as copper or aluminum, exceed acceptable levels?
e) what ongoing steps need to be taken to manage the water quality of the lake?

Answer to Question 3.

No further quantitative data is expected to be forthcoming within the time frame of the Review Committee. The working group discussed the value of obtaining anecdotal information regarding changes to lake quality from long time lake users. An informal poll was subsequently conducted of 20 residents and users from around the lake. The poll results are attached as Appendix-2. Important conclusions included the following:

- Users pursue a broad range of recreational activities upon the lake.
- Most users have observed deterioration in both the potability and turbidity of the water over time.

- Most users have observed heavy increases in algae at various points around the lake.
- There was less unanimity regarding increases in weed growth. Several users indicated the presence of significant weeds growing in the lake as far back as the early seventies. Several users indicated that weed growth now interferes with swimming.
- There is less observable diversity amongst the fish and other fauna inhabiting the lake now. Bull frogs, a known predator of many of our indigenous frogs and other wildlife, have established and are becoming more pervasive. There are fewer species of waterfowl now than in the past. Canada geese are considered to be more numerous now and are perceived as an increasing nuisance.

Answer to Question 4.

To some extent, what we ask of Rick Nordin in the future depends on what Rick submits in his report, due sometime later this month. It is anticipated, however, that Mr. Nordin shall be asked to assist a stewardship group with three things:

- pinpoint sources of excess nutrients,
- establish monitoring benchmarks for various water quality parameters,
- prepare recommendations for reducing nutrient flows and managing water quality.

We also wish Mr. Nordin to express an opinion on the present state of the lake from a water quality point of view.

The working group has prepared a draft letter, asking Mr. Nordin for his assistance in these matters. The letter includes attachments of Adriane's literature review and a copy of this report of the working group.

Some group members have also suggested that the Prospect Lake Community Association write to Andrew Petter, requesting that the government restore funding to M.E.L.P. The letter could point out that our committee cannot get prompt actions to questions regarding the lake because of the work load of the existing staff.

Summary Conclusion:

In reviewing the materials provided by Adriane and the poll of long term lake users, the working group offers the following summary conclusions and recommendations.

a) Due to the eutrophic state of the lake, nutrient flows must be carefully monitored and managed effectively when necessary.

b) Due to the limited extent of existing data and the need to record changes to critical water quality parameters over time (particularly in response to any action measures), it is recommended that a stewardship group be formed and tasked with the following work:

- Liase with M.E.L.P. to design and implement further water quality assessment as required. Particular attention is required to identifying specific sources of nutrient flows and quantifying their overall impact on the lake.
- Educate lake users and upstream residents of the fragility of Prospect Lake and importance of managing nutrient flows.
- Investigate measures to curb the present reliance on (dysfunctional) septic fields. Community-based collection systems and on-site sand filter treatment has been suggested as one possible avenue of investigation.
- Monitor the use of the lake and upstream tributaries and riparian area for negative impacts.

Prepared on behalf of the Prospect Lake Water Quality Working Group by Jeremy Gye, chairperson, in consultation with other members.

A Summary of Prospect Lake Water Quality Reports available at Saanich Hall.

State of Water Quality of Prospect Lake 1980-1995. **British Columbia Ministry of Environment, Lands and Parks, Environment Canada. April 1996.**

- 16 years of data including total phosphorus, total dissolved phosphorous, Kjeldahl nitrogen, nitrate/nitrite, dissolved ammonia, ammonia:nitrate ratio, N:P ratio, total calcium, fecal coliform, total organic carbon, true colour, total aluminum, total copper, dissolved silica, total residue, turbidity, pH
- monitoring recommended for aluminum, true colour, copper to determine whether water quality objectives need to be established
- monitoring recommended to identify changes in water quality attributed to biological activity in the lake and human activities in the watershed
- determine whether drinking water from the lake meets the fecal coliform criterion

Results:

- less nutrients in recent years
- total phosphorus values exceeded the criterion range for protecting aquatic life in 1984
- total phosphorus values exceeded the criterion range for recreational use and drinking water in 8 of 11 years
- phosphorous the limiting nutrient for algal growth in the lake
- Capital Regional Health has posted the beach on several occasions for fecal coliform
- insufficient fecal coliform data to assess as drinking water
- true colour values exceeded the criteria for drinking water (aesthetics) and for recreation in 1992 and 1995.
- total organic carbon values exceeded the drinking water criteria in 1980. Prospect Lake water has the potential to form trihalomethanes in excess of the criterion when chlorinated.

Tod Creek Stream Report. **Charles Thirkill, MELP. October 17, 1995** (page 3)
This study was focused on fish habitat and the augmentation of flow in Tod Creek. However, the following observations were made regarding water quality:

"Water quality in Tod Creek is affected by riparian land use. The creek appeared to be clear at the outlet from Prospect Lake, but was turbid at Lohr road bridge. The field between Goward and Lohr roads is used for cattle grazing and is not fenced off from the creek. Cattle are also allowed to use the creek at the Barlett farm, downstream from Durrance Road.

Water quality in Tod Creek was affected by runoff from the Hartland Landfill site. Prior to 1990, summer runoff was recycled through the landfill site, but was allowed to flow into Heal Creek in winter. Recycling the water protected the watershed for the summer, but the impact on water quality was probably increased when the water was released. Water is now routed through

the sewage system, and is monitored before being released into the watershed, to avoid water quality problems.

Water temperature at Durrance Road on August 9th 1995 was 14.5°C."

A Treatise on Prospect Lake. **R. Baker *et al.* 1976.**

- weekly sampling from Sept. 1976 to March 1977 by university students
- rain, lake level, secchi depth, temperature profiles, dissolved oxygen, pH, nitrates phosphates, orthophosphates, calcium hardness, total hardness, specific conductivity, TDS, plankton, macrophytes, sediment grabs, deep core, zooplankton, periphyton
- a discussion of the flushing rate ending in "it should be mentioned here that the relatively frequent flushing of Prospect Lake would be expected to reduce the rate of eutrophication and dampen productivity." This appears to contradict other reports.
- Prospect lake determined to be eutrophic in this study, as well as a warm monomictic lake, a medium softwater lake.
- a core sample (140-180 years) was examined for diatoms and there was difficulty in saying anything conclusive because of the resuspension of sediments but it was determined that the lake has been "nutrient enriched for quite some time' as diatoms throughout the core are indicators of eutrophy.

Tod Creek Fisheries Mitigation Plan. **B.A. White, MELP. Feb 1983.**

Report focuses on Tod Creek in channelized agricultural area and the impacts on fish.

- channelization of streams
- lack of streamside vegetation, low summer flows create high temperatures
- "...a more serious threat exists in the form of leachates draining from the Greater Victoria Garbage Dump, located off Hartland Avenue. These toxic wastes seep into Heal Creek, which joins with Durrance Creek, and finally drains into Tod Creek, approximately 1 km downstream. Water quality analysis at a site located downstream from the confluence of Durrance Creek and Tod Creek on April 28, 1982, indicated ammonia levels of 12.4 mg/l; over 150 times the level considered toxic to salmonids."

The Aquatic Environment. A Review for the Municipality of Saanich. **R.W. Langford. 1975.**

- hypolimnion deoxygenated, bottom sediments contain 80% organic substances
- hydrogen sulphide in sediments
- motor boat use, oil sheens evident
- high total dissolved solids levels, high nitrate levels, large standing crops of attached algae and macrophytes and high biochemical oxygen demand indicates that Prospect Lake is eutrophic. "Organic pollution of Prospect Lake is considerable and may be due to entry of polluting substances from dwellings along the shore." (Reference to report by J. Schefler, 1971, Some Limnological Considerations of Prospect Lake)

- plankton productivity is low, conductivity is low, benthic invertebrates and the number of pollution indicator species of plankton are high. Prospect lake is less eutrophic than Elk but richer than Maltby.(Reference to report by D. Mainguy)

Returning the Loon to Prospect Lake. **Undated.**
Slime balls, algae blooms, white foam, lake often unswimmable. (Rick Todd).

Prospect Lake/Tod Creek Watershed Action Plan. Draft. **May 20, 1999. Planning Department, The Corporation of The District of Saanich.** (page 8)
Qualitative data from Community Association and various residents attribute decline in water quality to:

- malfunctioning septic systems (maintenance, location)
- plant and algae production has increased, increase in nutrients
- types of waterborne plants have changed

Other possible sources:

- fertilizers, pesticides
- residential, golf course, and agricultural land uses
- nutrients from leaves, grass clippings, animal feaces
- toxic chemicals from boats, lawn mowers, road runoff

Various newspaper articles about fecal coliform at the beaches also available.

Available raw data includes:

- Prospect Lake, Detailed Data Report. For Rick Nordin. Feb 26, 1993. MELP.
- *Water Sample Summary Report. Prospect Lake - South.* Capital Health Region Environment Program. August 18, 1997.
- *Prospect Lake Inorganics, Field Data.* Environment Canada (analysis) Rick Nordin (samples) Feb 99.
- *Analysis Certificate.* JR Laboratories Inc for Rick Nordin. Jan, Feb 1999.

Future studies:
Rick Nordin will produce an analysis of the samples taken by Art Dimock. The emphasis will be on the water budget and effect of inflows in lake nutrient levels. Saanich hall has a description of the test sites by Rick Nordin.

A core sample may be analysed in the future.

SUMMARY OF INFORMATION FOUND IN THE REPORTS.

Water Quality Concern	**Status -Quantitative Data**	**Status -Qualitative Data**	**Reference**
total phosphorus	1. exceeded drinking water and recreational standards for 8 years in the '80's 2. exceeded aquatic life standards in 1984 3. the limiting nutrient for algal growth		State of Water Quality... 1996.
True colour	1. Exceeded for drinking and recreation standards 1992 and 1995		State of Water Quality... 1996.
total organic carbon	1. Exceeded drinking water standards in 1988.		State of Water Quality... 1996.
Nitrates	1. High.		1. Langford, 1975.
Oxygen	1. Low		1. Langford, 1975.
Eutrophication (nutrients)	1. Testing shows lake is eutrophic 2. Core sample shows lake has been eutrophic for many years (up to 140?) 3. Lake is eutrophic.		1, 2. A treatise...1976. 3. Langford, 1975.
Fecal Coliform	1. North beach is often closed by CRH after testing	2. Cattle are allowed in Tod creek and cause wq problem	1. Capital Regional Health 2. Thirkill, 1995.
Conductivity	1. Low		1. Langford, 1975.
Hartland Landfill (toxins)	1. Ammonia a problem.	2. A problem of the past?	1. White, 1983. 2.Thirkill, 1995.

Temperature of Tod Creek		1. Loss of riparian vegetation and low summer flows on creek and lake blamed for high temps.	1. White, 1983.
Channelization of Tod Creek		1. Partially responsible for deterioration of fish pop.	1. White, 1983.
Motor Boats, metals		1. Oil sheens seen. 2. Boats, lawn mowers, road runoff	1. Langford, 1975. 2. Prospect Lake/Tod...
Residential Septics		1. Malfunctioning septic systems (maintenance, location) 2. May be responsible for eutrophy	1. Prospect Lake/Tod... 2. Langford, 1975.
Nutrients		1. Leaves, grass clippings, animal feaces, fertilizers	1. Prospect Lake/Tod...
General Landuse		1. Residential, golf course, and agricultural land uses.	1. Prospect Lake/Tod...
Algae, macrophytes		1. Slime balls, algae blooms, white foam. 2. Plant and algae production has increased, increase in nutrients. 3. Types of waterborne plants have changed.	1. Returning the loon... 2,3. Prospect Lake/Tod...

Water Quality Information Related to Draft Action Plan

Concept	Quantitative Support	Qualitative Support	Source
Riparian zone protection, setbacks, run-off limits, riparian zone restoration	1. Numerous scientific reports show that riparian zones are significant for biodiversity, water quality, wildlife habitat, fisheries etc.	2. Loss of riparian vegetation and low summer flows on creek and lake blamed for high temps. 3. Saanich ESA atlas identifies reaches needing restoration.	1. Numerous, such as Riparian Management in British Columbia, 1995 MOF. 2. White, 1983. 3. Saanich ESA Atlas, 1999.
limits to impervious cover, replace impervious cover with native vegetation, measure impervious cover	Direct correlation between percent of impervious cover in a watershed to stream health and fish populations		Numerous scientific articles, including Arnold and Gibbons, 1996.
deleterious substances setbacks	Legally and scientifically accepted that deleterious substances have negative impacts to water quality	1. This would enhance current legislation not allowing the discharge of prohibited substances into watercourses.	1. Example, Saanich's watercourse bylaw.
sediment control plans, steep slope limits, ditch maintenance	Widely shown that fisheries, water quality, recreation, infrastructure damaged by sediments		Numerous, including "The Relationship Between Soil and Water 1999, King County Dept. of Natural Resources
restoration plan for Tod Creek	Subject of an entire report by MELP.	Subject of an entire report by MELP.	White, 1983 (MELP)
improve septic systems	1. Lake has been proven eutrophic, has summer fecal coliform problems, high nitrates, and low oxygen at various times. **These factors may or may not be related to septic systems.**	2. Malfunctioning septic systems , based on odour 3. May be responsible for eutrophy	1. Various. 2. Local residents 3. Langford, 1975.

protect wetlands from filling	1. Numerous scientific reports show that wetlands are significant for biodiversity, water quality, wildlife habitat, fisheries etc.		1. Numerous, including BC Wetlands Working Group, 1996
water quality monitoring	1. Recommended for Prospect Lake by MELP for specific parameters.	2. Requirement for baseline data and answers to nutrient sources.	1. State of Water Quality... 1996 2. Review Committee, 2000.
remove agriculture as a permitted use around lake; agricultural development permit area on non-agr lands, initiate farm bylaws, livestock out of water, no hog fuel,	1. Many guidelines for agriculture in place to protect water quality and habitat in recognition of farms as potential sources of pollution and habitat loss.	2. Cattle are allowed in Tod creek and cause wq problem 3. Animal faeces a wq problem	1. Various, including Watershed Stewardship (Agriculture) 1997, DFO, DOE, MELP. 2. Thirkill, 1995. 3. Prospect Lake/Tod...
groundwater testing and protection	deferred to Review Committee discussion.		
education, stewardship, awareness		Found in municipal, provincial, and federal policy and guidelines based on need for legislative compliance and non-legislative practice.	Various.

Adriane Pollard
Environmental Services
May 2, 2000

Prospect Lake Waterfront Residents Questionnaire
Observations of Prospect Lake Over Time (residents have lived an average of 33 years at the lake)
20 Questionnaires completed in April, 2000

	Echo Drive (3 residents)	Goward Rd. & Eastlake (6 residents)	Prospect Lake Road, North End (2 residents)	Prospect Lake Road (5 residents)	Estelline Rd. (3 residents)	Prospect Lake Rd. Stevens Road (2 residents)
USE OF THE LAKE *Then and Now*	Swim /3 Boating/1 Waterski/ 2 Enjoy /2 Fish/1 Row/1 Explore/1	Swim /5 Sail Windsurf/ 2 Row /2 Enjoy /3 Boating /2 Kayak /1 Canoe/1 Snorkel/1 Scuba dive/1 Golf ball collecting/1 Wildlife viewing/3	Swim /2 Boating /2 Fishing/1 Waterski /1 Sail/1	Kayak Canoe Row Swim /3 Bird watch Enjoy /3 Fishing Boating/2 Snorkel	4 HP boat waterski/ 2 Boating /2 Swim /2 Diving/1 Snorkel/1 Canoe/1 Sail/1 Enjoy/1	Canoe/ 2 Observe/1 Swim/1
WATER – GENERAL *Then*	Drinkable/1 Slightly cloudy/1 Pumped but didn't drink/ 2	Drinkable /2 Less suspended matter/1 Clean/1 Pumped for household/1 acceptable coliform/1	Clear - you could see the bottom/1 Suspended particles - late summer/1	*no comment*	*no comment*	Clear /1 Drinkable/1
Now	Less clear/1 Slightly cloudy/1 Less deterioration than expected/1	Foam/1 Small debris/1 Filthy/1 Disturbed/1 Park area more silted/1	Increase in silt - north end/2	Much the same/1 Silted at north end/1 Level fluctuates less/1	Much the same/3	Not drinkable/1 Slight change when neighbour's septic system installed near shore/1

Prospect Lake Waterfront Residents Questionnaire
Observations of Prospect Lake Over Time (residents have lived an average of 33 years at the lake)
20 Questionnaires completed in April, 2000

	Echo Drive (3 residents)	Goward Rd. & Eastlake (6 residents)	Prospect Lake Road, North End (2 residents)	Prospect Lake Road (5 residents)	Estelline Rd. (3 residents)	Prospect Lake Rd. Stevens Road (2 residents)
FISH and aquatic life *Then*	Less fishing than now/1 Cut-throat trout regenerate naturally/1 freshwater clams, muddy bass, crayfish/1	Saw turtle, 1 clam in '70s/1	Trout/1	Cutthroat trout and smallmouth bass/1 No rainbow trout/1	*no comment*	*no comment*
Now	No clams, fewer crayfish, large number of bass and hatchery fish/1	Bullfrogs/2	*no comment*	Large bullfrogs/1	Same # of fish as before/1 Fewer water spiders and frogs/1 More fishers/1	*no comment*
WILDLIFE *Then*	No geese, dump gulls, otter, mink, osprey, eagles/1	Too many seagulls/1 many ducks, otters, mink, osprey/1 Many seagulls/1	Loons/1 Swans/1 More seagulls/1	*no comment*	Swans/1	*no comment*
Now	More geese/1 Too many geese/1 Fewer gulls, otter, and mink/1 More eagles/1 No osprey/1	Too many geese/1 Mink, otters, eagles/1 No osprey/1	Increase in Canada geese/1 No swans/1	Fewer water birds/1 Plentiful swallows, blackbirds, kingfishers, eagles/1	Decrease in ducks/1 Fewer goslings in last 2 years/1	*no comment*

Prospect Lake Waterfront Residents Questionnaire
Observations of Prospect Lake Over Time (residents have lived an average of 33 years at the lake)
20 Questionnaires completed in April, 2000

	Echo Drive (3 residents)	Goward Rd. & Eastlake (6 residents)	Prospect Lake Road, North End (2 residents)	Prospect Lake Road (5 residents)	Estelline Rd. (3 residents)	Prospect Lake Rd. Stevens Road (2 residents)
WEEDS *Then*	Weeds/1	Weeds/1 Bad weed problem, and severe around 1978/1	Weeds, but in deep water/1 Not near as many weeds as now/1	18-20 years ago, bay full of weeds/1 West Bay always fairly weedy/1 2 species particularly prolific/1	More weed by the Golf Course/1 Less weed near our shore but always near island/1	*no comment*
Now	Fewer weeds some areas, more others/1 Increase in our area and other areas/1	Weeds now a problem for swimming/1 More weeds visible on surface/1 Lots of weed growth/1 Greatly increased weed s/1 More weeds/1	Weeds grow to surface and more types of weed/1 Increase in weeds since mid '70s/1	18-20 years later, not much change/1 More weeds and varieties throughout the lake/1 2 species spreading/1	Few more weeds close to our shore/1 Increased weed growth in our area/1	*no comment*
ALGAE/ SLIME *Then*	Less algae problem/1	Almost no slime/1 Less algae blooms/1	*no comment*	Some algae growth on underwater objects/1	*no comment*	*no comment*
Now	More algae problem/1 White, dot-like algae/1 Rocks covered & and boats fouled/1 We get rashes/1 Some increase in algae bloom/1	Sometimes green slime/1 Large algae blooms common/1 More algae/1 Huge algae blooms/1 Slimy on rocks,plants/1 Greatly increased slime/1	*no comment*	Algae growth much thicker on under-water objects/1 Algae blooms/1	More green algae blooms /1	More algae in the middle of the lake and at Prospect Place/1

OBSERVATIONS OF PROSPECT LAKE OVER TIME

Name of Respondent _____

Address _____ Phone _____

Name of Interviewer _____ Date _____

Personal obervations of lake users are needed to augment the scientific data on water quality in Prospect Lake. The information will be used for the Tod Creek/Prospect Lake Watershed Local Area Action Plan, and will also become a resource for the community.

Have you any objection to your name being used? ❒ Yes ❒ No

1. How long have you been associated with Prospect Lake?

_____

2. How do you use the lake?

_____

_____

_____

_____

3. What was the lake like when you first became involved with it?

_____

_____

_____

_____

4. What is the lake like now?

_____

_____

_____

_____

APPENDIX 5

TOD CREEK WATERSHED DEVELOPMENT PERMIT AREA

Category

"a" (protection of the natural environment, its eco-systems, and biological diversity)

Area

For watercourses identified in Map 3 (see Page 10 of the Prospect Lake/Tod Creek Action Plan), the Development Permit Area is the area within 30 m of a natural boundary of a lake or wetland, and top of bank of other watercourses.

Exemptions Where No Development Permit Is Required:

In the Tod Creek Watershed Development Permit Area, a development permit is not required where conditions meet those outlined on Page 1 of Development Permit Areas, Justifications and Guidelines, Appendix "N" to the Official Community Plan Bylaw, 1993. In addition, a development permit is not required for the following activities:

a. Gardening.

b. Minor landscaping where there is no alteration of the natural ground level of land which is the visible height of land undisturbed by human actions and formed by the presence and actions of natural geologic and hydrologic forces, and that does not require the use of a bulldozer, bobcat, excavator or other mechanical earth-moving device.

c. Fences.

d. Accessory buildings such as gazebos, playhouses, tool or garden sheds such that the aggregate total area of these small buildings cannot exceed 10 m^2.

e. Sundecks using post construction and permeable decking (quarter inch drainage between boards) where there is no ground cover loss.

f. Habitat improvement activities undertaken by the District of Saanich, Ministry of Environment, Lands and Parks, or other agencies approved by the District of Saanich to conduct such work.

g. Emergency responses or works required by the Provincial Emergency Program, Saanich Fire Department, Saanich Police Department, or the District of Saanich to prevent or control forest fire, flooding or erosion emergencies.

h. The cutting down of hazardous trees that present an immediate danger to the safety of persons or are likely to damage public or private property.

i. The construction of a trail across or through the Development Permit Area where:
   - a single trail is built;
   - the trail is for personal, non-vehicular use;
   - the trail is less than one metre in width
   - no trees will be removed
   - the trail surface is pervious (i.e. soil, gravel, wood chip)
   - the trail is designed to prevent erosion where slopes occur
   - the trail is more than 5 m away from the top of bank.

k. If the proposed development is not in the Development Permit Area, the development is exempt from requiring a permit (see Figure 1).

l. Agricultural activity in the Agricultural Land Reserve.

Justification

All wetlands, watercourses, and their associated riparian areas within 30 m as shown on Map 3 are designated as Development Permit Areas. These areas are important to the ecological integrity of the Tod Creek Watershed, and crucial to the natural functioning of the aquatic environment. These areas provide essential habitat for fish, birds and other wildlife. They also act as natural water storage, drainage and purifying systems. Riparian areas must remain largely intact and undisturbed in order to maintain healthy watercourse environments. They also help protect private property from flooding, and loss of land from erosion and instability. Building of structures or roads, or significant clearing or disturbance to these areas could harm the functions of these water or riparian areas, and could cause a risk to lives and property.

Objective

To maintain or restore riparian areas, protect the ecological functioning of the aquatic environment and biological diversity, and to protect against loss of property. To protect water quality, fish and fish habitat.

Guidelines

Development permits issued in these areas shall be in accordance with the following:

1. No unnecessary site disturbance shall be permitted within the Development Permit Area. Existing vegetation shall be maintained in order to control erosion, protect bank stability, protect habitat, perform natural hydrological functions, and retain the natural character of water features.

2. Measures should be taken to ensure that site construction including buildings, structures, and septic tanks or fields, do not negatively impact riparian vegetation, water quality, or other

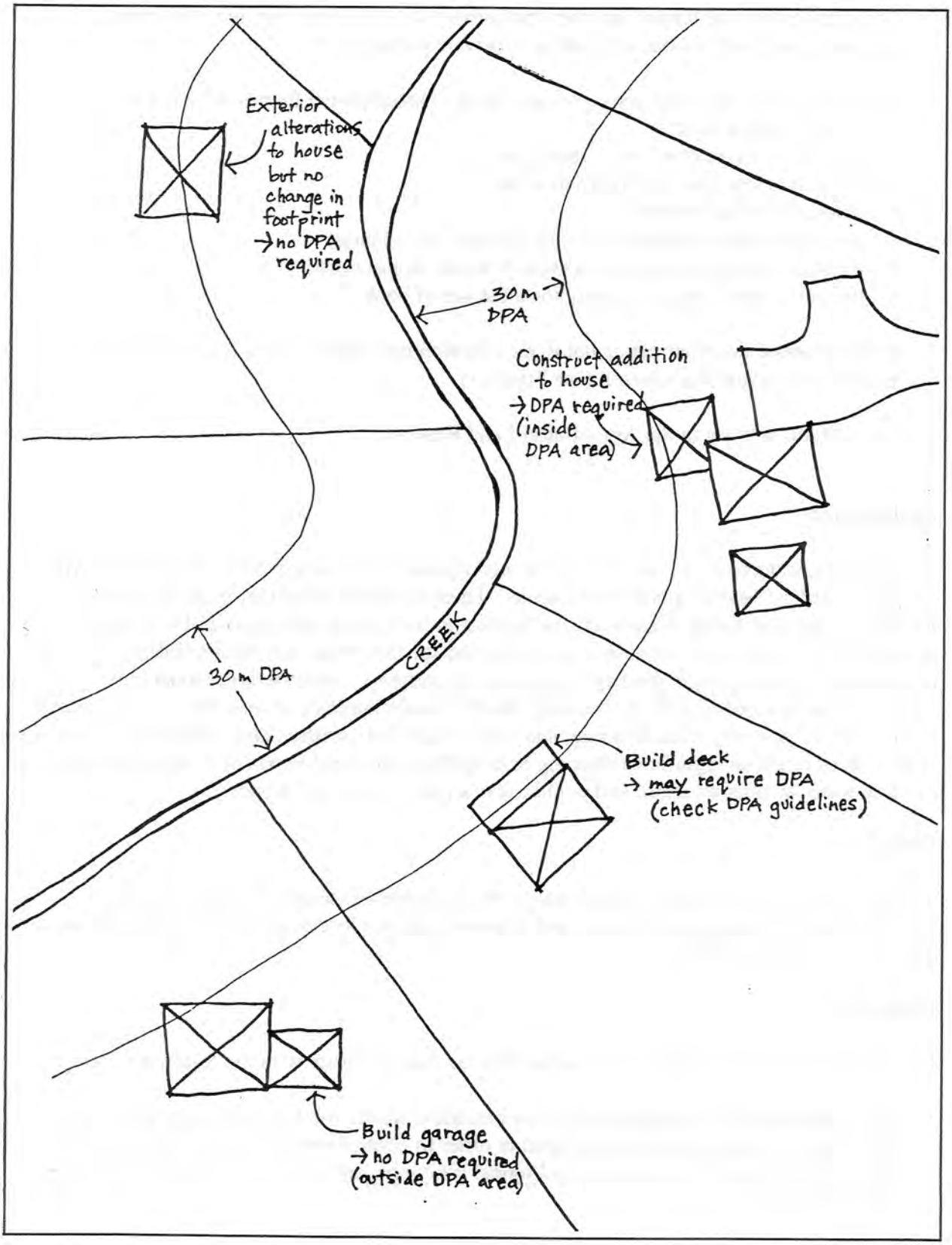

Figure 1: Scenarios where a DPA may be required

watercourse features which generally requires a minimum 15 m buffer from the top of bank of a watercourse or natural water boundary of major watercourses or lakes which include Tod Creek, Meadowbrook Creek, Bleathman Creek, Prospect Lake, Killarney Lake, and Maltby Lake, or 7.5 m from all others identified on Map 3.

3. Efforts should be made to avoid disturbing existing natural vegetation in riparian areas, and to restore damaged riparian areas with natural plantings.

4. The storage of prohibited waste as identified in the Watercourse Bylaw is prohibited.

5. Any major alteration of land such that the contours of the land are altered is prohibited.

6. Suitable vegetation indigenous to the District of Saanich may be required to be planted on the site to reduce erosion risk, restore the natural character of the site, improve water quality, or to stabilize slopes and banks.

7. Removal of gravel, sand, soil or peat from stream beds, lakes or wetlands and the draining, dredging, infilling, or dumping of materials will be strictly limited.

8. Modification of channels, banks or shores that could cause environmental harm or significantly alter local hydrological conditions will not be permitted.

9. Pollutants will be prevented from entering water features or wetlands by requiring the control of surface water drainage.

10. Nutrient-rich run-off water from residential, agricultural, and commercial uses/activities must not enter water features.

11. All new developments or modifications to existing developments shall be designed so that the development will cause no increase in run-off compared to existing conditions on the site.

12. Impervious cover within the Development Permit Area should be kept to a minimum.

APPENDIX 6

Septic Tank Effluent Pump Systems

Harold L. Ball, P.E. and Terry R. Bounds, P.E.

This paper was first presented by Harold L. Ball, P.E., at the 1998 Conference on Environmental Engineering, in Chicago, Illinois. The conference was organized by the American Society of Civil Engineers.

Abstract

Septic tank effluent pump (STEP) systems are beginning to be recognized as the preferred and most economical method of collecting and transporting partially treated wastewater to a treatment facility. A conventional septic tank provides pretreatment, removing most settleable and floatable solids from the wastewater. Specially designed pumps convey the septic tank effluent under pressure through a network of small diameter plastic piping to a treatment site. Shallow collection lines, following the contours of the terrain, eliminate the need for costly deep excavations. Changes in both vertical and horizontal alignments may be made in the field. The impetus for this rapidly developing technology has come mainly from the western United States. Oregon's Department of Environmental Quality, for example, requires engineers to consider STEP systems whenever a new wastewater collection project is contemplated. The success of a STEP system depends primarily on the skill of the engineer in designing and managing the project. Guidelines for designers are discussed and brief descriptions of several successful STEP systems are included.

Introduction

Septic tank effluent pump (STEP) systems, also known as effluent sewers, have a lot to offer. Shallow burial of small-diameter mains means installation costs and disruption of the community are minimized; infiltration and inflow are avoided; collected effluent is already pretreated in the septic tanks so final treatment is relatively simple and inexpensive; the septic tanks' reserve capacity means that problems are seldom emergencies; and, surprising to many, operation and maintenance, taking into account both power costs and routine maintenance and repair, cost less than does O&M for conventional gravity collection systems.

Why then aren't STEP systems cropping up all over? In fact, they are, at least in some regions of the United States. Michigan, for example, has more than 30 STEP systems in operation, most serving lakeshore communities. But the leader in applying STEP technology is the West. In just three states-California, Oregon, and Washington-more than 100 STEP systems have gone on line in the past two decades. Most live up to their billing as being reliable, low maintenance, and cost effective. A few have caused their owners a lot of grief and given pause to other communities considering STEP systems. What makes the difference between success and failure? The single most important factor in the success of a STEP system is the skill of the engineer in designing and managing the project. Close seconds are a competent installing contractor and a practical operator with a good attitude.

Designing for Success

There's nothing mysterious about STEP systems. There just aren't a lot of engineers who have experience with them, and

for a good reason-they're not part of the engineering curriculum at most colleges and universities. Designing a STEP system for the first time takes a certain degree of commitment. The engineer must educate himself: study existing systems and learn from others' successes and failures, learn about specialized equipment and design techniques, and, probably most helpful of all, seek the advice of an experienced STEP designer. Beyond that, attitude is everything. Woe is the community, its STEP system about to go to bid, whose engineer was overheard to say that he doesn't care which pumping equipment the contractor installs-so long as it survives the one-year warranty period.

A Little PR Goes a Long Way

Public relations may be outside some designers' comfort zone, but a successful STEP system isn't going to happen without a healthy dose of public education. Getting homeowners on board as stake holders at the beginning of a STEP project is vital. Typically a simple explanation of the economics-the low capital and treatment costs, low-cost O&M, and the resulting low utility charges-piques their interest immediately. Mention the environmental benefits-total biosolids to be handled are several times less than in a conventional system-and it begins to make sense to most everyone. And when someone protests "all those pumps," a description of their advantages-reliability, longevity, safety and low cost to operate relative to large lift station pumps-is usually sufficient to alleviate concerns.

While design is in progress, the engineer should schedule visits to each home to pin down mutually-agreeable locations for the tank, control panel, and service line, to arrange for easements, to make sure roof and other freshwater drains are not plumbed into the sewer line, and to help homeowners feel they're part of the process.

Septic Tanks First

Tanks for STEP systems absolutely must be structurally sound and watertight. Unfortunately, tanks that meet those specifications are not universally available. Manufacturers may claim they make them-and, indeed, some do-but a designer shouldn't just take their word for it. Engineered design calculations should be checked and a demonstration of the tank's watertightness required. Both concrete tanks and fiberglass tanks, when well built, are satisfactory for the job.

An engineer is well advised to start the search for tanks at the outset of the design process rather than to wait until bid time. Even if a local tank manufacturer agrees to produce tanks suitable for a STEP system, it often takes time to gear up. New forms may have to be ordered, reinforcing techniques learned, and crews trained. If tanks must be brought in from a distance, extra time must be allowed for transportation. By making tanks an early priority, a designer can avoid construction delays, or, worse, tanks that leak or collapse once the system is operational.

The Collection Lines

A novice STEP designer needs to develop a new mind set, putting aside much of what was learned in school and in practice about how sewers operate. A gravity sewer must be designed with slope adequate to maintain minimum velocity so that solids don't accumulate. In a STEP collection main, which handles essentially solids-free effluent under pressure, minimum velocity is irrelevant. Because the solids remain in the septic tank and there is no I&I, collection lines in a STEP system are much smaller in diameter than those in a gravity

system. Manholes are superfluous in STEP system mains. On those systems where they have been installed anyway, they have proved to be a source of damaging infiltration, not to mention the cause of wasted expense.

A STEP collection line must have air-release valves to avoid the headloss that pockets of air can cause. Pressure-sustaining valves are essential to keep the lines full, thus preventing generation of odorous gases. For clearing mains of construction debris at startup and for subsequent routine maintenance, STEP collection lines must be fitted with pigging ports. STEP units above the hydraulic grade line must have antisiphon valves to prevent draining of the septic tanks' contents.

The Pumping Systems

In evaluating STEP pumping equipment, it's essential to differentiate between minimum standards and the quality necessary for reliability and long life. Effluent pumps, for example, have useful lives that range from 13 months to 20 years or more. Some are lightweight and easy to service; others require back-saving lifting devices. Stainless steel pumps are corrosion-resistant; cast-iron bodied pumps are short-lived in a septic tank environment. Some are built to withstand frequent cycling; others wear out quickly in such duty.

A minimum standard for pumps and other electrical components is ensured only if UL listing is required. Indeed, pumps should be UL listed specifically for use in effluent. Beyond UL certification, control panels should be designed to withstand the weather, and component parts should have long life expectancy. What good is a pump that lasts 20 years if the contactor that controls it wears out in two?

To ensure quality pumping systems will be installed, engineers must specify equipment with a track record for reliability. Contractors should be required to obtain prebid approval from the engineer for all equipment to be used. Substitutions after the bid is awarded should not be allowed. What happens when contractors shop around, mixing and matching components to save a few dollars? Pumps too heavy to remove or not removable because they're blocked by discharge piping; pump vaults locked in place because the access riser is too small or because valves are in the way; float switches that are incompatible with control panels: they've all happened and are just a few of the reasons integrated pumping packages should be mandatory.

The Installing Contractor

While the bid process usually prevents an engineer from simply selecting a contractor he has confidence in, STEP systems designers should be aware that there are contracting companies with experience and expertise in STEP construction. It makes sense to seek them out, ask for relevant job references, and request bids from the best.

Inspection

Throughout the installation, rigorous inspection is the engineer's best insurance that quality will be maintained, especially if the contractor is new to this kind of construction. For example, a compacted base on which to place the septic tank is essential; otherwise, settlement will lead to broken pipes and fittings. Inspection of the installed tank and attached riser for watertightness needs to be done with care. It must be filled with just enough water to test the tank-to-riser connection. Water too high in the riser can create pressures that can crack an otherwise good tank.

The supplier of the pumping systems should be required to be onsite for the first installations to ensure that the contractor, the engineer, and his inspector understand the equipment and how it goes together. A mistake at this point will be duplicated many times over and may result in multiple costly repairs later on.

Operation and Maintenance

Once a STEP system has been designed, built, and accepted by the owner, its fate rests in the hands of those hired to operate and maintain it. While a can-do attitude carries a lot of weight, operators ultimately need the guidance of a thorough O&M manual supplied by the design engineer in order to understand the level of maintenance to expect.

If the operator at one STEP system had been instructed to monitor sludge and scum depths in the septic tanks, for example, he might not have taken it upon himself to have the tanks pumped annually, an entirely unnecessary expense to the district. Occasionally operators have been known to exaggerate their work load to turn their part-time jobs into full-time ones. One fellow routinely answered alarms in the middle of the night, collecting overtime pay, even though the septic tanks' reserve space makes emergency service calls almost always unnecessary. But then there's Elkton, where two retirees cheerfully take turns monitoring and maintaining the STEP system plus its treatment facilities in just a few hours each week.

If attitude helps, training is essential. STEP system owners should insist on the O&M manual and the supplier of the pumping equipment must be available to the operator for troubleshooting assistance. Periodic workshops at which operators of STEP systems can network to solve problems can be useful and are popular on the West Coast.

The Payoff

A STEP system works for the small town of Elkton. And the same technology works for the district that includes the cities of Olympia, Lacey and Tumwater, and the county of Thurston in Washington. These STEP systems are being used to economically handle rapidly expanding residential development. It even works for Montesano, a town of 3,000 in Western Washington, where the gravity collection system leaked so badly that winter flows often were dumped barely treated or untreated into the Chehalis River. When the gravity system was replaced with a STEP system, infiltration and inflow plummeted and plans for a 40-acre wastewater lagoon could be scrapped in favor of a three-acre aerated facultative lagoon. Case studies of these and other STEP systems are available from the authors.

Not many years ago government agencies were eager to hand out grants and low-interest loans to anyone with a wastewater problem to solve. As long as the money flowed, engineers found plenty of work without having to justify their designs as cost-efficient. Today with less and less money for infrastructure coming out of state capitals and Washington D.C., wastewater projects, increasingly, have to stand on their own merits. STEP systems work and can be built and operated affordably. Engineers who acquire a working knowledge of STEP system design will have a leg up when budget-conscious communities come looking for someone to solve their wastewater collection problems.

Source: Orenco Systems Inc., www.orrenco.com/ccs/ccs_conferencepaper.asp

O R E N C O

CASESTUDY

Diamond Lake, Washington:

1987 Effluent Sewer Requires Little Maintenance

The community of Diamond Lake, in northeast Washington state, saved its beautiful 800-acre lake by replacing all its old, leaking septic tanks and inadequate disposal systems with watertight tanks and an Orenco effluent sewer system. Diamond Lake's wastewater system serves more than 500 homes, as well as one of the largest Boy Scout camps in the country.

"This is the best system to maintain. The system is easy to operate and understand."

Buck Cole
Diamond Lake
Water & Sewer District

In the early 1970s, residents of Diamond Lake, Washington knew that something had to be done about their wastewater. According to Bob McGowan, long-time member of the Diamond Lake Water & Sewer Commission, "Our lake was being destroyed by leaking septic tanks and failing drainfields."

The community needed federal funding assistance. Even so, "A gravity system was way out of reason," recalled Larry Garwood, former system operator, now retired. After nearly 15 years of research and planning, the Commission decided on an effluent sewer and purchased ProSTEP™ pumping systems from Orenco.

Construction began in 1987. Installation went well but was not easy, since the soil was heavy clay, with high groundwater. In addition, about 25% of the excavation had to be blasted for the tanks and minimum 42-in. (1070-mm) deep collection lines. "If the engineers had known about the rock, the cost estimates for the gravity sewer would have been even higher," said Garwood.

Years later, the community is still happy with the system. All wastewater and water system maintenance is handled by just two operators year-round. (See "Operation/Maintenance" summary on back.)

Equally important, wastewater services are cost-effective for the district and its citizens. Customers pay $15/month for residential properties and $25/month for commercial properties.

Best of all, there's the lake. Within three years after Orenco's effluent sewer was installed, it was clear and clean again. "It recovered very early on," said Commissioner McGowan. "Diamond Lake is now a showcase."

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SUMMARY OF SPECIFICATIONS

Diamond Lake, Washington Effluent Sewer
Using Orenco Systems Equipment

Installation Date
1987

Total Project Cost
$2,951,280 (excluding lagoon)

$5,540 per home

Onsite Facilities
533 EDUs, mostly residential

529 STEP units, 4 STEG units

Collection System/Primary Treatment

Tanks

Residential: 1000-gal. (3785-L) single-compartment concrete tank with effluent filters or screened pump vaults. Tanks were tested extensively for watertightness and structural integrity.

Commercial: Multiple 1000-gal. (3785-L) or 2000-gal. (7570-L) tanks.

Pumps

1/2-hp (8-gpm [30-L/min] typical) effluent pumps.

Collection System
Each lot has 1.5- or 2-in.(38- or 51-mm) service lines.

System has more than 6.5 miles (10.5 km) of 3- to 8-in. (76- to 203-mm) main lines.

Secondary Treatment

Three-cell aerated lagoon

One cell is 0.75 acre × 10.5' deep (on average) (0.30 ha × 3.2 m deep).

Two cells are 3.75 acre × 16' deep (1.52 ha × 4.9 m deep).

180,000 gpd design (680 m^3/d)

Q (summer average) = 61,000 gpd (231 m^3/d)
Q (winter average) = 49,000 gpd (185 m^3/d)
Winter storage capacity = 37.9 million gallons (143,500 m^3) (on average)

Dispersal
410,000 gpd (1,550 m^3/d) irrigation to 38-acre (15.4-ha) alfalfa field (winter hold; summer irrigate)

Effluent Quality
Effluent quality of collection system (measured at inlet of first lagoon):

BOD = 183 mg/L (2003–2004 average)
TSS = 34 mg/L (2003–2004 average)

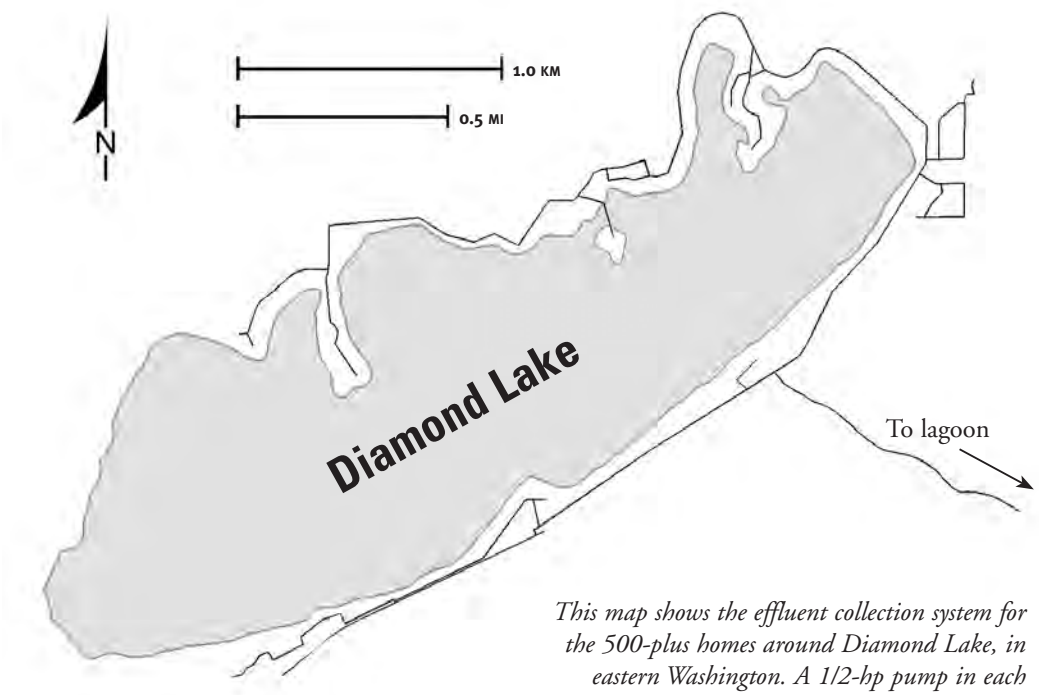
Operation/Maintenance
Entire system (wastewater and water) maintained by two full-time operators year-round.

About three alarm calls per week (often for customer power failure).

Average time spent at site for an alarm: 15 min.

Fees
$15/month residential

$25/month commercial



This map shows the effluent collection system for the 500-plus homes around Diamond Lake, in eastern Washington. A 1/2-hp pump in each septic tank transports wastewater to an aerated lagoon, six miles (9.7 km) distant, with no lift stations required.

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ACS-SL-2
Rev. 2.1, 9/04