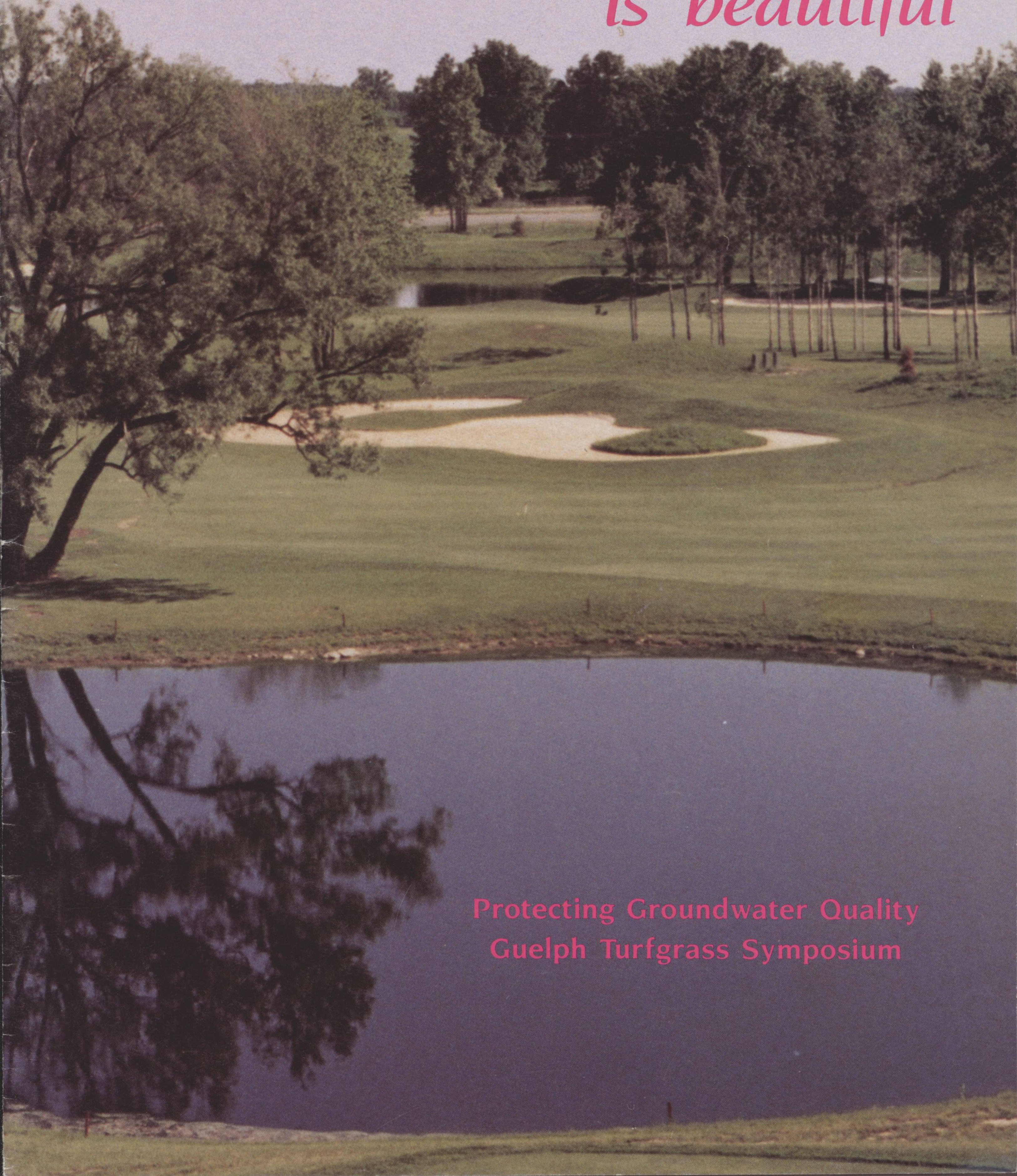
FALL 1991

GREEN is beautiful

An official publication of the Ontario Golf Superintendents Association



Protecting Groundwater Quality
Guelph Turfgrass Symposium

Ontario Golf Superintendents Association

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PRESIDENT'S REPORT

This year's weather couldn't have been better for most golfers. All across the province the season seemed to start earlier than normal and it was rarely interrupted by summer storms. Even now as I write this report in October, golfers are still enjoying excellent fall golfing. Unfortunately for some Superintendents this weather caused prolonged water shortages and extended disease susceptibility. As the season draws to a conclusion I'm anxiously looking forward to the upcoming seminars, conferences and symposiums. Read on in this issue to find out about the Ontario Turfgrass Symposium which our Association is co-sponsoring.

I would like to thank all the superintendents and their clubs that generously hosted our OGSA tournaments. Thanks again to Barry Britton, Ray Dlugokecki, the DeCorso's, Barry Endicott and all whom hosted the many regional meetings. Let the Board of Directors know if your club would like to host a regional or provincial event.

This will be my last report as OGSA President for Green is Beautiful. I would be hard pressed if I had to look back and pick the most memorable occassion while serving on the Board. The one thing that is quite clear to me is that the men and women in this business are very dedicated professionals willing to share their expertise with their peers.

It has been a great privelege and honour for me to have represented you as President of this great Association. The term was quite enjoyable as I was blessed with a very dedicated and talented Board of Directors. The support and cooperation of our membership was equally rewarding. Several long term Board members will be stepping aside to persue other interests and to allow new Directors with fresh ideas and enthusiasm to take charge. To these individuals and friends I would like to state publicly how proud I am to have been able to work with them. I appreciate their efforts and confidence in the administration of Association business.

Enjoy your down time and I hope everyone will take advantage of the available educational programs. See you there!

Mark Hagen
President, OGSA

FROM THE EDITOR

As another golf season winds down, we can all look back at our successes even in what was probably one of the hottest and driest in 31 years, dry enough in fact that many courses ran out of water.

The preservation of both water quality and quantity are now being very real concerns for our industry as well as the current issue of green space management.

Congratulations to the C.G.S.A. on their 25th anniversary celebrations and to all those involved in preparation for the Turf Conference in Toronto.

Have a great winter, take time to attend some of the educational programs offered.

Simon George
Editor

ROD TRAINOR
Superintendent, Hamilton Golf and Country Club Limited
Receiving Plaque from Mark Hagen, OGSA President for appreciation in hosting 1991 Ontario Amateur Golf Championships.

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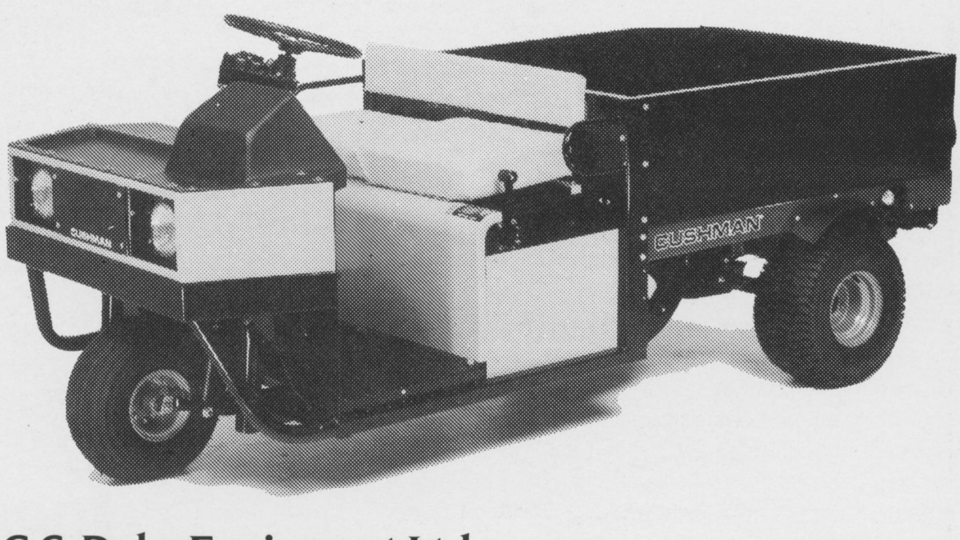

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Ontario Turfgrass Symposium

The first annual Ontario Turfgrass symposium will be held January 7-9, 1992, at the University of Guelph. The Symposium is the first of its kind to address the collective needs of all sectors of Ontario's turfgrass industry, including lawn care, sports turf and golf courses. The Symposium will consist of plenary and concurrent sessions, a trade show, presentations by turf experts from North America and England and industry specific half day seminars.

The first day of the Symposium will consist of concurrent morning and afternoon in depth seminars. Dr. John Street from Ohio State University will speak on "The Agronomics and Economics of Fertilizers." A workshop in Grub Identification and Control will be conducted by Dr. Michael Villani from Cornell University. "Pesticides In The Environment" will be addressed by Dr. Gerry Stephenson from the University of Guelph. Dr. Lynda Pinnington, of Pinnington Training and Development will lead a seminar geared towards customer service and public relations entitled "What The Public Expects." James Creighton, from resource Health and Safety Services will review what employees and employers should know about labour laws, workers compensation, occupational health and safety, WHMIS, and much more. Peter Simpson, Executive Vice-President and Director of Public Affairs and Research, Toronto Home Builders Association will give some tips on "Dealing With Time Media." The Superintendent of Agricultural Operations, Riverside California, Stephen Cockerham and several other key growers will talk about Sod Production. Dr. Lynda Pinnington will be leading a second seminar on "Managing and Motivating Your People." This will be a condensed talk from her successful week-long seminar she has been presenting at the University of Guelph for the past few years.

The day will conclude with a plenary session, with short addresses from Paul Dermott, Dr. Brian Segal, The Hon. Elmer Buchanan, Dr. Chris Hall and Dr. Clay Switzer.

The keynote speaker for the conference is Dr. Elliot Roberts from the Lawn Institute Pleasant Hills, Tennessee. His presentation is "Turf Stands Tall Among The Trees an Environmental Perspective." The Lawn Institute has determined through research conducted in recent years that turfgrasses indeed do "stand tall" amongst the trees. Both the lawn grasses and trees are important in the creation and maintenance of environmental quality. And, when attention is focussed on water use, carbon dioxide assimilation and oxygen release to the atmosphere, both present major strengths and also some weaknesses.

The Trade show opens on day two and day Three in the University's 40,000ft.^{2} Twin Pad Arena. It will be a good opportunity for delegates to meet Ontario's local suppliers of turf equipment and supplies.

For the next Two days the speaker's program splits into three concurrent session; Golf Course, Lawn and Landscape and Sports Turf. Speakers will be directing their talks towards that specific interest group. The speakers and topics being presented were suggested by the executive of each of the co-sponsoring groups. All delegates have the opportunity and are free to switch between talks of the concurrent sessions. Of particular interest to the Golf Course Sector will be the following speakers.

Dr. Michael Villani will explain Insect Monitoring Techniques for Golf Courses. Dr. John Street will discuss methods of Poa Annua Control. John Gall and Wayne Rath will follow this talk with their experience undertaking such a project. Dr. Jack Eggens will update the audience on "Cultural Practices for golf courses." The GTI. faculty and staff will be presenting numerous research updates throughout the morning.

Dr. Tom Hsiang, from the University of Guelph will give a "Plant Pathology Update." Terry Yamada from the RCGA, Greens Section will talk about "A Positive Look at Environmental Issues on The Golf Course." "Pesticides and Golf Course Development Issues" will be presented by Mr. Ric Lindgreen, a staff lawyer with the Canadian Environmental Law Society. Mr. Charlie Passios, Director with the GCSAA will talk about being "Pro Active Regarding Environmental Issues." "Playing Quality of Golf Course Turf as Affected; by Construction, Irrigation and Nutrition." will be discussed by Mike Conaway of the Sports Turf Institute, Bingley, England. Dr. Bob Shearman, University of Nebraska will speak on the "Role of Potassium in Stress Tolerence." Dr. Lee Burpee, former Director of the GTI. will return to talk about new "Creeping Bentgrass Research." The day will conclude with the Annual OGSA meeting.

The turfgrass industry is always changing, so take advantage of this excellent opportunity to acquire new information and knowledge. If you require further information or a registration kit contact: Continuing Education Office, University of Guelph (519) 767-5000.

Water Restrictions in Ontario

On October 21, 1991 the OGSA participated in the first of six workshops to help draft a Water Efficiency Strategy for Ontario.

For a native Ontarian it is difficult to believe that we are running short of water. At the initial workshop some startling facts were drawn to my attention from the Ministry of Natural Resources concerning the water situation here in Ontario. It is important to give some of the reasons why the Ministry of Natural Resources along with the other 12 ministries and government agencies are implementing a Water Efficiency Strategy for Ontario. We have all heard of the global state of available water through the media. In Eastern Europe for example the water is so polluted in some areas that even industry can not use it. Worldwide, there is a growing concern over the degradation in the health of the environment. Examples include the poor tree growth in the Black Forest, loss of the rain forests and destruction of soils in the Amazon Basin, and here at home, the pollution in the Great Lakes. It is a rarity in Southern Ontario that swimming is allowed during the summer months as beaches continue to be closed for health reasons.

The global pressures are mounting. The world population, currently at five billion, is expected to double sometime in the next century. The population of Ontario is currently at nine million and will rise to twelve million by the year 2011. Meanwhile, the limits of our resource base and the capacity of our physical environment to absorb wastes has become increasingly apparent. Concerns now arise regarding the earth's limits to environmental sustainability. The Love Canal, Chernobyl, Bhopal, Kuwait, and the Exxon Valdez are all part of the modern environmental disasters that we will be leaving for future generations to clean up or live with. Perhaps the time has arrived to begin shaping the future with decisions and actions that will support a strong economy and protect the environment.

The worlds quantity of fresh water is comparatively scarce. The worlds water supply consists of the following: 97.2% is salt water, 2.1% is polar ice and glaciers, 0.6% underground and 0.1% in lakes, rivers, soil and the atmosphere. Canada has 20% of the world's surface freshwater stocks, most of which are shared with the U.S. (i.e. the Great Lakes). Ontario contains about one half of the basin of the great lakes which by themselves constitute 18% of the world's freshwater resources. This fact alone would lead one to assume that we here in Ontario are water rich. Unfortunately this is not the case in point. Almost all of the water in the Great Lakes was deposited from the last ice age and only 1% of the volume is replaced by annual run-off. This means that only 1% of the volume of this system can be used on a sustainable basis. Also much of the water in Ontario's smaller lakes and rivers are not located near the large populated areas.

Ontario's extensive water system of rivers drains the province primarily north to Hudson's Bay and east through the Great Lakes system to the St. Lawrence River. This distribution of renewable water supplies is in contrast with the distribution of population in Ontario.

Coupled with the relatively low amount of fresh water in the populated areas is the extremely high usage rates in Ontario. On average in Ontario each person uses approximately 300 liters per day as compared to only 150 liters per person in Europe. This water use rate is projected to increase 2-3% per year assuming that current trends continue. We as Golf Course Superintendents can appreciate the additional water usage rates as a result of the global warming. Is it merely a coincidence that the summer months notably in 1988 and to a degree in 1991 were the hottest and driest on record?

Realizing this dilemma what can be expected of the Ontario Golf Course Superintendent once this Water Efficiency Strategy is adopted through the Province of Ontario. First off you can expect that this policy will recommend a user fee structure for all golf courses. Course monitoring will definitely come into effect as withdrawals will be scrutinized. You will not be allowed to take more water than you need. You will have to return the water from where you took it and in the same condition. Water restriction devices will be installed on faucets and washroom facilities in your workshop, clubhouses and homes. As we are currently using an unsustainable water rate in Ontario it is currently proposed that water users in Ontario decrease their consumption by up to 50% by the year 2020. In order to abide by these restrictions the water efficiency use rates on golf courses will be reduced dramatically. Future golf course designs will have to allow for better water usage by implementing a more target orientated concept, use more drought tolerant turfgrasses, water collection systems, water efficient irrigation systems, low precipitation heads etc. in order to comply with the reduction of water as proposed by the Water Efficiency Policy For Ontario. As more information is provided to us through the workshops I will disseminate this information to you the Golf Course Superintendent.

The costs of groundwater contamination

By William B. O'Niel and Robert S. Raucher

William B. O'Neil is senior economist with the U.S. Environmental Protection Agency, 401 M Street, S.W., Washington D.C. 20460. Robert S. Raucher is a principal with RCG/Hagler, Inc., Bailly, Inc., P.O. Drawer O, Boulder, Colorado 80306-1906. This paper represents the views of the authors alone and should not be interpreted as a statement by the U.S. Environmental Protection Agency or RCG/Hagler, Bailly, Inc.

RESOURCES are valued primarily for the services they provide. For example, water can be used to irrigate cropland, to wash clothes, and to drink. The amount people are willing to pay for clean water depends upon the nature of these uses and the availability of substitute resources that could provide the same services. Also, resources not being used currently may have value to people who expect to use them in the future or who wish to ensure that they are available for others to use. Finally, there may be those willing to pay for preservation of rare resources merely to ensure their continued existence, regardless of plans for actual use. Using this reasoning, economists refer to the sources of value for a resource as use, option, and existence or bequest values.

If a valuable resource is damaged or lost, then the cost of that event can be determined by examining the change in the services available from the resource. In response to the loss or damage, the services can be restored by the least expensive alternative methods or the services can be foregone. The extra cost of the least expensive response option represents the cost of the adverse event.

In this context, the words "use" and "service" include indirect effects as well as direct services provided by the affected resource. For example, groundwater may serve as a drinking water supply and as a recharge source for a wetland. Because the wetland provides services, such as recreation, wildlife habitat, fish spawning grounds, and lower-level food chain functions, it has other values as well as its value as drinking water. The additional cost of restoring these functions or the loss of those functions is part of the "cost" of groundwater contamination.

In theory these principles can be applied in a straightforward manner. For any groundwater contamination incident, the first step is to gather information on the physical characteristics of the event, including the type of contaminant, its concentration in the aquifer, the areal extent of the pollution, and its expected path of movement. This information tells policymakers what can be done to respond to the incident. The basic alternatives include some combination of the following:

- Contain the original source.
- Treat the contaminated water before use.
- Remediate the water in the aquifer before use.
- Provide an alternative clean water supply.
- Continue use of the contaminated water and suffer the health, welfare, or ecological effects.
- Forego use of the water and lose the valuable services it once provided.

The next step is to assess how the water had been used and how it could be used after taking one of the response strategies listed. For example, even after treatment, some residual health risk may exist, compared with the "no-contamination" baseline. In this case, the extra cost of treatment should be added to the value of the residual health effects to determine the cost of the contamination incident.

From an efficiency standpoint, the best strategy, or combination of strategies, is the one with the lowest overall extra cost. The extra cost of this chosen "cost-effective" strategy represents the cost of the contamination incident. That is the *opportunity cost* borne by society in the event of contamination.

With this conceptual framwork in mind, it is clear that two general factors together determine the cost of groundwater contamination: (1) the ways in which water was being used or was expected to be used in the future and (2) the physical characteristics of the setting that constrain the responses available to regain lost uses or to present related damages to human health and the environoment.

The use value of groundwater

We begin by reviewing the uses of groundwater because it is the actual or expected use of the resource that primarily gives it value. In some cases, there may be no acceptable way to restore the lost services of groundwater. In these cases, the cost of the incident is equal to the net benefits of the aquifer when it was clean. There are a number of use values that may be lost due to contamination. In most cases, however, cost effective remedies are available, and the added cost of these remedies represents the cost of the incident rather than the use value itself.

Groundwater is the source of domestic supplies for about half of the U.S. population and about 90 percent of the rural population. In addition, it provides 40 percent of irrigation water and 26 percent of industrial demand, excluding cooling water. Moreover, as a major surface water development alternatives become fully developed, groundwater becomes the major source for development of new supplies of potable water.

Municipal use value. Although municipalities account for only 10 percent of water withdrawn in the United States, such uses are generally thought to be the most important and highly valued. Municipal supplies provided for residential use as well as for firefighting and other outdoor uses. In most systems, water rates are not set in competitive markets; often rates are not designed to cover the costs of development, treatment, and delivery. As a result, it has been difficult to conduct statistical studies of the willingness to pay for potable supplies of municipal water.

A survey of literature on water demand reveals that the value of water, at the margin, varies widely across different regions (3). In a survey of how much consumers would be willing to pay to avoid a 10 percent reduction in water use, the answers (in 1988 dollars) ranged from about $28 per acre-foot in Toronto, Canada, to about $142 per acre-foot in Raleigh, North Carolina. The upper end of this range is equivalent to about $5 per year per household. For larger reductions, however, willingness to pay to avoid the reduction is much greater.

Looking at the actual amounts paid, 90 percent of households in the United States pay less than $110 per year for water service. We can draw two lessons from this data. First, households can conserve a small amount of water without too much loss in welfare. Second, large, permanent reductions in water use could be very disruptive for the typical household. As a result, in cases where contamination affects a large part of the water supply, reduction in quantity supplied would not be feasible and remediation or replacement of the resource would probably be the preferred strategy.

Industrial use value. Industrial use accounts for about 10 percent of water withdrawals in the United States, with the dominant use being for cooling. Because many industrial processes are not sensitive to the quality of the water, contamination may not preclude such uses. But, in the event that water use must be curtailed, recycling and reuse costs range from about $10 to $100 per acre-foot. In special uses, recycling and extra quality treatments may push the cost up to $400 per acre-foot (3).

Irrigation use value. Some of the most productive farmland in the country is irrigated land in the West. Many researchers have assessed the value of extra crop yield attributable to irrigation. These "marginal value products" for water vary widely in value from near zero to more than $100 per acre-foot, depending upon the crop and the geography of the area. The wide range of values clearly shows that water is not marketed and transported easily to the point of its highest valued use. Rather, it is used in activities of very different productivity, and these "inefficient" uses are protected by legal and institutional barriers.

As water markets mature, however, we can expect to see only higher valued water uses. Also, we can expect the price to reflect a more uniform marginal value. For example, in some parts of the West, farmers and ranchers are paying about $30 per acre-foot for irrigation water. As water rights become more transferable, municipal users will bid up the price, and less water will be used in irrigation.

Option value and existence value

Besides actual use value, water supplies also may be valued for potential future use. There is much public interest in protecting groundwater for the future. A study by Edwards (1) assessed residential willingness in Cape Cod to pay to protect potable groundwater from possible nitrate contamination. The study focused on several scenarios representing different levels of risk of future contamination. The present value of protecting the aquifer ranged from $5 million to $25 million per 1,000 households. This represents a willingness to pay ranging from $500 to $2,500 per year per household for groundwater protection.

In summary, *use* and *option* values can be viewed as an approximation of the cost of contamination. Most contamination incidents can be managed at a low enough cost that uses will not be foreclosed.

Finally, society may desire to protect groundwater as a resource with intrinsic value separate from any desire to avoid the direct costs associated with contamination. Because this existence value also is lost when groundwater is contaminated, it may motivate even greater protection efforts.

Physical aspects of contamination

Three physical characteristics of ground water are of particular importance when considering cost. First, groundwater usually moves very slowly through an aquifer. As a result, natural cleansing of an aquifer through recharge and dilution can take many years. A simulation study of a Superfund site in Woburn, Massachusetts, suggests that 40 years of natural cleansing still would not result in water that meets U.S. Environmental Protection Agency (EPA) drinking water standards (8).

The second aspect of groundwater that influences the cost of contamination is the fact that it's underground. Although the science of hydrogeology has advanced greatly in recent years. It still is very difficult and costly to identify the exact area and expected path of a contamination plume. In such cases, choosing a cost-effective and protective response strategy is a serious dilemma. In a case where contamination is not detected, the cost will be in the form of adverse human health effects and ecological damages.

A third consideration is that groundwater is no different than any other water. Therefore, treatment or replacement of contaminated water often may represent the cost-effective strategy for managing the event.

Cost of contamination

If contamination of groundwater is not detected, then adverse health and ecological effects may result. For example, contamination of surface water by groundwater recharge can damage spawning grounds, upset food chains, and affect habitat in many ways that affect biodiversity and other measures of ecosystem health. These costs are difficult to quantify, although they can be severe.

When contamination of a drinking water supply is detected, a response strategy can be fashioned from available options. Detection itself can be costly because of the need for monitoring wells and laboratory analysis. For example, if a private well is threatened with possible contamination from agricultural chemicals, biannual testing would cost $100 to $300 per year. If larger areas are threatened, the drilling of new monitoring wells may cost several thousand dollars each, and more elaborate sampling protocols may be necessary.

Adverse health effects. Although health effects are a principal concern in cases of undetected water contamination, there is significant uncertainty in any attempt to quantify and value such damages. Economic researchers have identified methods for measuring willingness to pay for reduced risk of adverse health effects across large populations. For example, observation of wage premiums paid to workers in risky jobs has allowed inference of the money-risk trade-off. In addition, a variety of survey methods have been used to assess the subjective value of changes in such risks. A survey of recent literature on the valuation of small changes in the risk of death due to such accidental causes as pollution suggests that the value of a "statistical life" saved ranges from $1 million to $7 million (2).

There is less empirical evidence on the value of avoiding nonlethal health effects. A rough but practical approach is to use the cost-of-illness approach for valuing non-lethal effects. Costs include direct medical treatment costs, whether covered by insurance or not; the value of lost work; and the value of lost leisure time. These costs vary according to the nature of the illness and its severity, duration, possibility of recurrence, and other factors. Pain and suffering represent additional costs that are difficult to place monetary figures on.

Containment and remediation costs. Source control can mean stopping an activity like agricultural chemical use; removing a source, such as an underground storage tank; injecting barrier walls underground around a source; sealing the surface area above a source to reduce water infiltration and leaching; or controlling water pumping and reinjection to prevent groundwater from flowing out of the area. Costs for containment action can vary widely depending upon site characteristics, type of contaminant, and extent of the plume.

For example, analysis of containment options at a hypothetical 10-acre landfill included $4 million for sealing the bottom. $1.4 million for installing a grout curtain, and $200,000 for an injection/extraction barrier (9). The average cost of remedial action at Superfund sites has been estimated to be $8 million (9). In many cases, the cost of providing alternative water supplies until remediation is complete must be added to other costs to determine the total cost of the contamination incident.

Treatment. Effective removal of many contaminants can occur through central treatment technologies in municipal systems or by point-of-entry/point-of-use technologies in rural residences with private wells. The EPA Office of Drinking Water has gathered information on costs of various treatment technologies in different-sized systems. Due to economies of scale, unit costs generally are lower in larger systems and highest in single-household point-of-use systems.

Central treatment often is the least-expensive response to a contamination incident. Such treatment can add several hundred dollars per year to the household cost of water supply in very small systems and from $2 to almost $50 per year to the annual household bill in large systems.

Replacement. For large public water suppliers facing contamination of a small part of the total source supply, replacement of the contaminated supply is often fairly inexpensive response strategy. Construction of new wells can provide water ranging in cost from a few cents per 1,000 gallons in very large systems to $3 per 1,000 gallons in the smallest systems. A new well for a single household can cost $5,000 to $7,000, depending upon diameter, depth, and other site characteristics. Hookup of a

Average treatment costs for groundwater systems

	System Size (no. households served)					
	25-100		25k-50k		500k-1M	
Treatment	Cost/1000 gal*	Cost/household/yr†	Cost/1000 gal	Cost/household/yr	Cost/1000 gal	Cost/household/yr
Disinfection	$1.38	$175.00	$0.036	$ 4.00	$0.014	$ 2.00
GAC‡	$1.71	$217.00	$0.17	$21.00	$0.085	$11.00
Multiple§	$5.70	$723.00	$0.70	$89.00	$0.44	$56.00

Note: Preliminary estimates provided by the Office of Drinking Water are subject to revision.
*Costs are expressed in 1988 dollars.
†Assumes use of 140 gallons/day/capita for all uses and 2.5 people/household.
‡GAC—granular-activated carbon.
§Multiple—disinfection, corrosion control, ion exchange, and GAC.

household to a public system can cost $12,000 or more, depending upon distance to the water main and water payments (5).

National cost estimates

EPA prepared an assessment of the water supply replacement cost due to groundwater contamination potentially resulting from nine types of major point sources (11). The total present value of resource damage from these sources was estimated to exceed $28 billion. This figure does not include costs for monitoring or management of groundwater contaminated by such nonpoint sources as agricultural chemicals or urban runoff. Estimated national damages range from no cost for combustion of hazardous waste to $8 billion for Superfund sites and more than $15 billion for underground storage tanks. On average, the study estimated resource damages at $9.7 million for individual Superfund sites; $300,000 to $400,000 each for land disposal sites of various kinds; and $11,000 each for underground storage tanks. The great number of underground storage tanks accounts for their large contribution to the National problem.

Implications for policy

A primary reason for developing estimates of the costs of groundwater contamination to enlighten decision-makers about the importance of preventive measures for groundwater protection. Because of the difficulty of cleaning up contaminated aquifers, it is argued that prevention is better than remediation. In carrying out an analysis comparing prevention with remediation, it is tempting to focus on the costs of contamination and compare them with the costs of a prevention program. This approach, however, can lead to serious errors.

No prevention program is perfect, so there is always the possibility of groundwater contamination despite protective measures. Conversely, contamination of groundwater does not occur around every potential point source. Therefore, damages from contaminatioin only occur sometimes, with a probability between zero and one.

In comparing the costs and benefits of prevention programs with those of remediation, replacement, or treatment, it is essential to adjust the cost/benefit analysis always should occur within an expected value framework. In addition, because costs and benefits likely occur at very different points in time, all values should be discounted to the same point in time to make them comparable.

While groundwater contamination occurs nationwide, each incident typically affects only a small part of the relevant groundwater system. Because of the wide dispersion of many small events, the cost of each incident seems small. But as demand for potable water increases and if at the same time contamination becomes more widespread, the opportunities for finding alternative sources will decline and the extra cost of contamination incidents will rise quickly. State and regional authorities need to develop water supply plans for a reasonable long planning horizon, as well as strategies to protect both current and future supply sources.

Research needs

Recognizing that the cost of contamination depends upon the availability of substitutes and treatment technology, two lines of research that require further pursuit. First, better forecasts of water demand are needed to predict more accurately the scarcity of new supply and the associated cost of replacement. This research should include estimates of the price elasticity of water demand and the possible effect on demand of more rational cost-based pricing structures.

Second, research and development of techniques for *insitu* remediation should be encouraged. Pump-and-treat strategies result in very slow remediation of aquifers. Biological or chemical methods of purifying water in the ground could reduce greatly the cost of cleansing contaminated groundwater sources.

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NEWS FLASH

Congratulations to the Canadian Golf Team of Thom Charters, Bob Heron, Doug Meyer and Robbie Robinson on their one point victory over the United States in the Ransomes International Golf Tournament, England. The tournament was played over 36 holes with Stableford scoring, a birdie on the last hole by Bob Heron was the deciding factor. Teams from Austria, Belgium, Denmark, Finland, Germany, Holland, Northern Ireland the Republic of Ireland, Norway, Scotland, Sweden and Wales also competed.

Congratulations are also in order for Mr. Paul Dermoit who has been selected the 1991 Canadian Superintendent of the year. He will be recognized at the conference annual meeting and awarded a trophy at the score awards banquet in Toronto

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I have recently accepted a 10 month developmental assignment with OMAF Plant Industry Branch as Program Manager, Greenhouse & Provincial Specialists. I will be relocating to the Guelph Agriculture Centre during this period.

Ms. Pam Charbonneau will be assuming the duties of Turfgrass Extension Specialist November 12, 1991 – August 1, 1992. Pam has an extensive background in horticulture in particular in plant breeding and will be a valuable asset to the GTI team.

I would like to thank you for your support and cooperation over the past 5 years. Being turf extension specialist has been both challenging and rewarding. I look forward to continuing to work with the turf industry in the future.

UPCOMING EVENTS

December 8 – 11, 1991
C.G.S.A. Conference & Show, Toronto, Ontario

January 8 – 11, 1992
University of Guelph, Ontario Turfgrass Symposium

January 13 – 17, 1992
Ohio State University, Golf Course Short Course

Turfels Pesticide Licence Preparation Course
January 25 & 26, 1991, London, Ont.
February 22 & 23, 1992, Scarborough, Ont.
March 28 & 29, 1992, Guelph, Ont.
April 25 & 26, 1992, Ottawa Ont.

Golf Superintendents Meet at Saugeen G.C.

A combined "work and play" seminar for golf course superintendents of Georgian Bay District was held at Saugeen Golf Club, a 67-year-old facility located three miles east of Southampton, Ontario in Bruce County. Seventy-eight "supers", equipment representatives and guests entered for the tournament and golf course equipment demonstrations.

The programme started with a golf tournament in which 74 men and six ladies teed off. During this period an impressive display of maintenance equipment was being shown from companies of the industry including, G.C. Duke Lawn, RMS Turf Care, Ontario Turf and Multitines. Demonstrations were naturally directed at the greenskeepers, but were also viewed by many interested golfers gathered around the site.

Other firms associated with golf maintenance included Scott's Pro Turf, Arborists Tree Care, Hunter Irrigation, C-I-L Industries, Aqua Tec, Par Ex and Kaboto Equipment.

In the golf competition, Robert Greer, superintendent of Listowel Golf and Country Club, fired a two-over par 74 to win the championship of the day, while Rod Champman of Kabota was 80 for the best score of the "B" entries. Low net of "A" division was won by Dave Brooke of Bradford while Tom MacLean was best net for "B" flight.

Special awards went to Saugeen's assistant superintendent, Steve Connors for longest drive; closest to pin awards were won by Rod Chapman of Kaboto and Bob Brewster of Toronto. Some of the 24 golf clubs represented included Goderich, Wingham, Exeter, Parry Sound, Port Carling, Barrie, Midland, Creemore, Toronto Ladies Golf Club, Toronto Golf, Tobermory, Kincardine, Southport G.C. and Holiday Golf Club, Port Elgin.

An added attraction to the day's events was the "fly-past" of the course by Exeter superintendent, Gib Dow, who piloted his Cessna in for the day, landing at an area strip owned by a Port Elgin developer.

Host superintendent and club general manager, Gary Gravett, welcomed the group and acted as master of ceremonies at the awards dinner following the days play. The equipment demonstrations drew such interest that they carried on into darkness.

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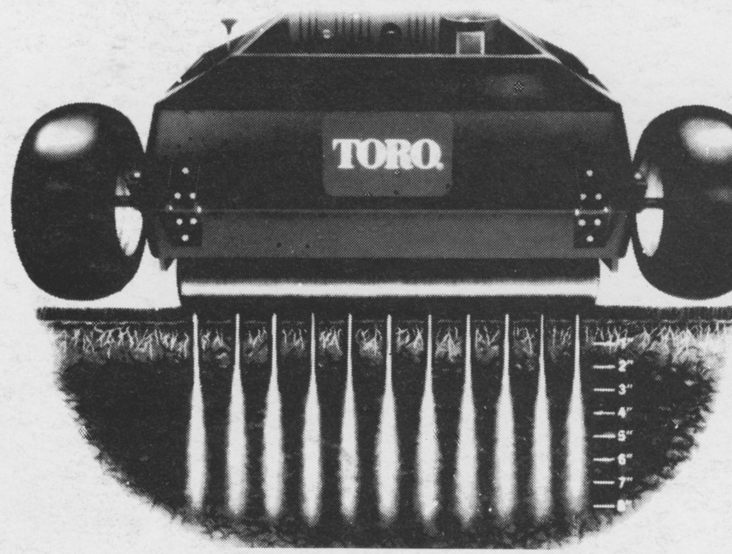

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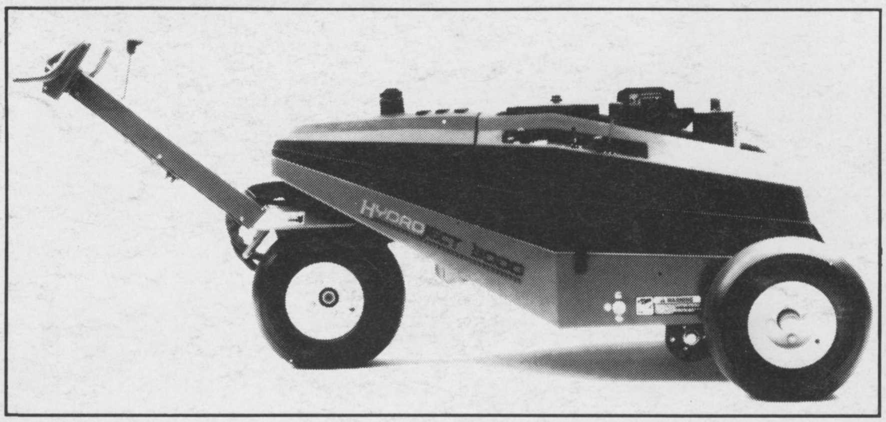

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