

Economic Profile of the Ontario Turfgrass Industry, 2007
Kate Tsiplova, Glenn Fox, Katerina Jordan, Eric Lyons

Economic Profile of the Ontario Turfgrass Industry¹

Final Report

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Executive Summary⁴

Background

The Ontario turfgrass industry consists of diverse segments, such as golf courses, municipal parks, sod farms, lawn care companies and sports fields. Prior to this project, the most recent economic profile of the Ontario turfgrass industry was conducted for 1982. The Ontario Turfgrass Research Foundation commissioned an economic study of the Ontario turfgrass industry. Starting in the fall of 2007, the University of Guelph research team, consisting of Professors Glenn Fox, Katerina Jordan, and Eric Lyons and Research Associate Kate Tsiplova, have undertaken a study that:

- Developed an economic profile of the Ontario turfgrass industry and;
- Analyzed and assessed the growth potential of the Ontario turfgrass industry.

This study should be of interest to all Ontario turfgrass industry segments and to government agencies that regulate them. We hope that the results of this study will emphasize the importance of the turfgrass industry to the economy of Ontario.

Both secondary and primary data sources were used to collect data on the land area devoted to turfgrass cultivation and maintenance, the sales value of turfgrass products and services, and the value of turfgrass maintenance expenditures in Ontario. We surveyed selected turfgrass industry segments to gain insight about factors that turfgrass managers believe to be either constraints to or opportunities for the growth of the Ontario turfgrass industry.

Production

The total gross Ontario turfgrass industry's revenue was \$2.61 billion in 2007. In comparison, the total Ontario farm value of grains and oilseeds was \$2.34 billion 2007.

Acres

The Ontario turfgrass industry maintained 390 thousand acres of turfgrass in 2007. In comparison, the total Ontario harvested area of grains and oilseeds was 5.52 million acres in 2007.

⁴ All financial magnitudes are reported in 2007 Canadian \$ unless otherwise noted.

Turfgrass Survey Summary

Industry Segment	Acres thousand	Gross Revenue 2007 CDN \$ million	Operating Expenditures 2007 CDN \$ million	Equipment Purchase 2007 CDN \$ million	Total Full-time Equivalent Employees
Sod Farms	36.3	108	68.8	12.0	1,055
Golf Courses	98.6	1,250	339	35.9	6,711
Households	122		223	280	
Municipalities	93.2		174	9.00	3,840
Universities	0.839		7.72	0.0348	357
Provincial Highways and Roads	38.5		2.47	22.8	
Lawn Care Companies ¹		1,256	577		20,810
Total	390	2,614	1,391	360	32,773

1. Since lawn care companies provide maintenance services for other industry segments, we excluded the turfgrass area that they maintained from the total province-wide area. Lawn care companies maintained 1.13 million acres of turfgrass, which does not match the acreage maintained by other industry segments. The reason for this divergence may be that lawn care respondents may have specified the area of turfgrass that was treated multiple times by their company. Therefore, one treatment location may have been counted more than once.

Strategic Growth Analysis

All industry segments, except universities and colleges, reported that they expected population growth and urbanization or retirement trends or both to benefit the industry over the next five to ten years. Overall, all industry segments had a positive outlook on the future of their turfgrass operation. The majority of respondents indicated that they expect the size of their turfgrass operation to either increase somewhat or remain stable over the next 5 to 10 years.

Some of the impediments to growth of the turfgrass industry included water use policies and cost of water. Another potentially problematic factor for turfgrass industry is either cost of labour or availability of qualified labour. The Cosmetic Pesticides Ban Act impacts the turfgrass industry considerably, with lawn care companies being affected the most. We found that lawn care respondents identified pesticide use policies and public perception of turfgrass industry as having a negative effect on the future growth of their turfgrass operations.

Turfgrass Research

We found that the Ontario turfgrass symposium was a frequently chosen source of turfgrass information for sod farms, golf courses and municipalities with over 50% of responses. Other frequently chosen sources of turfgrass information included industry associations and peers. The turfgrass research subject that yielded the greatest number of responses among golf courses was soil fertility. A frequently chosen research subject for universities and colleges was equipment innovations, while lawn care and municipalities were primarily interested in research information on alternative pest control and soils and soil management.

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1. Introduction

1.1 Background

The turfgrass industry is diverse, consisting of businesses and public sector operations. The Ontario turfgrass industry includes turfgrass production, use, and maintenance segments. Sod farms represent the production segment of the Ontario turfgrass industry. Turfgrass is used for recreational, aesthetic, and environmental purposes. Industry segments that use turfgrass for such purposes include golf courses, residential and commercial properties, educational facilities, municipal parks, municipal and provincial roads, churches, and cemeteries. Lawn care and landscaping companies represent the maintenance segment. Turf related industry segments include the seed, equipment, fertilizer and pesticide companies.

The last comprehensive study documenting the economic impact of the turfgrass industry in Ontario was published in 1984. Sears and Gimplej (1984) estimated the area of maintained turfgrass in Ontario and determined the value of sales and expenditures within the turfgrass industry in Ontario in 1982. The authors collected data by surveying households, commercial developments, golf courses, sod farms, educational facilities, parks and recreational lands, government-related areas, cemeteries, airports and other transportation facilities, and religious institutional lands.

Sears and Gimplej (1984) estimated that Ontario turfgrass industry maintained 385 thousand acres in 1982, with the highest acreage being attributed to residential properties. They estimated the industry's total expenditure on turfgrass maintenance to be \$504 million in 1982. According to Sears and Gimplej (1984), the sales of products that were used for turfgrass maintenance totalled \$397 million in 1982.

Since 1982, the Ontario turfgrass industry has expanded and changed. The extent of this expansion has not been documented. Furthermore, the current contribution of the turfgrass industry to the Ontario economy is unknown.

The turfgrass industry contributes significantly to the economy in other jurisdictions as well. For example, Justason (2006) estimated that in 2006 the British Columbia turfgrass industry maintained 180 thousand acres across the province. Justason (2006) also estimated that the industry budget was in the range of \$1.02 billion in 2006. The estimated British Columbia turfgrass industry's employment was in the range of 16.7 thousand people in 2006.⁵

New York Agricultural Statistics Service (2004) found that the New York turfgrass industry maintained a total of 3.43 million turfgrass acres in 2003. The turfgrass industry employed 43.2 thousand employees in 2003⁶. New York Agricultural Statistics Service (2004) estimated that the New York turfgrass industry spent over \$7.66 billion (\$5 billion 2003 US) on turf maintenance expenses in 2003.

National Agricultural Statistics Service (2006) estimated that the turfgrass industry contributed in excess of \$1.91 billion (\$1.5 billion 2005 US) to the economy of the State of Maryland in 2005. The Maryland turfgrass industry maintained 1.1 million of acres of turf in 2005. The Maryland turfgrass industry employed an estimated 12.7 thousand workers⁷ and spent \$371 million (\$291 million 2005 US) in wages in 2005.

⁵ Justason (2006) did not seem to make an adjustment to their total number of employees that would account for seasonal and part-time employees. In our study, we report the total industry number of year-round full-time equivalent employees, which required an adjustment to the number of year round part-time and seasonal full-time and part-time employees.

⁶ New York Agricultural Statistics Service (2004) did not adjust the total number of employees to account for seasonal and part-time employees.

⁷ New York Agricultural Statistics Service (2006) did not adjust the total number of employees to account for seasonal and part-time employees.

1.2 Purpose and Objectives

The purpose of this project was to develop an economic profile of the Ontario turfgrass industry and to identify strategic policy and research issues that face the industry. The objectives of the study were:

1. To estimate the total area of maintained turfgrass in Ontario,
2. To estimate the number of staff employed by the Ontario turfgrass industry and their education and training levels,
3. To estimate the gross revenue of the Ontario turfgrass industry,
4. To estimate expenditures on turf maintenance by the Ontario turfgrass industry,
5. To identify various factors that may affect the expansion of turfgrass industry and determine which of these factors will serve as opportunities or constraints to the expansion of the Ontario turfgrass industry,
6. To compare the Ontario turfgrass industry with other commodity groups, such as corn and wheat.

1.3 Outline of the Report

Section 2 describes the methods of this study. Section 3 summarizes data for the entire Ontario turfgrass industry. Section 4 presents detailed data for each of the industry segments included in the study, specifically, the sod industry in section 4.1, the golf course segment in section 4.2, residential properties in section 4.3, municipalities in section 4.4, universities and colleges in section 4.5, provincial highways and roadside in section 4.6, and lawn care companies in section 4.7. Section 4.8 is an overview of the turf-related industry segment. Section 5 presents an analysis of strategic policy and management issues facing the industry. Section 6 discusses the turfgrass research needs of turfgrass managers. Section 7 is the conclusion.

2. Methods

The economic profile of the Ontario turfgrass industry required quantitative data on land area of maintained turf, labour, expenditures, and revenues. In order to develop the strategic analysis of the Ontario turfgrass industry, we identified potential challenges and opportunities that face the Ontario turfgrass industry. Turfgrass managers are the first to be affected by policy or technological changes, and, as such, they may be in the best position to judge how such changes may affect their turfgrass operation. Therefore, the strategic growth analysis necessitated collecting turfgrass managers' opinions on the challenges and opportunities that face the Ontario turfgrass industry.

We collected primary and secondary data for this study. Collection of primary data involved surveys of selected turfgrass industry segments. The first step to developing a survey was to establish a pool of potential respondents and a possible way to contact them. We identified and established contact with various associations whose members represent the production, use and maintenance segments of Ontario turfgrass industry. Appendix 1 contains the list of such associations. We designed our surveys with a view toward maximizing the comparability of our data with other industry profiles, in particular, the 1997 and 2006 British Columbia Turfgrass Industry Profile, the 1984 Turfgrass Production and Maintenance Costs in Ontario study (Sears and Gimplej 1984), and the 2004 New York Turfgrass Survey. However, since the production, use and maintenance of turfgrass differ across regions, our questionnaires also had to be tailored to the Ontario context. Draft surveys were prepared for each industry segment and pre-tested with selected industry representatives and practitioners. Based on comments on these draft surveys, questionnaires were revised and delivered to our sample. Prior to distributing surveys, we sent out notices to members of participating industry associations.

After each survey was distributed, at least two reminders about the survey were sent out to members of each association. Questionnaire delivery methods varied across industry segments, following the advice of industry associations. Notifications and reminders of questionnaires were distributed through a variety of means, including associations' newsletters, magazines, e-mail distribution lists and postings on associations' website. Appendix 1 presents a detailed log of survey distribution. The categories of questions in the questionnaire included the following:

1. type and area of maintained turfgrass,
2. revenue generated from turfgrass related operations, if applicable,
3. employment figures, employee qualifications and recently completed training,
4. expenditures on payroll, equipment, supplies, and management activities,
5. challenges, opportunities and future trends, and
6. views on turfgrass research.

In order to capture the sod production industry segment, we distributed our survey to members of the Nursery Sod Growers Association of Ontario. The Association has 43 members. We received 9 responses, resulting in about 20.9% response rate. Furthermore, we consulted the annual Greenhouse, Sod and Nursery Survey and Censuses of Agriculture, conducted by Statistics Canada, for additional data.

For the economic profile of golf courses, we relied on primary data collection as there are limited secondary data. We contacted the members of the Golf Superintendents Association of Ontario. The Association had over 800 members, however only 388 were golf superintendents. Our sample was then 388 people. We received 105 responses, resulting in 27.1% response rate.

For the parks and recreation facilities, we distributed the survey to 156 members of the Sports Turf Association of Ontario, 735 members of the Ontario Parks Association, and 1,200

members of the Ontario Recreation Facilities Association. The members of these associations represent Ontario municipalities, universities and colleges and other public organizations that maintain parks and recreational facilities. In this report, we conducted an economic profile for municipalities and universities only. In the strategic growth analysis, we included responses from colleges as well. We received 22 responses from the Sports Turf Association of Ontario, 61 responses from the Ontario Parks Association, and 16 responses from the Ontario Recreation Facilities Association, resulting in 14.3%, 8.30%, and 1.33% response rates for each association, respectively. Clearly, the response rate for the Ontario Recreation Facilities Association is low. There are two reasons for such a low response rate. Firstly, the membership list for the association is diverse, containing workers that maintain non-turfgrass recreation facilities as well as turfgrass recreation facilities. Secondly, there were some issues with respect to delivering survey notifications and reminders to the membership list.

The responses from each association were used jointly to develop a profile of municipalities and universities. Although, the response rate of the Ontario Recreation Facilities Association is low, the completed surveys represent responses from municipalities and universities and colleges that help to build a profile of the Ontario turfgrass industry. The memberships of the Ontario Recreation Facilities Association, Sports Turf Association of Ontario and Ontario Parks Association are not used to produce aggregate estimate of economic activity of municipalities and universities. We used an independent source to obtain data on the total number of municipalities and universities. We used these data to produce aggregate estimates.

In order to obtain a sample of lawn care industry segment, we distributed the survey to members of the Professional Lawn Care Association of Ontario and the Landscape Ontario. The

Professional Lawn Care Association of Ontario had 197 lawn care companies as members. The Landscape Ontario had 2,000 members, however only about 1,000 members were lawn care companies. We received 29 responses from the Professional Lawn Care Association of Ontario and 95 responses from the Landscape Ontario, resulting in 15 % and 9.5 % response rates, respectively

The standard aggregation procedure that we used for quantitative survey data was to multiply the average response by the total number of relevant Ontario operations (population). In the case of golf courses, municipalities, and sod farms, we modified the procedure to overcome what appeared to be a bias in our survey responses. For golf courses, we adjusted our sample data in order for the sample distribution of 9-hole, 18-hole and other types of golf courses to more closely match the population distribution as reported by ScoreGolf.com. We used the ScoreGolf.com website as it contained a comprehensive listing of Ontario golf courses, categorized geographically and by the number of holes. Section 4.2.1 describes the modified aggregation procedure for golf courses in greater detail. For municipalities, our sample consisted of municipalities with population of over 5,000 people. The number used for the aggregation of survey data was the number of Ontario municipalities with over 5,000 people, as reported by Statistics Canada (2007e). Section 4.4.1 describes the modified aggregation procedure for municipalities in greater detail. We also modified the aggregation procedure for the sod farms sector to reflect our survey's apparent bias towards larger sized sod farms. Section 4.1.1 describes the modified aggregation procedure for sod farms in greater detail.

In order to get an estimate of turfgrass maintenance by the provincial roads and highways, we contacted the Ontario Ministry of Transportation for that information directly. We collected secondary data for households using Statistics Canada as a source. In particular, we

were able to collect time series of pesticide, fertilizer, and equipment expenditures by Ontario households.

We compared some of our findings with findings of the 2006 British Columbia Turfgrass Industry Profile study, the 1984 Turfgrass Production and Maintenance Costs in Ontario study, the 2004 New York Turfgrass Survey, and the 2005 Maryland Turfgrass Survey. We also compared the sales value and the acreage of Ontario turfgrass products and services with the farm value and the acreage of selected Ontario agricultural commodities. We can gain perspective of the size of the Ontario turfgrass industry when it is compared with other industries. Moreover, we can use other studies to confirm that our results are in the reasonable range. All financial magnitudes are reported in 2007 Canadian dollars unless otherwise noted.

Our economic profile of the Ontario turfgrass industry includes estimates of gross revenues, land area and input expenditures for industry segments including golf courses, households, sod farms, municipalities, universities, lawn care companies, and provincial roads and highways. We compared these estimates of revenues, land area and expenditures on inputs with comparable measures for turfgrass industry segments in other jurisdictions and also with selected Ontario agricultural commodities.

Other studies of economic significance of specific industries often rely on calculations based on so-called multipliers, based typically on input-output models. This approach is controversial on theoretical grounds. A practical objection is that estimated values for multipliers vary. Since we elected to avoid the use of input-output models and multipliers in this study, our results should not be compared to calculations of industry size that are based on multipliers.

3. Summary of Findings for the Ontario Turfgrass Industry

3.1 Definitions and Methods

In Table 1 we provide information on the year(s) for which the data were collected, sources of data, sample and population sizes. Individual industry segments' sections provide greater detail on methods of obtaining and analyzing data. We attempted to be consistent with respect to the year for which the data was collected. However, some of the secondary sources' data were not available for 2007. As can be seen from Table 1, we considered seven primary turfgrass industry segments – households, golf courses, municipalities, sod farms, lawn care companies and provincial roads and highways. We also collected sales data for the secondary turfgrass industry segments – fertilizer, pesticide, seed and equipment companies. There are other primary turfgrass industry segments that were not considered in this study. These industry segments include commercial properties, school boards, conservation authorities, airports, public and private secondary and elementary schools and post-secondary institutions other than universities. We received some responses from private schools, conservation authorities and colleges; however they were too few to permit any quantitative analysis. Furthermore, it is often the case that municipalities maintain turfgrass that is used by secondary and elementary schools.

3.2 Area of Maintained Turfgrass

In Table 2 we report total area of turfgrass for each industry segment that was maintained in 2007. Since lawn care companies provide maintenance services for other industry segments, we excluded the turfgrass area that they maintained from the total province-wide area. We estimated that sod farms, golf courses, households, municipalities, universities and the Ontario Ministry of Transportation maintained 390 thousand acres of turfgrass in 2007. Households had the largest share of the total area by maintaining 122 thousand acres in 2007. Golf courses had

Table 1. The Year for which Turfgrass Maintenance Data were Collected, Data Source, Sample Size and Estimated Population Size for Households, Sod Farms, Golf Courses, Municipalities, Universities, Provincial Highways and Roads, Lawn Care Companies.

Industry Segment	Year	Source	Sample Size	Population Size
Households	2006 ¹	Statistics Canada Survey of Household Spending	20,436	4,737,841 households
Sod Farms	2007 ²	University of Guelph 2007 Turfgrass Survey	9	51.6 sod farms ³
Golf Courses	2007 ²	University of Guelph 2007 Turfgrass Survey	105	806 golf courses ⁴
Municipalities	2007 ²	University of Guelph 2007 Turfgrass Survey and Selected Municipal Budgets	66	228 municipalities with population of over 5,000 people
Universities	2007 ²	University of Guelph 2007 Turfgrass Survey	6	19 universities
Provincial Highways and Roads	2006-2007 ⁵	Ontario Ministry of Transportation	not applicable	not applicable
Lawn Care Companies	2007 ²	University of Guelph 2007 Turfgrass Survey	119	1,300 lawn care operators that hold the Ontario Ministry of Environment's pesticide license

Notes:

1. The most recent turfgrass maintenance data available for households are for the year of 2006.
2. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.
3. We assumed that the sod farm population is equal to the number of members belonging to the Nursery Sod Growers Association of Ontario, 43 farms. Since the Association represent 80% of all acres of sod sold in Ontario, we developed the adjustment factor of 1.2 to account for the remaining 20% of sod sold. This adjustment means that the estimated sod farm population size is 51.6 sod farms.
4. According to the ScoreGolf.com website, there are 811 golf courses in Ontario. Using the ScoreGolf.com database of golf courses, we determined that there are 806 golf courses in Ontario that are applicable to this study.
5. The Ontario Ministry of Transportation reported turfgrass maintenance figures for the 2006 construction season as well as the 2007 construction season up to October 18, 2007. In order to estimate expenditure in 2007, we divided that value by two.

Table 2. Ontario Total Area of Turfgrass Maintained by Households in 2006¹ and the Total Area of Turfgrass Maintained by Golf Courses, Municipalities, Sod Farms, Universities, Lawn Care Companies, Provincial Highways and Roads in 2007².

Industry Segment	Acres (thousands)
Sod Farms	36.3
Golf Courses	98.6
Households	122
Municipalities	93.2
Universities	0.839
Provincial Highways and Roads	38.5 ³
Total	390⁴
Lawn Care Companies	1,126

Notes:

1. The most recent turfgrass maintenance data available for households are for the year of 2006.
2. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.
3. The Ontario Ministry of Transportation reported total area of mowable turfgrass and the total area of turfgrass that underwent construction activities, such as seed and mulch; seed and erosion control blanket; seed and bonded fibre matrix; and sod. In this table we only report the total area of mowable turfgrass.
4. Since lawn care companies provide maintenance services for other industry segments, we excluded the turfgrass area that they maintained (1,126 thousand acres) from the total province-wide area to avoid double-counting.

Sources:

1. The acres of maintained turfgrass in the Sod farms' row correspond to Table 9
2. The acres of maintained turfgrass in the Golf Courses' row correspond to Table 15
3. The acres of maintained turfgrass in the Households row correspond to Section 4.3.2
4. The acres of maintained turfgrass in the Municipalities' row correspond to Table 27
5. The acres of maintained turfgrass in the Universities' row correspond to Section 4.5.2
6. The acres of maintained turfgrass in the Provincial Highways and Roads' row correspond to Section 4.6
7. The acres of maintained turfgrass in the Lawn Care Companies' row correspond to Section 4.7.2

the second largest share with 98.6 thousand acres. They were closely followed by municipalities with 93.2 thousand acres. According to the data in Table 2, lawn care companies maintained 1.13 million acres of turfgrass. This number does not match the acreage maintained by other industry segments in our survey. The likely reason for such a divergence is that lawn care respondents may have specified the area of turfgrass that was treated multiple times by their company. Therefore, one treatment location may have been counted more than once.

3.3 Revenues and Costs

In Table 3 we report the total 2007 Ontario sod farms' revenue, golf courses' revenue from round and membership fees and lawn care maintenance companies' revenue. The total gross Ontario turfgrass industry's revenue was \$2.61 billion in 2007. The total gross revenue excludes revenues by sports fields and parks, as these revenues are not likely to be significant. According to our survey, the sod farms' revenue was \$108 million in 2007. The gross revenue of Ontario golf courses in 2007 was \$1.25 billion. Ontario lawn care companies earned \$1.26 billion in 2007 from providing turfgrass maintenance services. About 70.9% of Ontario lawn care companies' revenue was attributed to services provided to Ontario households, approximately \$891 million.⁸

Table 4 contains data on operating turfgrass maintenance expenditures by industry segments, such as households, golf courses, municipalities, sod farms, universities, lawn care companies, and provincial roads and highways. According to the data in Table 4, the Ontario turfgrass industry spent an estimated \$1.39 billion on operating turfgrass maintenance expenditures in 2007. There is an exchange of services and products within the turfgrass

⁸ The total amount that residential properties spent on lawn care services is calculated by multiplying the total Ontario sales value of lawn care services by the percentage of residential properties that an average lawn care company had as its customers.

Table 3. Ontario Sod Farms', Golf Courses' and Lawn Care Companies' Gross Revenue, 2007¹.

Industry Segment	2007 CDN \$ million
Sod Farms ²	108
Golf Courses ³	1,250
Lawn Care Companies ⁴	1,256
Total	2,614

Notes:

1. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.
2. For sod farms, we report gross revenue from sale of sod that an operation grew and sold in their most recent fiscal year
3. For golf courses, we report gross revenues generated from round and membership fees.
4. For lawn care companies, we report the gross revenue from providing turfgrass maintenance services in their most recent fiscal year.

Sources:

1. The gross revenue in the Sod farms' row corresponds to Section 4.1.3.
2. The gross revenue in the Golf Courses' row corresponds to Table 16.
3. The gross revenue in the Lawn Care Companies' row corresponds to Section 4.7.3

Table 4. Ontario Operating Turfgrass Maintenance Expenditures by Households in 2006¹ and by Golf Courses, Municipalities, Sod Farms, Universities, Lawn Care Companies, and Provincial Highways and Roads in 2007².

Industry Segment	Input Categories (2007 CDN \$ million)							Total ⁵
	Payroll	Equipment Rental, Repair and Maintenance	Pesticide	Fertilizer	Seed	Fuel/Gas	Other ³	
Households	not applicable	not available	49.3	173	not available	not available	not available	223
Golf Courses	227	33.9	25.2	17.4	2.84	14.9	18.1	339
Municipalities	129	14.5	4.16	1.81	4.47	2.09	17.8	174
Sod Farms	30.5	10.9	2.40	11.1	4.49	6.48	3.02	68.8
Universities	6.98	0.418	lack of data	0.0523	0.0428	0.105	0.12	7.72
Lawn Care Companies	395	21.4	44.5	47.9	9.05	42.1	17.2	577
Provincial Highways and Roads ⁴	not available	not available	not available	not available	2.47	not available	not available	2.47
Total	788	81.1	125	252	23.4	65.7	56.2	1,391

Notes:

1. The most recent turfgrass maintenance data available for households are for the year of 2006.
2. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.
3. "Other" includes expenditures on topsoil, topdressing material, alternative pesticide treatments, growth regulators, wetting agents, purchased irrigation water, and turfgrass consulting. For golf courses, other expenditures also include expenditures on mulch and bunker sand.
4. The Ontario Ministry of Transportation provided expenditures on the new turf construction activities, such as seed and mulch; seed and erosion control blanket; seed and bonded fibre matrix for both 2006 and 2007. In order to estimate expenditure in 2007, we divided that value by two. The new turf construction activities include materials, as well as labour.
5. The total expenditure for each industry segments excludes expenditures on lawn care and sod, as these services/products are purchased within the primary turfgrass industry. Their inclusion would result in double-counting.

Sources:

1. The fertilizer and pesticide expenditures in the Households' row correspond to Table 23.
2. The expenditures in the Golf Courses' row correspond to Table 17, less expenditures on sod and lawn care services.
3. The expenditures in the Municipalities' row correspond to Table 30, less expenditures on sod and lawn care services.
4. The expenditures in the Sod farms' row correspond to Table 10.
5. The expenditures in the Universities' row correspond to Table 36, less expenditures on sod and lawn care services.
6. The expenditures in the Lawn Care Companies' row correspond to Table 39, less expenditures on sod.
7. The expenditures in the Provincial Highways and Roads' row correspond to Table 38, less sod expenditures.

industry. Lawn care companies and sod farms provide services and products to other industry segments. The expenditures by lawn care companies and sod farms are accounted for in their revenues. In order to avoid double-counting, we excluded expenditures by industry segments on lawn care services and sod. Therefore, we reported operating turfgrass maintenance expenditures on inputs that are obtained outside of the primary turfgrass industry.

Lawn care companies reported the largest share of operating expenditures with \$577 million, followed by golf courses with \$339 million. Turfgrass operating expenditures of households and municipalities were approximately \$223 and \$174 million, respectively. Payroll accounted for the second largest share of operating expenditures across industry segments with \$788 million in 2007. The next largest share belonged to fertilizer with \$252 million. Expenditures on fuel and gas were also significant with \$65.7 million. According to the data in Table 4, the Ontario turfgrass industry spent \$23.4 million on seed.

In Table 5 we report the turfgrass maintenance equipment purchased by and value of equipment owned by golf courses, households, sod farms, municipalities, universities, and lawn care companies. Ontario turfgrass industry segments purchased \$360 million worth of turfgrass maintenance equipment in 2007. The total value of turfgrass equipment owned by the Ontario turfgrass industry as of 2007 was \$778 million. The value of equipment owned by golf courses was the highest among turfgrass industry segments with \$467 million in 2007. Households spent the most on equipment purchases in 2007 with \$280 million in 2007.

3.4 Employment

Table 6 contains data on the employment numbers for golf courses, sod farms, municipalities, universities, and lawn care companies. We report the number of full-time year round and

Table 5. Ontario Purchase and Value of Turfgrass Maintenance Equipment Owned by Households in 2006¹ and by Golf Courses, Municipalities, Sod Farms, Universities, Lawn Care Companies, and Provincial Highways and Roads in 2007².

Industry Segment	Equipment Purchase (2007 CDN \$ million)	Value of Equipment (2007 CDN \$ million)
Households	280	not available
Golf Courses	35.9	467
Municipalities ³	9.00	71.4
Sod Farms	12.0	67.7
Universities	0.0348	4.81
Lawn Care Companies	22.8	167
Provincial Highways and Roads	not available	not available
Total	360	778

Notes:

1. The most recent turfgrass maintenance data available for households are for the year of 2006.
2. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.
3. Municipal equipment purchase and value of equipment were reported only for municipalities with over 5,000 people and under 500,000 people. The municipalities with over 500,000 people did not provide value and purchase of their turfgrass maintenance equipment.

Sources:

4. Equipment purchase in the Households' row corresponds to Table 24
5. Equipment purchase and equipment value in the Golf Courses' row correspond to Section 4.2.3
6. Equipment purchase and equipment value in the Municipalities' row correspond to Section 4.4.3.
7. Equipment purchase and equipment value in the Sod Farms' row correspond to Section 4.1.3.
8. Equipment purchase and equipment value in the Universities' row correspond to Section 4.5.3
9. Equipment purchase and equipment value in the Lawn Care Companies' row correspond to Section 4.7.3.

Table 6. Ontario Number of Turfgrass Maintenance Employees at Golf Courses, Municipalities, Sod Farms, Universities, and Lawn Care Companies, 2007¹

Industry Segment	Year Round Full-time	Seasonal Full-time	Year Round Part-time	Seasonal Part-time	Total Full-time Equivalent²	Percentage of Students³
Households	not applicable	not applicable	not applicable	not applicable	not applicable	not applicable
Golf Courses	1,949	5,397	289	4,079	6,711	68.5%
Municipalities	1,735	2,293	326	1,650	3,840	65.5%
Sod Farms	384	757	287	91.7	1,055	29.4%
Universities	279	88.7	0	76.0	357	44.4%
Lawn Care Companies	8,134	16,339	1,789	3,554	20,810	25.8%
Provincial Highways and Roads	not available	not available	not available	not available	not available	
Total	12,481	24,875	2,691	9,451	32,773	39.5%

Notes:

1. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.
2. This column reports total number of year round full-time equivalent employees. We assume that in an average season full-time employees work 8 months. Year round part-time employees work 6 months. Seasonal part-time employees work half of the time of year-round part-time employment. In order to calculate the total number of full-time equivalent employees employed by each industry segment, we used the following formula:

$$\text{Total full-time equivalent employees} = \text{year round full-time employees} + (8/12) \times \text{seasonal full-time employees} + (1/2) \times \text{year round part-time employees} + (1/4) \times \text{seasonal part-time employees}.$$
3. This column indicates the proportion of students in the year round full-time number of employees for each industry segment. The percentage was calculated by dividing the total number of students employed by each industry segment by the total number of year round full-time equivalent employees reported in the "Total" column for each industry segment.

Sources:

1. The number of employees in the Golf Courses' row corresponds to Table 30.
2. The number of employees in the Municipalities' row corresponds to Table 33.
3. The number of employees in the Sod farms' row corresponds to Table 12.
4. The number of employees in the Universities' row corresponds to Table 37.
5. The number of employees in the Lawn Care Companies' row corresponds to Table 40.

seasonal employees and part-time year round and seasonal employees. We also report the number of full-time year round equivalent employees. We assumed that seasonal full-time employees worked for 8 months in a year. Year round part-time employees worked 6 months in a year. Seasonal part-time employees worked about four months in year. In order to calculate the total number of people employed by each industry, or in other words total number of year round full-time equivalent employees, we used the following formula:

Total employees = year round full-time employees + $(8/12) \times$ seasonal full-time employees + $(1/2) \times$ year round part-time employees + $(1/4) \times$ seasonal part-time employees.

The Ontario turfgrass industry employed 32.8 thousand year round full-time equivalent employees in 2007. Lawn care companies had the most employees in 2007 with 20.8 thousand year round full-time equivalent employees. The most common type of employees was seasonal full-time, which reflects the seasonal nature of the turfgrass industry.

3.5 Water Source

There are a number of sources of water for turfgrass industry segments, such as public or municipal water system, well, pond, lake, river, run-off water, and effluent waste water. In Table 7 we list sources of water for sod farms, golf courses, municipalities and universities. According to the data in Table 7, only Ontario municipalities and universities used a public/municipal water system as a source of irrigation water. Ontario sod farms primarily used ponds to irrigate sod fields. About 24.9% of an average Ontario sod farm was irrigated in 2007. No one water source was more used than other sources by golf courses. Reclaimed water (run-off water) was chosen as at least one water source by 27.3% of golf course respondents. All of sod farms that were surveyed indicated that they used a pond as a water source. These responses indicate that the choice of a water source was site specific and varied across industry segments.

Table 7. Sources of Irrigation Water for Sod Farms, Golf Courses, Municipalities and Universities.

Water Source	Sod Farms¹ % of responses	Golf Courses¹ % of responses	Municipalities² % of responses	Universities^{2,3} % of respondents
Public/Municipal Water System	0%	0%	79.2%	100%
Well	44.4%	30.3%	12.5%	0%
Pond	100%	42.4%	8.33%	0%
Lake	22.2%	22.7%	12.5%	0%
River	11.1%	30.3%	0%	0%
Reclaimed Water (Run-off Water)	11.1%	27.3%	0%	0%
Effluent/Waste Water	11.1%	3.03%	0%	0%
Other	0%	4.55%	8.33%	0%

Notes:

1. The respondents were instructed to select all responses that were applicable to their operation (Sod Farms and Golf Courses industry segments)
2. The municipalities' and universities' sample consists of members of three different associations. The surveys that were distributed to these associations differed from each other with respect to how this question was asked. In one survey the respondents were instructed to select multiple options and in another survey respondents were instructed to select only one option. The responses listed in the table include responses from both types of questions.
3. There are only four responses for this question; therefore the results should be interpreted with caution.

Sources:

1. University of Guelph 2007 Turfgrass Survey, Sod Farms, 6.4: What is your organization's irrigation source?
2. University of Guelph 2007 Turfgrass Survey, Parks and Rec, 11.6: What is your organization's irrigation source?
3. University of Guelph 2007 Turfgrass Survey, Golf Courses, 6.5: What is your golf course's irrigation source?

3.6 Trends and Comparison with other Crops and Jurisdictions

In this section, we compare the Ontario turfgrass industry in 2007 with the Ontario turfgrass industry in 1982, and with the 2006 British Columbia turfgrass industry, the 2003 New York turfgrass industry, and the 2005 Maryland turfgrass industry. We also compare the area and value of maintained Ontario turfgrass with the area and value of selected Ontario agricultural crops. All financial magnitudes are reported in 2007 Canadian \$ unless otherwise noted.

Sears and Gimplej (1984) estimated the total area of maintained turfgrass in Ontario to be 385 thousand acres in 1982. In order to facilitate the comparison between our study and Sears and Gimplej (1984), we only used the area of maintained turfgrass for those industry segments that were surveyed in this study and by Sears and Gimplej (1984). The industry segments that were present in both our study and in Sears and Gimplej were sod farms, households, lawn care companies, golf courses, municipalities, and provincial roads and highways. For these segments, the 1982 area of maintained turfgrass was 354 thousand acres and the 2007 area of maintained turfgrass was 389 thousand acres. There is little difference between the area maintained in 1982 and 2007. This discrepancy is likely due to the fact that we used 1,500 square feet as an average household lawn size, while Sears and Gimplej (1984) used 3,050 square feet.

Sears and Gimplej (1984) calculated the gross sales of turfgrass services and productions to be \$392 million in 1982. This figure includes sales of pesticides, fertilizers, equipment, small tractors, sod, seed and commercial lawn care maintenance. The 2007 sales value of lawn care services alone was \$1.26 billion.

In 2007, the Ontario turfgrass industry spent \$1.39 billion on operating turfgrass expenditures, less purchases of sod and lawn care services. The Ontario turfgrass industry also spent \$360 million in 2007 on purchasing turfgrass maintenance equipment (see Table 5). In

comparison, in 1982 the Ontario turfgrass industry spent \$497 million on turfgrass maintenance, including equipment purchase⁹ (Sears and Gimplej 1984).

The Ontario turfgrass industry hired 32.8 thousand year round full-time equivalent employees in 2007 (see Table 6). None of the other studies that are reviewed in the report used year round full-time equivalent units. In order to be consistent, we used the total number of people employed by a turfgrass industry. The Ontario turfgrass industry employed 49.5 thousand people in 2007, with 34.3 thousand people in seasonal positions and 15.2 thousand people in year round positions (see Table 6). In 1982, golf courses, municipalities, airports, armed forces, conservation authorities, provincial parks, and sod farms employed 2.31 thousand people in permanent positions and 6.19 thousand people in seasonal positions (Sears and Gimplej 1984). The increase in the Ontario turfgrass industry's revenues, expenditures and number of employees since 1982 indicates significant industry expansion.

In Table 8 we list total 2007 harvested acres, farm value and farm value per acre of selected Ontario field and horticultural crops. In Table 8, we compare these selected crops with golf courses' and sod farms' maintained turf acres, gross revenue and gross revenue per acre. The harvested land areas of grain corn, soybeans and winter wheat in Ontario were 2.06, 2.23, and 0.60 million acres in 2007, respectively. In comparison, golf courses and sod farms maintained 98.6 and 36.3 thousand acres of turfgrass in 2007, respectively. The golf courses' revenue from round and membership fees was \$1.25 billion and the 2007 sales value of sod was \$108 million. In comparison, the 2007 farm values of grain corn, soybeans and winter wheat were \$1.13 billion, \$741 million and \$300 million, respectively (see Table 8). With respect to the sales value per acre, golf courses and sod farms earned \$12.7 and \$2.97 thousand

⁹ This figure includes expenditures by households, golf courses, municipalities, highways, airports, military locations, conservation authorities, and provincial parks.

Table 8. Comparison between 2007¹ Ontario Golf and Sod Farms' Acres, Revenues, and Gross Revenue per Acre of Maintained Turf and 2007 Ontario Selected Field and Horticultural Crops' Harvested Acres, Farm Values and Farm Value per Acre.

Crop/Turfgrass Industry Segment	Acres Harvested/Maintained	Gross Revenue/Farm Value	Gross Revenue/Farm Value per Acre
	(thousand)	(2007 CDN \$ million)	(2007 CDN \$ thousand/Acre)
Golf	98.6	1,250	12.7
Grain Corn	2,055	1,128	0.55
Soybeans	2,225	741	0.33
Winter Wheat	595	300	0.50
Sod	36.3	108	2.97
Total Grapes	16.5	78.6	4.77
Apples	17.0	75.0	4.41
Tomatoes, Field	18.0	74.3	4.12
Spring Wheat	180	71.1	0.40
Barley	165	41.9	0.25
Mixed Grain	125	25.7	0.21
Oats	90.0	16.8	0.19
Canola	35.0	12.9	0.37
Fall Rye	50.0	6.60	0.13

Notes:

1. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.

Sources:

1. Ontario Ministry of Agriculture, Food and Rural Affairs (2008a), Ontario Ministry of Agriculture, Food and Rural Affairs (2008b)
2. Values for acres of turfgrass maintained and gross revenue for golf and sod industry segments are reported in Tables 3 and 4, respectively.

per acre in 2007, respectively. Grapes' and apples' farm value per acre was \$4.77 and \$4.41 thousand per acre in 2007, respectively.

With respect to other jurisdictions, the British Columbia turfgrass industry maintained 180 thousand acres across the province in 2006 (Justason 2006). The New York state turfgrass industry maintained 3.43 million acres in 2003 (New York Agricultural Statistics Service 2004); while the Maryland turfgrass industry maintained 1.1 million acres in 2005 (National Agricultural Statistics Service). Turfgrass area maintained by Maryland single family residences represented the greatest share of the total area with 937 thousand acres.

The British Columbia turfgrass industry spent \$1.02 billion on turf maintenance, equipment, construction materials and production and \$634 million on payroll in 2006 (Justason 2006). The New York turfgrass industry spent over \$7.66 billion on turf maintenance expenditures, including payroll and contracted labour (\$2.77 billion), equipment (\$3.00 billion) and supplies (\$1.10 billion) in 2003 (New York Agricultural Statistics Service 2004). The New York turfgrass industry's value of equipment as of 2003 was estimated to be over \$9.66 billion (\$6.3 billion 2003 US). The Maryland turfgrass industry spent an excess of \$1.91 billion (\$1.5 billion 2005 US) in 2005 in purchases of capital equipment and expenditures on labour, seed, sod, fertilizers and chemicals, miscellaneous supplies, equipment parts and repairs and contracted lawn care services (National Agricultural Statistics Service 2006). The Maryland turfgrass industry spent \$371 million (\$291 million 2005 US) in wages in 2005.

The New York turfgrass industry employed 43.2 thousand people in 2003 (New York Agricultural Statistics Service). The British Columbia turfgrass industry employed 16.7 thousand people in 2006 (Justason 2006). Of these, 22% were year-round full-time positions, 49% were seasonal full-time, 10% were year-round part-time positions, and 19% were seasonal part-time

positions. The estimated total payroll was in the range of \$634 million in 2006. The Maryland turfgrass industry employed an estimated 12.7 thousand people in 2005 (National Agricultural Statistics Service).

4. Industry Segments

4.1 Sod Farms

4.1.1 Definition and Methods

Sod consists of turfgrass and the part of the soil that contains roots. Sod is sold in rolls or squares that can be applied to a desired location. The industry that produces sod is referred to as sod farms. In order to capture this industry segment in our study, we distributed the survey to members of the Nursery Sod Growers Association of Ontario. The Association has 43 members and represents about 80% of all acres of sod grown in Ontario (Barbara Tweedle pers. comm. 2008). We received 9 responses, resulting in the 20.9% response rate. We also conducted secondary data collection. Statistics Canada keeps time series records on sod farms by conducting Annual Greenhouse, Sod and Nursery Surveys and Censuses of Agriculture. An Annual Greenhouse, Sod and Nursery Survey is a census of all commercial greenhouse growers and of all sod and nursery operations that grow some or all of the commodities they sell.

The standard aggregation procedure for quantitative survey data was to multiply the average response by the number of Ontario operations. According to the 2006 Census of Agriculture, conducted by Statistics Canada, there were 120 sod farms in 2006 (Statistics Canada 2007a). However, many of these farms were likely small and are not represented in our sample. Therefore, it would be inaccurate to aggregate our survey results to the provincial level using 120 farms as a population size. We assumed that the sod farm population is equal to the number of members belonging to the Nursery Sod Growers Association of Ontario – 43 farms. Since the

Association represents 80% of all acres of sod grown in Ontario, we used the adjustment factor of 1.2 to account for the remaining 20% of sod grown. The aggregation procedure for the sod industry segment is the following: multiply the average response by 43 and multiply the resulting number by the adjustment factor of 1.2 to get the provincial total.

4.1.2 Area of Cultivated Sod

As can be seen in Table 9, according to the 2006 Census of Agriculture, the “total area of sod under cultivation for sale” was 32.2 thousand acres in 2006 (Statistics Canada 2007a).

According to the Annual Greenhouse, Sod and Nursery Survey, the “land owned and used for growing sod” in Ontario was 28.0 thousand acres in 2007 and the “area of sod grown and sold” in Ontario was 10.5 thousand acres in 2007 (Statistics Canada 2008a). The difference in these values can be attributed to the fact that in any given year only a portion of cultivated sod or sod in production is harvested. Sears and Gimplej (1984) estimated that approximately 30% of sod that was in production in 1982 was harvested. We assumed that the Census of Agriculture’s “total area of sod under cultivation for a sale” and the Annual Greenhouse, Sod and Nursery Survey’s “area of land owned and used for growing sod” are meant to represent the same thing, since their values are similar.

In our survey we asked the respondents to indicate the area of sod that an operation grew and sold in its most recent fiscal year. As can be seen from Table 9, the total Ontario area was 36.3 thousand acres in 2007. This value closely resembles Census of Agriculture’s “total area of sod under cultivation for a sale” and the Annual Greenhouse, Sod and Nursery Survey’s “area of land owned and used for growing sod”. Therefore, we assumed that when answering this question, respondents provided the total area of land on which sod was grown or, in other words, total area of sod under cultivation.

Table 9. Area of Sod Grown and Sold, Comparison between the University of Guelph 2007 Turfgrass Survey Results, 2007¹ and Statistics Canada’s Data, 2007 and 2006

Data Source	Data Description	Ontario Total² (Acres thousand)
University of Guelph Turfgrass Survey, 2007	Area of sod that an operation grew and sold in its most recent fiscal year	36.3
Statistics Canada, Greenhouse, Sod and Nursery Industries Survey, 2007	Area of sod grown and sold	10.5
Statistics Canada, Greenhouse, Sod and Nursery Industries Survey, 2006	Land owned and used for growing sod	28.0
Statistics Canada, Greenhouse, Sod and Nursery Industries Survey, 2006	Area of sod grown and sold	10.0
Statistics Canada, 2006 Census of Agriculture	Land owned and used for growing sod	28.0
Statistics Canada, 2006 Census of Agriculture	Total area of sod under cultivation for sale	32.2

Notes:

1. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.
2. The survey results were aggregated to the province-wide level using the following formula: Question Average × Population (43 sod farms) × Adjustment factor (1.2). The adjustment factor accounts for the fact that the population (43 sod farms) accounts for 80% of total acres of sod grown in the province of Ontario.
3. There is a difference between Statistics Canada’s “area of sod grown and sold” and the University of Guelph turfgrass survey’s “area of sod grown and sold”. The survey’s “area of sod grown and sold” closely resembles 2006 Census of Agriculture “total area of sod under cultivation for sale”. Therefore, we assume that when answering this question, respondents provided the total area of land on which sod was grown or, in other words, the total area of sod under cultivation.

Sources:

1. Statistics Canada (2007a), Statistics Canada (2008a)
2. University of Guelph 2007 Turfgrass Survey, Sod Farms, 3.2: For each of the following turfgrass varieties (Kentucky Bluegrass, Kentucky Bluegrass/Fine Fescues, Creeping Bentgrass, Other) please approximate the total area of sod that your operation grew and sold in your most recent fiscal year.

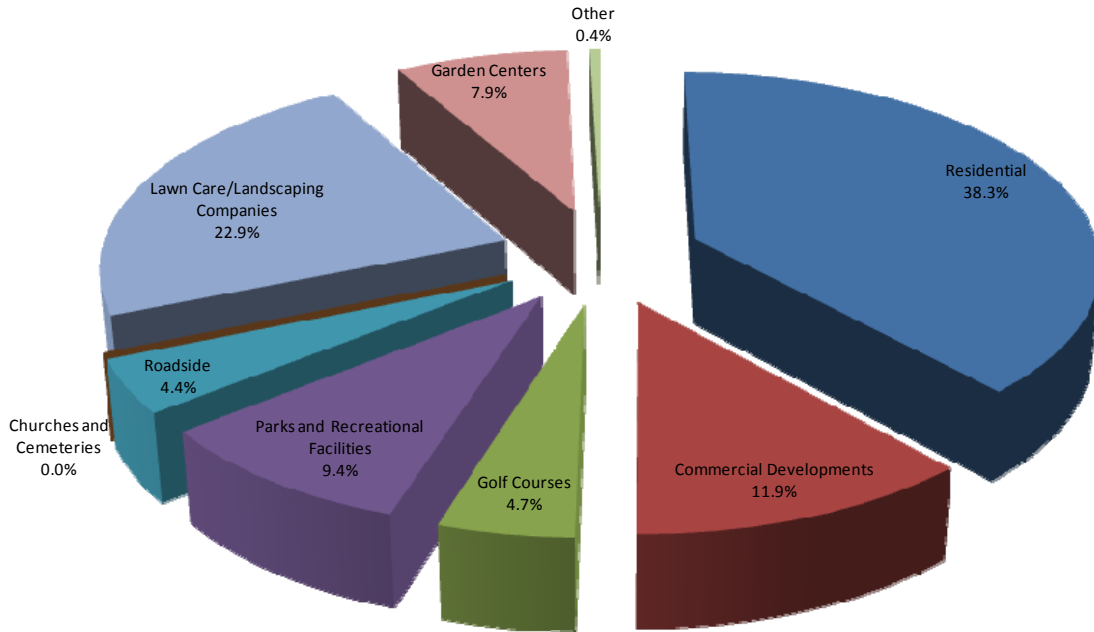
4.1.3 Revenues and Costs

According to Statistics Canada (2008a), the reported value of sod sold in Ontario in 2007 was \$55.2 million. According to our survey, the sales value of sod that Ontario sod operations grew and sold in 2007 was \$108 million. The sales value estimated in this study is almost twice as big as the value of sod reported by Statistics Canada (2008a). Such a difference is likely due to the fact that our sample consisted of relatively large sod farms, while Statistics Canada (2008a) surveyed large as well as small sod farms. In Figure 1 we show the distribution of sod farm customers. As can be seen from Figure 1, most of the sod produced by Ontario sod farms is sold to households (about 38.3%). About 22.9% of Ontario sod is sold to lawn care companies, followed by commercial developments with 11.9%.

The operating inputs of sod production include labour, various turfgrass supplies, and equipment repair and maintenance. In Table 10 we list Ontario sod farms' expenditures on each input and the share of each input in the total expenditures. In total, Ontario sod farms spent \$68.8 million on operating turfgrass maintenance expenditures in 2007. Payroll represented the largest share of the total expenditures with \$30.5 million. Fertilizer came in second with \$11.1 million. Equipment repair and maintenance and fuel/gas followed with \$10.2 and \$6.48 million, respectively. In terms of capital, Ontario sod farms spent \$12.0 million on the purchase of turfgrass maintenance equipment in 2007. The value of turfgrass maintenance equipment owned by all Ontario sod farms as of 2007 was \$67.7 million.

In Table 11 we list expenditures by sod farms on specific management activities. We asked respondents to specify all operating expenses corresponding to each management activity, such as supplies, in-house and contract labour, and equipment rentals and repair. The values in Table 11 roughly correspond to operating expenditures in Table 10, however there are some

**Figure 1. Distribution of Ontario Sod Sales by Type of Customer, University of Guelph
2007 Turfgrass Survey Results, 2007¹**



Notes:

1. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.

Sources:

1. University of Guelph 2007 Turfgrass Survey, 3.4: In your estimation, approximately, what percentage of your customers, in your most recent fiscal year, were the following? The total number must add up to a 100%.

**Table 10. Operating Turfgrass Maintenance Expenditures of Ontario Sod Farms, 2007¹,
 University of Guelph 2007 Turfgrass Survey.**

Item	Ontario Total² (2007 CDN\$ million)	% of Total Expenditures
Payroll	30.5	44.3%
Fertilizer	11.1	16.1%
Equipment Repair and Maintenance	10.2	14.8%
Fuel/Gas	6.48	9.41%
Seed	4.49	6.52%
Topsoil	1.72	2.50%
Herbicide	1.57	2.28%
Other	0.975	1.42%
Insecticide	0.711	1.03%
Equipment Rental	0.659	0.958%
Turfgrass Consultant	0.162	0.236%
Top Dressing Material	0.161	0.233%
Fungicide	0.115	0.167%
Alternative Pesticide Treatments	0	0%
Purchased Irrigation Water	0	0%
Wetting Agents	0	0%
Growth Regulators	0	0%
Total	68.8	

Notes:

1. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.
2. The survey results were aggregated to the province-wide level using the following formula:
 $\text{Question Average} \times \text{Population (43 sod farms)} \times \text{Adjustment factor (1.2)}$. The adjustment factor accounts for the fact that the population (43 sod farms) accounts for 80% of total acres of sod grown in the province of Ontario.

Sources:

1. University of Guelph 2007 Turfgrass Survey, Sod Farms, 5.1: Please approximate your sod operation's total payroll costs in your most recent fiscal year?
2. University of Guelph 2007 Turfgrass Survey, Sod Farms, 5.2: If your sod operation hired a turfgrass consultant, what was the approximate total cost of this service in your most recent fiscal year?
3. University of Guelph 2007 Turfgrass Survey, Sod Farms, 5.3: Approximately, what were your sod operation's expenditures on turfgrass maintenance equipment in your most recent fiscal year?
4. University of Guelph 2007 Turfgrass Survey, Sod Farms, 5.5: Approximately, what were your sod operation's total expenditures on the following supplies in your most recent fiscal year?

Table 11. Expenditures on Turfgrass Maintenance Activities¹ by Ontario Sod Farms, 2007², University of Guelph 2007 Survey Results

Activity	Ontario Total³ (2007 CDN\$ million)	% of Total Expenditure on Maintenance Activities
Other	8.13	39.5%
Mowing	5.29	25.7%
Seeding and Overseeding	3.23	15.7%
Irrigation System Installation	1.55	7.53%
Fertilizer Application	1.07	5.21%
Pesticide Application	0.555	2.70%
Scouting/Inspections	0.323	1.57%
Irrigation System Repairs	0.258	1.26%
Soil, Water, Tissue Testing/Diagnostic Services	0.155	0.753%
Topdressing	0	0%
Cultural Pest Control	0	0%
Wildlife Control	0	0%
Aerification	0	0%
Dethatching	0	0%
Total	20.5	

Notes:

1. Turfgrass maintenance activity represents a functional activity and includes some survey data reported in Table 9. The expenditures on maintenance activities are approximate and should only be used to determine which management activity was most costly to Ontario sod farms.
2. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.
3. Ontario total expenditure on each specific maintenance activity was calculated using the following formula: Average Expenditure on Specific Activity × Population (43 farms) × Population (43 sod farms) × Adjustment factor (1.2). The adjustment factor accounts for the fact that the population (43 sod farms) accounts for 80% of total acres of sod grown in the province of Ontario.

Sources:

1. University of Guelph 2007 Turfgrass Survey, Sod Farms, 5.6: In your estimation, approximately, what were your sod operation's total expenditures associated with the following management activities in your most recent fiscal year? This figure should include the costs of supplies, labour, consulting services, and any other applicable costs.

discrepancies. As such, values in Table 11 should only be used to gauge which management activity required most expenditures. The management activity that fell under “other” category was the most costly activity with 39.5% of total expenditures, followed by mowing and seeding/overseeding with 25.7% and 15.7% of total expenditures, respectively.

4.1.4 Employment

Statistics Canada (2008a) reported the number of full-time and part-time employees for both sod and nursery farms. In 2007, the number of full-time and part-time employees for Ontario sod and nursery operations was 3.43 and 2.60 thousand, respectively. In Table 12 we report province-wide numbers of full-time and part-time year round and seasonal employees. We found that sod farms employed 1.06 thousand year round full-time equivalent employees in 2007, with seasonal full-time type being the most prevalent type of employment. Ontario sod farms employed 310 students in 2007. About 33.3% of the Ontario sod farms hired a turfgrass consultant, for the primary purpose of soil agronomist.

In Table 13 we report educational and training requirements for positions of sod farm manager, assistant/supervisor/foreman and machine operator. Grade 12 qualification elicited the majority of responses for all three positions. A position of sod farm managers also commonly required a completion of Turf Manager Short Course, as indicated by 42.9% of responses. In Table 14 we report the distribution of responses for training completed in the last two years by sod farm employees. According to Table 14, the most prevalent trainings completed in the last two years, were Health and Safety, Grower’s Pesticide Safety Course and Workplace Hazardous Materials Information Systems/Hazardous Products.

Table 12. Number of Full-time and Part-time Employees Employed by Ontario Sod Farms and by Ontario Nurseries, Comparison between University of Guelph 2007¹ Survey Results and 2007 Statistics Canada Data.

Data Source

Type of Employee	University of Guelph 2007 Turfgrass Survey	Statistics Canada, Greenhouse, Sod and Nursery Industries Survey, 2007
	Ontario Total ² (employees)	Ontario Sod and Nursery Total (employees) ³
Year round full-time	384	3,430
Seasonal full-time	757	
Year round part-time	287	2,600
Seasonal part-time	91.7	
Total full-time equivalent⁴	1,055	

Notes:

1. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.
2. The survey results were aggregated to the province-wide level using the following formula:
 $\text{Question Average} \times \text{Population (43 sod farms)} \times \text{adjustment factor (1.2)}$. The adjustment factor accounts for the fact that the population (43 sod farms) accounts for 80% of total acres of sod grown in the province of Ontario.
3. Statistics Canada reports total full-time and total part-time time number of employees for both nurseries and sod farms.
4. We assume that in an average season full-time employees work 8 months. Year round part-time employees work 6 months. Seasonal part-time employees work half of the time of year-round part-time employment. In order to calculate the total number of full-time equivalent employees employed by each industry segment, we used the following formula:
 $\text{Total full-time equivalent employees} = \text{year round full-time employees} + (8/12) \times \text{seasonal full-time employees} + (1/2) \times \text{year round part-time employees} + (1/4) \times \text{seasonal part-time employees}$.

Sources:

1. Statistics Canada (2008a)
2. University of Guelph 2007 Turfgrass Survey, Sod Farms, 4.1: How many people, including yourself, were employed by your sod operation in your most recent fiscal year?

**Table 13. Current Employee Qualifications at Ontario Sod Farms, University of Guelph
 2007 Turfgrass Survey Results.**

Qualification	Sod Farm Manager (% of responses)¹	Assistant/ Supervisor/ Foreman (% of responses)¹	Machine Operator (% of responses)¹
Grade 12	85.7%	85.7%	71.4%
2-year Certificate/Diploma in Landscape Management	0%	0%	0%
2-year Certificate/Diploma in Turfgrass Management	28.6%	14.3%	0%
Turf Managers' Short Course	42.9%	14.3%	0%
Undergraduate/Bachelors Degree	0%	0%	0%
Graduate Degree	0%	0%	0%
Other	28.6%	14.3%	28.6%

Notes:

1. Each cell in the table reports the percentage of responses for each combination of a qualification and a position. Respondents were instructed to select multiple options, if applicable. For example, a position of sod farm manager could require Grade 12 and 2-year Certificate/Diploma in Turfgrass Management and Turf Managers' Short Course. The number of responses for each qualification was divided by the total number of responses for each column, or in other word, for each position. This proportion was then converted to a percentage format.

Sources:

1. University of Guelph 2007 Turfgrass Survey, Sod Farms, 5.5: What are the typical entry-level qualifications for your sod operation's employees in the following positions? Please check all that apply.

Table 14. Training Completed in the Last Two Years by Ontario Sod Farms' Employees, University of Guelph 2007 Survey Results

Training	% of responses
Health and Safety	88.9%
Grower Pesticide Safety Course	88.9%
Workplace Hazardous Materials Information Systems/Hazardous Products	77.8%
Other Turfgrass Courses/Workshops	66.7%
Turf Managers' Short Course	22.2%
Other	22.2%
Trained Agricultural Assistant Course	11.1%
Turfgrass Management Diploma	0%
None	0%

Notes:

1. Respondents were instructed to select multiple options, if applicable.

Sources:

1. University of Guelph 2007 Turfgrass Survey, Sod Farms, 4.6: What training or further qualifications have you and your employees completed in the past two years? Please check all that apply.

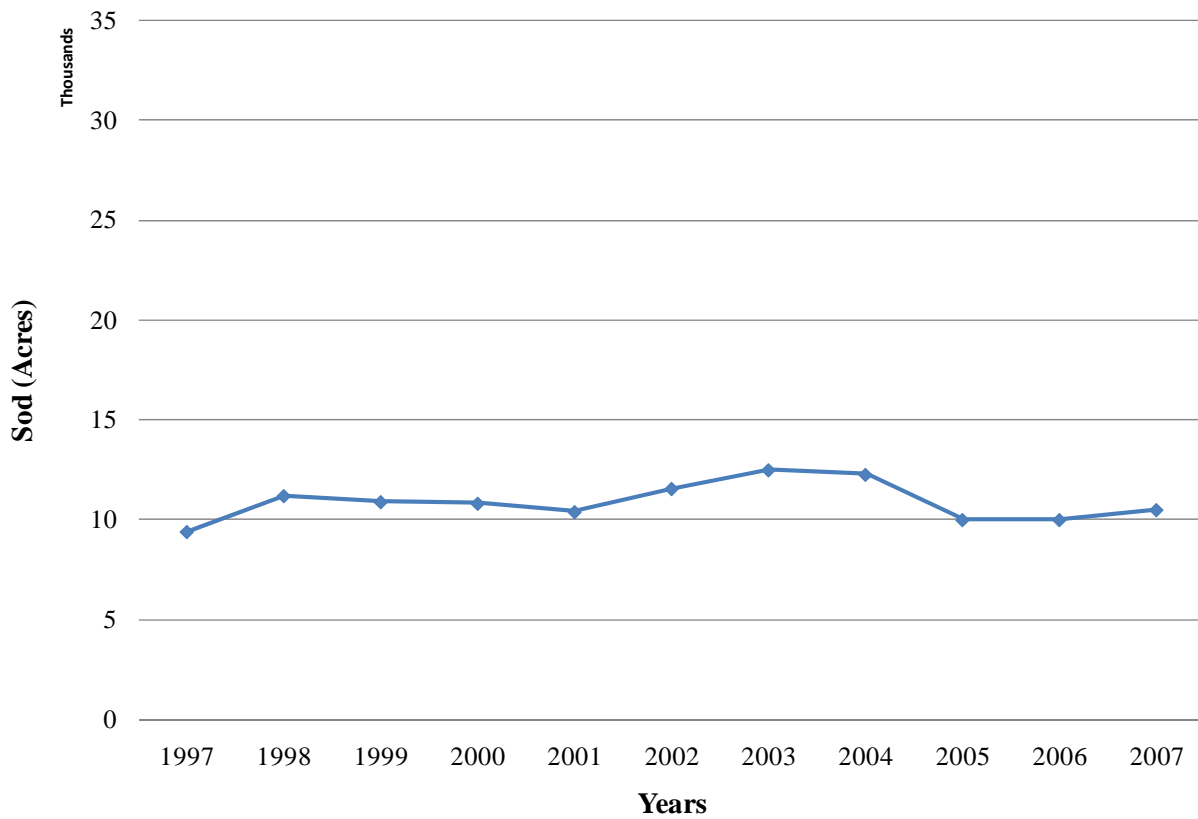
4.1.5 Trends

According to the 2006 Census of Agriculture, the total area of sod under cultivation for sale in Ontario increased from 28.7 thousand acres in 2001 to 32.2 thousand acres in 2006 (Statistics Canada 2007a). In Figures 2 to 4 we use the Statistics Canada's Annual Greenhouse, Sod and Nursery Survey data to illustrate trends in sod production and sales. In Figure 2 we plot land owned and used for growing sod for the 1997-2007 period. In Figure 3 we plot the land owned and used for growing sod for the 2001-2007 period. In Figure 4 we plot the value of sod sold for the 1997-2007 period. As can be seen from Figures 2 and 3, the area of maintained turfgrass remained relatively stable through the years. According to data in Figure 4, the value of sod sold increased from \$34.9 million in 1997 to \$54.0 million in 2007.

Comparing the results of our study to the 1982 study, we found that the 2007 area of sod in production was 36.3 thousand acres, compared to 24 thousand acres in 1982 (Sears and Gimplej 1984). Sears and Gimplej (1984) reported that Ontario sod farms earned \$51.4 million in revenues in 1982. Sales of sod increased about two-fold from \$51.4 million in 1982 to \$108 million in 2007. Sears and Gimplej (1984) reported that the total expenditures by sod farms on turfgrass maintenance less equipment purchases were \$31.1 million. The 2007 level of operating expenditures by sod farms was \$68.8 million, which represents an about 121% increase from the 1982 level.

Sears and Gimplej (1984) reported that the Ontario number of permanent and seasonal staff at sod farms were 215 and 567 in 1982, respectively. In 2007, Ontario sod farms hired an estimated 757 seasonal full-time employees and 91.7 seasonal part-time employees. In 2007, Ontario sod farms also hired an estimated 384 year round full-time employees and 287 year round part-time employees.

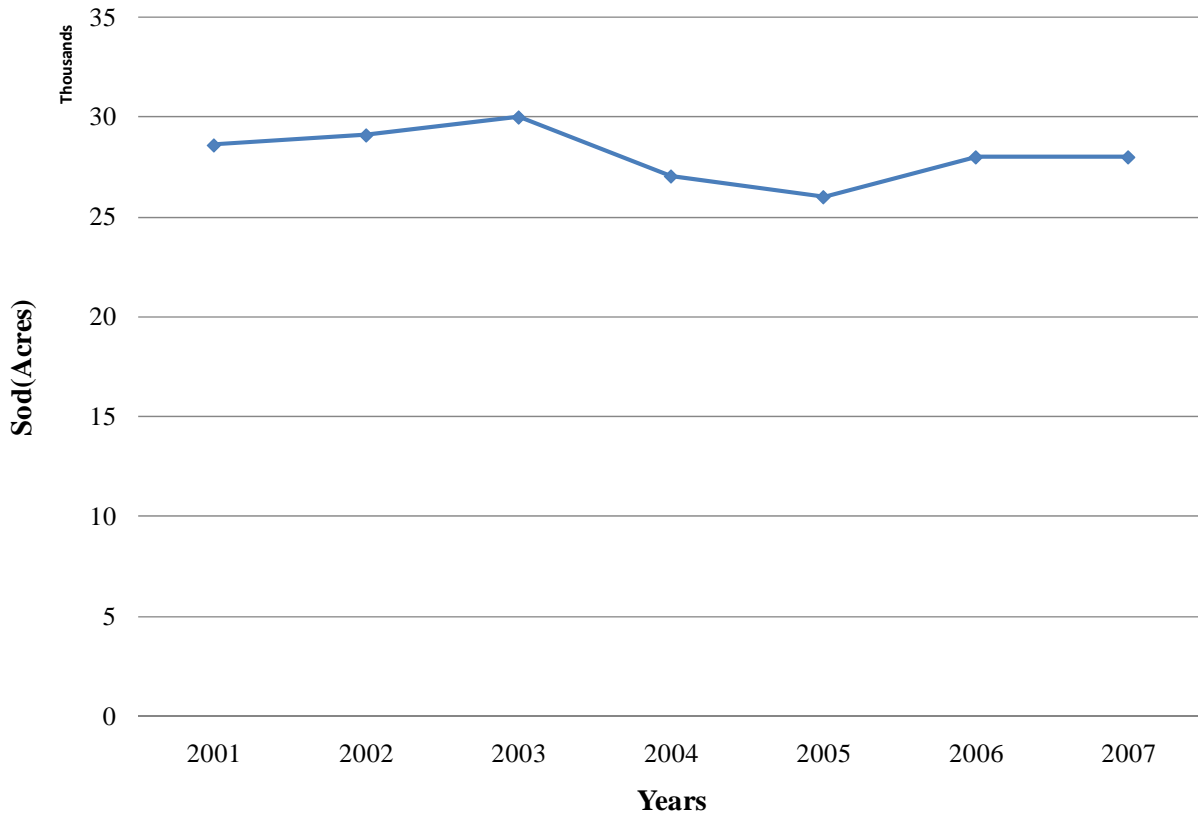
Figure 2. Acres of Sod Grown and Sold in Ontario as Reported by the Statistics Canada's Annual Greenhouse, Sod and Nursery Industries Survey for the Years of 1997 to 2007.



Sources:

Statistics Canada (2008a), Statistics Canada (2006), Statistics Canada (2005), Statistics Canada (2004), Statistics Canada (2000), Statistics Canada (1999).

Figure 3. Acres of Land Owned and Used for Growing Sod¹ in Ontario as Reported by the Statistics Canada’s Annual Greenhouse, Sod and Nursery Industries Surveys for the Years of 2001² to 2007.



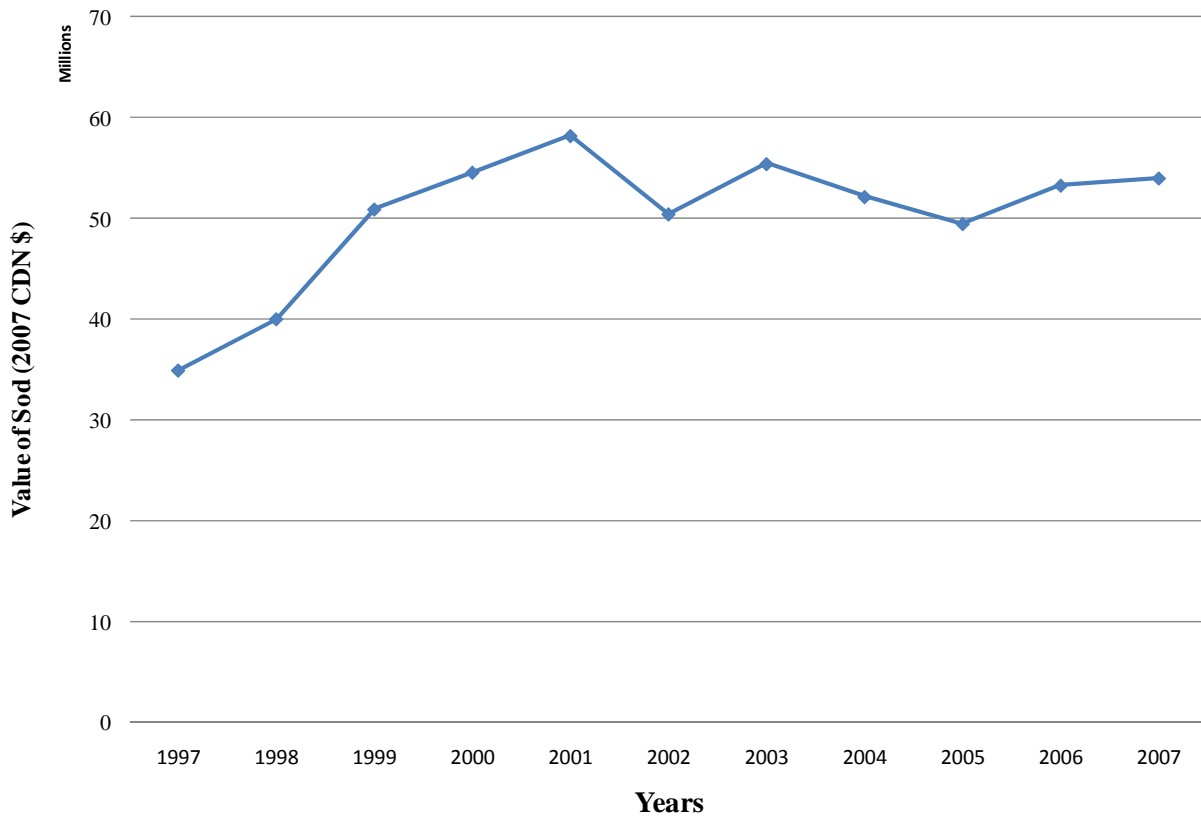
Notes:

1. We assume that acres of land owned and used for growing sod is similar to the Census of Canada’s “total area of sod under cultivation for a sale” and to the University of Guelph 2007 Turfgrass Survey “area of sod grown and sold”.
2. Data for years earlier than 2001 are available only for both nurseries and sod farms and therefore not included in this figure.

Sources:

Statistics Canada (2008a), Statistics Canada (2006), Statistics Canada (2005), Statistics Canada (2004), Statistics Canada (2000), Statistics Canada (1999).

Figure 4. Value of Sod Sold¹ in Ontario as Reported by the Statistics Canada's Annual Greenhouse, Sod and Nursery Industries Surveys for the Years of 1997 to 2007.



Notes:

1. Monetary values are adjusted for inflation and reported in constant 2007 CDN \$.

Sources:

Statistics Canada (2008a), Statistics Canada (2006), Statistics Canada (2005), Statistics Canada (2004), Statistics Canada (2000), Statistics Canada (1999).

4.2 Golf Courses

4.2.1 Definitions and Methods

We distributed the survey to members of the Ontario Golf Superintendents' Association and received 105 fully and partially completed surveys. According to the ScoreGolf.com website (2008), there are 811 golf courses in Ontario. Some golf courses listed on the ScoreGolf.com were not applicable to our study, as these golf courses lacked specification by the number of holes and in our study we sorted our golf course sample by the number of holes. Furthermore, some golf courses were categorized as mini golf courses. We eliminated these golf courses from our population estimate and ended up with 806 golf courses that were applicable to our study. According to ScoreGolf.com, there are 233 9-hole courses, 469 18-hole courses, and 104 other type of golf course. Other golf course types include 27-hole, 36-hole, 45-hole, and 54-hole golf courses.

In order to determine whether our sample represented the Ontario golf course population, we compared the ScoreGolf.com golf courses' characteristics with our sample's characteristics. According to the ScoreGolf.com (2008), the province-wide golf course distribution by the number of holes is the following – 29% of 9-hole golf courses, 58% of 18-hole golf courses and 13% of other types of golf course. Our sample consisted of 8% of 9-hole golf courses, 68% of 18-hole golf courses and 25% of other types of golf course. According to the ScoreGolf.com (2008), the spatial distribution is the following – 44%, 28%, 18% and 10% of golf courses are located in the South Central Ontario, South Western Ontario, South Eastern Ontario and Northern Ontario, respectively. In our sample, 59%, 24%, 14% and 3% of golf courses are located in the South Central Ontario, South Western Ontario, South Eastern Ontario and Northern Ontario, respectively.

Our survey is biased towards 18-hole courses and courses located in the South Central Ontario. This means that the majority of golf courses in our sample are likely to be larger than most Ontario golf courses. Without an appropriate adjustment, the total Ontario golf courses' expenditures and revenues are likely to be overestimated. We used the following adjustment procedure when aggregating our survey data to the Ontario level. We grouped the survey results by the type of golf course: 9-hole, 18-hole and other (27-hole, 36-hole, 45-hole and other types of golf course). For each group, we calculated the average response. We multiplied each average response in each group of golf courses by the number of golf courses that belong to that group in order to get province-wide estimates for each type of golf. In order to get province-wide estimates for all types of golf courses we added up province-wide estimates for each golf course group.

4.2.2 Area of Maintained Turfgrass

Golf course superintendents maintain various turfgrass surfaces— greens, fairways, tees, rough, naturalized areas and other surfaces. In Table 15 we report the average and province-wide area of maintained turf by the type of surface. In Table 15 we also provide province-wide totals by the surface types for all types of golf courses. In total, Ontario golf courses maintained 98.6 thousand acres of turfgrass in 2007. Rough area was the largest surface maintained by Ontario golf courses with 32.7 thousand acres in 2007. Tees were the smallest surface maintained by Ontario golf courses in with 1.95 thousand acres in 2007.

As can be seen from Table 15, the average area of maintained turfgrass increased with the number of holes. An average 9-hole golf course maintained 1.62 acres of greens in 2007, compared to 2.96 and 4.32 acres of greens that an average 18-hole golf course and an average golf course with the number of holes higher than 18 maintained in 2007, respectively. The total area of maintained turfgrass was the highest for 18-hole golf courses with 62.0 thousand acres.

Table 15. Turfgrass Area Maintained by Ontario Golf Courses in 2007¹.

Surface	9-hole Golf Courses		18-hole Golf Courses		Other Types of Golf Courses ²		All Types
	Average per Course (Acres)	Ontario Total ³ (Thousand Acres)	Average per Course (Acres)	Ontario Total ⁴ (Thousand Acres)	Average per Course (Acres)	Ontario Total ⁵ (Thousand Acres)	Total Ontario ⁶ (Thousand Acres)
Green	1.62	0.378	2.96	1.39	4.32	0.449	2.21
Fairways	11.5	2.68	24.7	11.6	34.5	3.59	17.9
Tees	1.43	0.334	2.68	1.26	3.45	0.359	1.95
Rough	25.6	5.96	42.9	20.1	63.8	6.63	32.7
Naturalized Area	27.2	6.34	36.5	17.1	45.0	4.69	28.1
Other	2.84	0.662	22.5	10.6	43.3	4.50	15.7
Total	70.2	16.4	132	62.0	194	20.2	98.6

Notes:

1. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.
2. Other types of golf course include 27-hole, 36-hole, 45-hole, and 54-hole golf courses.
3. The formula for aggregating 9-hole golf course survey results to the province-wide level is: Average × Population (233 9-hole golf courses)
4. The formula for aggregating 18-hole golf course survey results to the province-wide level is: Average × Population (469 18-hole golf courses)
5. The formula for aggregating other type of golf course survey results to the province-wide level is: Average × Population (104 other types of golf courses)
6. Totals for all Ontario golf courses were calculated by adding the province-wide totals for 9-hole, 18-hole and other types of golf courses.

Sources:

1. University of Guelph 2007 Turfgrass Survey, Golf Courses, 3.6: For each of the following, please indicate the area of turfgrass applicable to your course.

4.2.3 Revenues and Costs

In order to estimate revenues of Ontario golf courses associated only with playing golf, we assumed that gross revenue consists of membership fees and fees for golf rounds. We did not consider other sources of revenues, such as pro-shops, driving ranges and dining facilities. However, these secondary revenue sources may be significant, as according to our survey, roughly 93% of Ontario golf courses had a dining facility and about 71 % of Ontario golf courses had a driving range.

We asked respondents to specify the number of new and existing members, the number of 18-hole rounds played, the initiation and annual fees, and the fee per an 18-hole round. We reported these values for both an average golf course and for all Ontario golf courses within each size category, as well as for all types of Ontario golf courses in total in Table 16. There were two responses in the sample that were identified as outliers in terms of revenue and thus were removed from revenue calculations, including the number of new and existing members, the number of 18-hole rounds played, and the fees. However, we found that for the rest of answers, these responses were well within reasonable range. In total, Ontario golf courses had 17.7 thousand new members and 208 thousand existing members in 2007. The total number of 18-hole rounds played at Ontario golf courses was estimated to be 21.8 thousand. According to Table 16, 9-hole golf courses have the lowest initiation and annual fees: an average of \$0 and \$570, respectively. According to the data in Table 16, an average 18-hole golf course charged \$2.84 thousand and \$20.2 thousand as annual and initiation fees, respectively. An average golf course with more than 18 holes charged about the same annual and initiation rates as an average 18-hole golf course.

Table 16. Number of 18-hole Rounds of Golf, Number of New Members, Number of Existing Members, Annual Fee, Initiation Fee and Total Revenue from Membership Fees and Rounds of Golf Played of Ontario Golf Courses in 2007¹.

	9-hole Golf Courses		18-hole Golf Courses		Other Types of Golf Courses ²		All Types
	Average per Course	Ontario Total ³	Average per Course	Ontario Total ⁴	Average per Course	Ontario Total ⁵	Total Ontario ⁶
Number of 18-hole rounds (thousands)	16.4	3,825	31.0	14,554	32.4	3,372	21,750
New Members	6.17	1,437	22.4	10,510	55.1	5,725	17,673
Existing Members	63.0	14,679	321	150,504	413	42,947	208,130
One 18-hole Round of Golf Rate (2007 CDN \$)	40.7		75		76.6		
Annual Fee (2007 CDN \$)	570		2,840		2,701		
Initiation Fee (2007 CDN \$)	0		20,198		22,578		
Total Revenue (2007 CDN \$ million)⁷	0.467	109	1.80	845	2.85	296	1,250

Notes:

1. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.
2. Other types of golf course include 27-hole, 36-hole, 45-hole, and 54-hole golf courses.
3. The formula for aggregating 9-hole golf course survey results to the province-wide level is: Average × Population (233 9-hole golf courses)
4. The formula for aggregating 18-hole golf course survey results to the province-wide level is: Average × Population (469 18-hole golf courses)
5. The formula for aggregating other type of golf course survey results to the province-wide level is: Average × Population (104 other type of golf courses)
6. Totals for all Ontario golf courses were calculated by adding the province-wide totals for 9-hole, 18-hole and other types of golf courses.
7. We assumed that 90% of rounds played at Ontario private and semi-private golf courses are played by members. About 70% of rounds played at Ontario public golf courses are played by non-members. In calculating the revenue for a private/semi-private golf course, we used the following formula: Revenue (Private/Semi Private) = Initiation Fee×New Members + Annual Fee×New Members + Annual Fee×Existing Members + 0.10×Total 18-hole rounds played×Fee for one 18-hole Round. We used the following formula for a public golf course: Revenue (Public) = Initiation Fee×New Members + Annual Fee×New Members + Annual Fee×Existing Members + 0.70×Total 18-hole rounds played×Fee for one 18-hole Round

Sources:

1. University of Guelph 2007 Turfgrass Survey, Golf Courses, 3.7/3.8/3.9/3.10: Approximately, how many 18-hole rounds of golf were played at your golf course in your most recent fiscal year? Approximately, how many new members joined your golf course in your most recent fiscal year? How many members currently belong to your golf course? What are the rates for the following categories at your golf course (One 18-hole Round of Golf, Annual Fee, Initiation Fee)?

We used a separate procedure for calculating revenue for public courses than for private and semi-private courses. We assumed that the majority of players (90%) at private and semi-private courses are members and therefore do not have to pay round fees. On the other hand, about 70% of players at public golf courses are not members and have to pay round fees. Hence, private/semi-private golf courses derive most of their revenue from membership fees, while public golf courses' revenue comes mostly from round fees. We took initiation fees, as well as annual fees, into account for calculating revenue from recruiting new members. We assumed that the existing members pay solely annual fees. The formula used to calculate revenue for a private and semi-private golf course is the following:

$$\text{Revenue (Private/Semi Private)} = \text{Initiation Fee} \times \text{New Members} + \text{Annual Fee} \times \text{New Members} + \text{Annual Fee} \times \text{Existing Members} + 0.10 \times \text{Total 18-hole rounds played} \times \text{Fee for one 18-hole Round}$$

We used the following formula for a public golf course:

$$\text{Revenue (Public)} = \text{Initiation Fee} \times \text{New Members} + \text{Annual Fee} \times \text{New Members} + \text{Annual Fee} \times \text{Existing Members} + 0.70 \times \text{Total 18-hole rounds played} \times \text{Fee for one 18-hole Round}$$

Total province-wide revenue for each size category of golf courses is a sum of total province-wide revenues for public and private/semi-private golf courses.

According to the data in Table 16, an average 9-hole golf course earned about \$467 thousand in membership and rounds fees in 2007. Province-wide, 9-hole golf courses made about \$109 million in revenues from membership and round fees in 2007. Golf courses with a greater number of holes than 9 earned significantly more. According to the data in Table 16, an average 18-hole golf course and an average golf course with a greater number of holes than 18 earned \$1.80 and \$2.85 million in 2007, respectively. Province-wide, 18-hole golf courses earned \$845 million in 2007. Ontario golf courses with a number of holes greater than 18 earned

\$296 million in 2007. In total, all types of Ontario golf courses earned \$1.25 billion in revenues from membership and round fees in 2007.

In Table 17 we list average and province-wide expenditures for each golf course size category. Total operating expenditures for all Ontario golf courses were \$343 million in 2007. We also provide province-wide operating expenditures for all Ontario golf courses, organized from the highest to the lowest expenditure item (last column of Table 17). The items with the highest expenditure for all Ontario golf courses were payroll (\$227 million), fungicide (\$21.3 million), equipment repair and maintenance (\$18.2 million), and fertilizer (\$17.4 million).

Other significant turfgrass maintenance expenditures in 2007 include equipment rental with \$15.7 million, fuel and gas with \$14.9 million and topdressing material with \$5.37. Ontario golf courses spent \$3.10 million on sod and \$2.84 million on seed. In terms of pest management, Ontario golf courses spent \$21.3 million on fungicides, \$2.32 million on insecticides, and \$1.58 million on herbicides in 2007. In total, Ontario golf courses spent \$25.2 million on pesticides in 2007. Ontario golf courses spent less on alternative pesticide treatments with \$227 thousand in 2007.

According to the data in Table 17, as the number of holes at a golf course increased, so too did the average expenditure on fertilizer. Average fertilizer expenditures were \$10.9, \$24.1, and \$34.2 thousand for 9-hole golf courses, 18-hole golf courses and other types of golf courses, respectively. Province-wide, 18-hole golf courses spent the most on fertilizer in 2007 - \$11.3 million. In total, Ontario golf courses spent \$17.4 million on fertilizer in 2007.

An average 9-hole golf course spent \$20.2 thousand on the purchase of turfgrass maintenance equipment in 2007, for a province-wide total of \$4.70 million for all 9-hole golf

Table 17. Operating Turfgrass Maintenance Expenditures of Ontario Golf Courses, 2007¹

Item	9-hole Golf Courses		18-hole Golf Courses		Other Types of Golf Courses ²		All Types
	Average per Course (2007 CDN \$ thousands)	Ontario Total ³ (2007 CDN \$ million)	Average per Course (2007 CDN \$ thousands)	Ontario Total ⁴ (2007 CDN \$ million)	Average per Course (2007 CDN \$ thousands)	Ontario Total ⁵ (2007 CDN \$ million)	Total Ontario ⁶ (2007 CDN \$ million)
Payroll	135	31.5	328	154	399	41.5	227
Fungicide	14.8	3.44	30.1	14.1	35.6	3.71	21.3
Equipment Repair and Maintenance	14.4	3.36	23.8	11.2	34.9	3.63	18.2
Fertilizer	10.9	2.54	24.1	11.3	34.2	3.55	17.4
Equipment Rental	10.1	2.36	16.0	7.50	56.6	5.89	15.7
Fuel and Gas	8.67	2.02	20.9	9.80	29.7	3.09	14.9
Topdressing Material	6.30	1.47	6.13	2.87	9.92	1.03	5.37
Sod	5.92	1.38	2.95	1.38	3.28	0.341	3.10
Seed	2.51	0.584	3.40	1.60	6.39	0.664	2.84
Bunker Sand	2.33	0.544	3.14	1.47	2.96	0.308	2.32
Insecticide	1.62	0.377	3.50	1.64	2.90	0.302	2.32
Wetting Agents	1.90	0.443	3.00	1.41	4.05	0.422	2.27
Purchased Irrigation Water	0	0	0.376	0.176	19.7	2.05	2.23
Growth Regulators	1.17	0.272	2.59	1.21	2.34	0.243	1.73
Herbicide	0.975	0.227	2.44	1.14	2.02	0.210	1.58
Turfgrass Consultant Costs	0.833	0.194	2.03	0.952	3.62	0.377	1.52
Mulch	2.20	0.513	0.693	0.325	1.24	0.129	0.966
Topsoil	0.833	0.194	1.07	0.502	1.12	0.116	0.812
Lawn/Landscaping Costs	1.67	0.388	0.565	0.265	0.500	0.0520	0.705
Other	1.17	0.272	0.843	0.395	0	0.000	0.667
Alternative Pesticide Treatments	0.217	0.0505	0.225	0.106	0.679	0.0706	0.227
Total	224	52.1	476	223	651	67.7	343

Table 17 continues on page 47

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Notes:

1. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.
2. Other types of golf course include 27-hole, 36-hole, 45-hole, and 54-hole golf courses.
3. The formula for aggregating 9-hole golf course survey results to the province-wide level is: Average \times Population (233 9-hole golf courses)
4. The formula for aggregating 18-hole golf course survey results to the province-wide level is: Average \times Population (469 18-hole golf courses)
5. The formula for aggregating other type of golf course survey results to the province-wide level is: Average \times Population (104 other type of courses)
6. Totals for all Ontario golf courses were calculated by adding the province-wide totals for 9-hole, 18-hole and other types of golf courses.

Sources:

1. University of Guelph 2007 Turfgrass Survey, Golf courses, 5.1: In your estimation, approximately, what were your golf course's total payroll costs related to turfgrass maintenance in your most recent fiscal year?
2. University of Guelph 2007 Turfgrass Survey, Golf courses, 5.2: If you hired a professional lawn care and/or landscaping company to perform maintenance on your golf course's turfgrass, what was the approximate cost of this service in your most recent fiscal year?
3. University of Guelph 2007 Turfgrass Survey, Golf courses, 5.3: If you hired a turfgrass consultant, other than a professional lawn care and/or landscaping company, what was the approximate cost of this service in your most recent fiscal year?
4. University of Guelph 2007 Turfgrass Survey, Golf courses, 5.4: 4. In your estimation, approximately, what were your golf course's total expenditures on turfgrass maintenance equipment in your most recent fiscal year?
5. University of Guelph 2007 Turfgrass Survey, Golf courses, 5.6: In your estimation, approximately, what were your golf course's total expenditures on fuel and gas in your most recent fiscal year? University of Guelph 2007 Turfgrass Survey, Golf courses, 5.7: In your estimation, approximately, what were your golf course's total expenditures on the following supplies in your most recent fiscal year?

courses. An average 18-hole golf course spent about \$53.6 thousand on purchasing turfgrass maintenance equipment in 2007, for a province-wide total of \$25.2 million. Finally, an average golf course with a higher number of holes than 18 spent about \$58.6 thousand on purchasing turfgrass maintenance equipment in 2007, for a province-wide total of \$6.10 million. In total, Ontario golf courses spent about \$35.9 million on the purchase of turfgrass maintenance equipment in 2007.

In terms of the value of the turfgrass maintenance equipment, 9-hole golf courses were again in the lowest range, with an average course's equipment valued at \$347 thousand as of 2007. An average 18-hole golf course's equipment value was almost double that at \$627 thousand. An average golf course with a number of holes greater than 18 owned equipment valued at \$881 thousand as of 2007. Province-wide, the total value of turfgrass equipment as of 2007 was \$80.9, \$294, and \$91.6 million for 9-hole, 18-hole, and other types of golf courses, respectively. The total value of turfgrass maintenance equipment for Ontario golf courses was \$467 million in 2007.

In Tables 18 and 19 we document expenditures associated with specific management activities and with activities associated with controlling various pests, respectively. These values should correspond approximately to values in Table 17, however there are discrepancies. Thus, the values in Tables 18 and 19 should only be used as gauges to judge which management activities were most costly and which specific pests required the most resources to control. According to the data in Table 18, mowing/trimming was the most costly management activity at \$65.1 million for all Ontario golf courses in 2007, followed by pesticide application at \$25.2 million. Bunker upkeep and renovation was the third most costly management activity with

Table 18. Expenditures on Turfgrass Maintenance Activities¹ performed by Ontario Golf Courses, 2007².

Activity	9-hole Golf Courses		18-hole Golf Courses		Other Types of Golf Courses ³		All Types
	Average per Course (2007 CDN \$ thousand)	Ontario Total ⁴ (2007 CDN \$ million)	Average per Course (2007 CDN \$ thousand)	Ontario Total ⁵ (2007 CDN \$ million)	Average per Course (2007 CDN \$ thousand)	Ontario Total ⁶ (2007 CDN \$ million)	Total Ontario ⁷ (2007 CDN \$ million)
Mowing/Trimming	56.0	13.0	79.8	37.4	141	14.7	65.1
Pesticide Application	25.8	6.01	30.8	14.4	46.1	4.79	25.2
Bunker Upkeep and Renovation	7.84	1.83	24.4	11.4	43.8	4.56	17.8
Fertilizer Application	11.7	2.72	21.8	10.2	31.0	3.22	16.1
Landscaping	6.44	1.50	13.1	6.14	22.7	2.36	10.0
Clean-up (Fall)	2.40	0.559	7.95	3.73	26.4	2.74	7.03
Topdressing	10.6	2.46	6.60	3.10	13.6	1.41	6.97
Irrigation Repairs	2.62	0.610	7.55	3.54	15.1	1.57	5.72
Clean-up (Spring)	3.00	0.699	6.03	2.83	15.0	1.56	5.09
Sodding	9.60	2.24	4.82	2.26	4.50	0.468	4.97
Aerification	4.26	0.99	6.77	3.18	7.65	0.796	4.97
Seeding and Overseeding	6.10	1.42	4.74	2.23	9.86	1.03	4.67
Scouting/Inspections	0.700	0.163	2.94	1.38	21.6	2.25	3.79
Cultural Pest Control	2.90	0.676	2.80	1.31	7.50	0.780	2.77
Edging	3.92	0.913	2.42	1.13	4.44	0.462	2.51
Dethatching	2.28	0.531	2.09	0.979	2.10	0.218	1.73
Irrigation Installation	0.900	0.210	2.84	1.33	1.23	0.127	1.67
Soil/Water/Tissue Testing & Diagnostic Services	1.140	0.266	1.53	0.715	2.37	0.246	1.23
Rolling	0.400	0.0932	1.99	0.933	1.505	0.156	1.18
Other	0.200	0.0466	1.63	0.763	0	0	0.810
Wildlife Control	0.520	0.121	0.598	0.281	0.910	0.0946	0.496
Total	159	37.1	233	109	418	43.5	190

Table 18 continues on page 50

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Notes:

1. Turfgrass maintenance activity represents a functional activity and includes some survey data reported in Table 17. The expenditures on maintenance activities figures are approximate and should only be used to determine which management activity was most costly to golf courses.
2. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.
3. Other types of golf course include 27-hole, 36-hole, 45-hole, and 54-hole golf courses.
4. The formula for aggregating 9-hole golf course survey results to the province-wide level is: Average \times Population (233 9-hole golf courses)
5. The formula for aggregating 18-hole golf course survey results to the province-wide level is: Average \times Population (469 18-hole golf courses)
6. The formula for aggregating other type of golf course survey results to the province-wide level is: Average \times Population (104 other types of golf courses)
7. Totals for all Ontario golf courses were calculated by adding the province-wide totals for 9-hole, 18-hole and other types of golf courses.

Sources:

1. University of Guelph 2007 Turfgrass Survey, Golf Courses, 5.8: In your estimation, approximately, what were your golf course's total expenditures associated with the following management activities in your most recent fiscal year? This figure should include costs of supplies, labour, consulting services, and any other applicable costs.

Table 19. Expenditures on Turfgrass Pests Maintenance¹ by Ontario Golf Courses, 2007²

Pest	9-hole Golf Courses		18-hole Golf Courses		Other Types of Golf Courses ³		All Types
	Average per Course (2007 CDN \$ thousands)	Ontario Total ⁴ (2007 CDN \$ million)	Average per Course (2007 CDN \$ thousand)	Ontario Total ⁵ (2007 CDN \$ million)	Average per Course (2007 CDN \$ thousand)	Ontario Total ⁶ (2007 CDN \$ million)	
Insects							
Black Cutworm	0.350	0.0816	1.03	0.483	0.657	0.0683	0.633
European Chafer	0.292	0.0680	0.919	0.431	0.439	0.0457	0.545
Black Turfgrass Ataenius	0.183	0.0427	0.863	0.405	0.884	0.0919	0.540
European Crane Fly	0.392	0.0913	0.541	0.254	0.607	0.0631	0.408
Other Insects	0.267	0.0621	0.532	0.250	0.625	0.0650	0.377
Japanese Beetle	0.183	0.0427	0.614	0.288	0.429	0.0446	0.375
Annual Bluegrass Weevil	0	0	0.349	0.164	0.241	0.0251	0.189
June Beetle	0.183	0.0427	0.108	0.0507	0.232	0.0241	0.118
Insects Total	1.85	0.431	4.96	2.32	4.12	0.428	3.18
Weeds							
Broadleaf Weeds	0.908	0.212	2.66	1.25	3.57	0.371	1.83
Annual Bluegrass	0	0	3.69	1.73	0.321	0.0334	1.77
Crabgrass	0.0917	0.0214	0.563	0.264	0.250	0.0260	0.311
Moss	0.292	0.0680	0.297	0.139	0.0786	0.0082	0.216
Algae	0	0	0.0811	0.0380	0.464	0.0483	0.0863
Other Weeds	0.0833	0.0194	0	0	0.393	0.0409	0.0603
Weeds Total	1.38	0.320	7.30	3.42	5.08	0.528	4.27

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Diseases							
Dollar Spot	7.37	1.72	11.4	5.33	12.7	1.32	8.37
Snow Mold	5.70	1.33	11.2	5.24	16.6	1.73	8.30
Fusarium Patch	1.29	0.301	2.62	1.23	4.50	0.468	2.00
Anthracnose Basal Rot	0.333	0.0777	2.55	1.20	0.821	0.0854	1.36
Summer Patch	0.883	0.206	1.07	0.503	1.53	0.159	0.868
Anthracnose Foliar Blight	0.333	0.0777	1.26	0.589	1.46	0.152	0.819
Take-all Patch	0.917	0.214	0.897	0.421	1.64	0.171	0.805
Other Diseases	0	0	1.20	0.564	0	0	0.564
Pythium Blight	0	0	0.730	0.342	0.821	0.0854	0.428
Diseases Total	16.8	3.92	32.9	15.4	40.2	4.18	23.5
All Pests Total	20.1	4.67	45.1	21.2	49.3	5.13	31.0

Notes:

1. Controlling pests represents functional activities and include some survey data reported in Table 17. The expenditures on controlling pests are approximate and should only be used to determine which pest was most costly to control.
2. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.
3. Other types of golf course include 27-hole, 36-hole, 45-hole, and 54-hole golf courses.
4. The formula for aggregating 9-hole golf course survey results to the province-wide level is: Average \times Population (233 9-hole golf courses)
5. The formula for aggregating 18-hole golf course survey results to the province-wide level is: Average \times Population (469 18-hole golf courses)
6. The formula for aggregating other type of golf course survey results to the province-wide level is: Average \times Population (104 other type of golf courses)
7. Totals for all Ontario golf courses were calculated by adding the province-wide totals for 9-hole, 18-hole and other types of golf courses.

Sources:

1. University of Guelph 2007 Turfgrass Survey, Golf Courses, 5.9: In your estimation, approximately, what were your golf course's total expenditures on controlling the following insects in your most recent fiscal year? Please include all costs, including labour, supplies, and consulting services.

\$17.8 million in 2007. Management activities that were least costly in 2007 were wildlife control, rolling, dethatching, soil/water/tissue testing, and irrigation equipment installation.

According to the data in Table 19, the most troublesome pests at golf courses were Black Cutworm, European Chafer, Broadleaf Weeds, Annual Bluegrass, Dollar Spot, Snow Mold and Fusarium Patch. In fact, managing diseases in 2007 were more costly than controlling other types of pests. In total, Ontario golf courses spent \$8.37 and \$8.30 million on controlling Dollar Spot and Snow Mold in 2007.

4.2.4 Employment

In Table 20 we report employment information for Ontario golf courses. In total, Ontario golf courses employed 6.71 thousand year round full-time equivalent employees in 2007. The majority of employees at golf courses in 2007 were seasonal employees. An average 18-hole golf course hired 7 seasonal full-time employees and 6 seasonal part-time employees in 2007, compared to 2.75 year round full-time employees and 0.438 year round part-time employees. Province-wide, Ontario golf courses hired 1.95 thousand year round full-time employees, 5.40 thousand seasonal full-time employees, 289 year round part-time employees and 4.08 thousand seasonal part-time employees in 2007. Ontario golf courses provided employment to about 4.60 thousand students in 2007.

Table 21 contains data on training requirements for golf course employees, such as golf superintendent, assistant/supervisor/foreman, and machine operator, for each type of golf course. A position of golf superintendent most commonly required a completion of the 2-year Certificate/Diploma in Turfgrass Management for all types of golf courses. A position of Assistant/Supervisor/ Foreman most commonly required a completion of Grade 12 for 9-hole golf courses and a completion of the 2-year Certificate/Diploma in Turfgrass Management for

Table 20. Number of Full-time and Part-time Employees Employed at Ontario Golf Courses in 2007¹

	9-hole Golf Courses		18-hole Golf Courses		Other Types of Golf Courses ²		All Types
	Average per Course	Ontario Total ³	Average per Course	Ontario Total ⁴	Average per Course	Ontario Total ⁵	Total Ontario ⁶
Year round full-time	1.25	291	2.75	1,290	3.54	368	1,949
Seasonal full-time	3.25	757	7.00	3,283	13.0	1,356	5,397
Year round part-time	0.250	58.3	0.438	205	0.250	26.0	289
Seasonal part-time	1.88	437	6.05	2,836	7.75	806	4,079
Total⁷	4.01	934	9.15	4,290	14.3	1,487	6,711
Number of Students	3.00	699	5.68	2,665	11.8	1,231	4,595

Notes:

1. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.
2. Other types of golf course include 27-hole, 36-hole, 45-hole, and 54-hole golf courses.
3. The formula for aggregating 9-hole golf course survey results to the province-wide level is: Average \times Population (233 9-hole golf courses)
4. The formula for aggregating 18-hole golf course survey results to the province-wide level is: Average \times Population (469 18-hole golf courses)
5. The formula for aggregating other type of golf course survey results to the province-wide level is: Average \times Population (104 other courses)
6. Totals for all Ontario golf courses were calculated by adding the province-wide totals for 9-hole, 18-hole and other types of golf course.
7. This column reports the total number of year round full-time equivalent employees. We assume that in an average season full-time employees work 8 months. Year round part-time employees work 6 months. Seasonal part-time employees work half of the time of year-round part-time employment. In order to calculate the total number of full-time equivalent employees employed by each industry segment, we used the following formula: Total full-time equivalent employees = year round full-time employees + (8/12) \times seasonal full-time employees + (1/2) \times year round part-time employees + (1/4) \times seasonal part-time employees.

Sources:

1. University of Guelph 2007 Turfgrass Survey, Golf Courses, 4.1: How many people, including yourself, were employed for the purpose of turfgrass maintenance by your golf course in your most recent fiscal year?
2. University of Guelph 2007 Turfgrass Survey, Golf Courses, 4.2: How many students did your golf course employ in full-time, part-time, and seasonal positions, for the purpose of turf maintenance, in your most recent fiscal year?

Table 21. Current Employee Qualifications at Ontario Golf Courses.

Qualification	Golf Course Superintendent (% of responses)¹	Assistant/Supervisor/ Foreman (% of responses)¹	Machine Operator (% of responses)¹
9-hole Golf Course			
Grade 12	14.3%	57.1%	80.0%
2-year Certificate/Diploma in Landscape Management	14.3%	28.6%	20.0%
2-year Certificate/Diploma in Turfgrass Management	85.7%	28.6%	20.0%
Turf Managers' Short Course	14.3%	42.9%	20.0%
Undergraduate/Bachelor Degree	14.3%	14.3%	20.0%
Graduate Degree	0%	14.3%	20.0%
Other	0%	14.3%	40.0%
18-hole Golf Course			
Grade 12	20.7%	33.3%	69.2%
2-year Certificate/Diploma in Landscape Management	12.1%	22.8%	7.69%
2-year Certificate/Diploma in Turfgrass Management	58.6%	50.9%	3.85%
Turf Managers' Short Course	37.9%	35.1%	5.77%
Undergraduate/Bachelor Degree	13.8%	5.26%	11.5%
Graduate Degree	3.45%	3.51%	3.85%
Other	8.62%	5.26%	32.7%
Other Types of Golf Course²			
Grade 12	22.7%	26.1%	68.2%
2-year Certificate/Diploma in Landscape Management	9.09%	17.4%	9.09%
2-year Certificate/Diploma in Turfgrass Management	59.1%	65.2%	9.09%
Turf Managers' Short Course	31.8%	47.8%	13.6%
Undergraduate/Bachelor Degree	18.2%	4.35%	4.55%
Graduate Degree	0%	0%	4.55%
Other	4.55%	4.35%	36.4%

Notes:

- Each cell in the table reports the percentage of responses for each combination of a qualification and a position. Respondents were instructed to select multiple options, if applicable. The number of responses for each qualification was divided by the total number of responses for each column, or in other word, for each position. This proportion was then converted to a percentage format.
- Other types of golf course include 27-hole, 36-hole, 45-hole, and 54-hole golf courses.

Sources:

- University of Guelph 2007 Turfgrass Survey, 4.6: What is the typical entry-level qualification for employees at your golf course in the following positions? Please check all that apply.

golf courses with higher number of holes than 9. Finally for all types of golf courses, a position of Machine Operator most commonly required a completion of Grade 12. Table 22 contains data on training completed in the last two years by golf course employees for each type of golf course. According to the data Table 22, golf course employees were most likely to complete WHIMS/Hazardous Products and Health and Safety training in the last two years.

4.2.5 Trends and Tourism Statistics

According to the 2006 Golf Participation in Canada survey conducted by Ipsos Reid on behalf of the Royal Canadian Golf Association, there were 2.32 million golfers in Ontario, which represent 21.7% of the Ontario population that played golf in 2006. The Ontario golf participation rate increased from 18.6% in 2001 to 21.7% in 2006 (Ipsos Reid 2006).

Sears and Gimplej (1984) estimated that in 1982 there were 45.8 thousand acres of maintained turfgrass on Ontario golf courses. We estimated that in 2007 Ontario golf courses maintained nearly 100 thousand acres of turfgrass, which represents about 116% increase in the total area of maintained turfgrass from 1982. Sears and Gimplej (1984) also estimated that in 1982 golf courses spent a total of \$141 million on operating expenditures (equipment purchase not included). We estimated that Ontario golf courses spent \$343 million on operating expenditures in 2007, which represents about 143% increase in operating expenditures since 1982.

Sears and Gimplej (1984) estimated that Ontario golf courses employed 3.96 thousand seasonal employees and 1.18 thousand permanent employees in 1982. In 2007, Ontario golf courses hired 1.95 thousand year round full-time employees, 5.40 thousand seasonal full-time employees, 289 year round part-time employees and 4.01 thousand seasonal part-time

Table 22. Training Completed in the Last Two Years by Golf Course Employees.

Training	9-hole Golf Course (% of responses)³	18-hole Golf Course (% of responses)³	Other Types of Golf Course¹ (% of responses)³
Turfgrass Management Diploma	0%	20.3%	16.7%
WHIMS/Hazardous Products	62.5%	68.8%	95.8%
Health and Safety	62.5%	75.0%	87.5%
Pesticide Applicator's License	12.5%	46.9%	50.0%
Voluntary IPM Accreditation	25.0%	35.9%	25.0%
Turf Managers' Short Course	12.5%	15.6%	4.17%
Other Turfgrass Courses/Workshops	25.0%	78.1%	54.2%
None	25.0%	6.25%	4.17%
Other ²	25.0%	9.38%	8.33%

Notes:

1. Other types of golf course include 27-hole, 36-hole, 45-hole, and 54-hole golf courses.
2. Other training most often included chain saw operation and safety
3. Respondents were instructed to select multiple options, if applicable.

Sources:

1. University of Guelph 2007 Turfgrass Survey, 4.7: What training or further qualifications have you and your employees completed in the past two years? Please check all that apply.

employees. In total, Ontario golf courses hired about 11.7 thousand people in 2007, which represents about 128% increase in the total number of people hired since 1982.

4.3 Households

4.3.1 Definitions and Methods

Households include homeowners of various dwelling types and sizes. We did not survey Ontario households. We obtained data on turfgrass maintenance expenditures by households through secondary sources. Statistics Canada's Households and the Environment Survey contains 2005 data on the amount of households that own lawn or garden (2007c). Statistics Canada has been conducting the Survey of Household Expenditures since 1997. Using this survey, we were able to find expenditures on pesticides and fertilizers, as well as expenditures on lawn and garden equipment in 2006 (Statistics Canada 2007d). In order to calculate the total Ontario expenditures, we multiplied the average household expenditure by the number of households.

4.3.2 Area of Maintained Turfgrass

According to Statistics Canada (2007c), 75% of Ontario households had a lawn or a garden in 2005. Out of these lawn or garden owners, 37% of households used fertilizers and 34% used pesticides in 2005. In 2005, 64% of Ontario households that owned a lawn or a garden owned a lawnmower. According to Statistics Canada (2007d), there were 4.74 million households in Ontario in 2006. The Ontario Ministry of Agriculture, Food and Rural Affairs estimated that an average Ontario lawn size is 1,500 square feet or 0.0344 acres (pers. comm. Pam Charbonneau). Assuming that the Statistics Canada's Households and the Environment Survey's 2005 data are applicable to 2006 and using the average lawn size of 0.0344 acres, the total area of turfgrass owned by residential properties in 2006 was approximately 122 thousand

acres. Since no more recent data is available, we assumed that 122 thousand acres represented a turfgrass area maintained by households in 2007.

4.3.3 Costs

In Table 23 we report pesticides' and fertilizer/soils/soil conditioners' expenditures by Ontario households in constant 2007 CDN dollars for 1997 to 2006. For time period of 1997 to 2003, Statistics Canada (2007d) reported an average household expenditure on pesticides separately from an average household expenditure on fertilizer, soils and soil conditioners. In 2004, Statistics Canada started to report these values as one figure. In order to separate 2004-2006 expenditures into pesticide and fertilizer/soils/soil conditioners components, we first added pesticide and fertilizer/soils/soil conditioners expenditures for the time period of 1997 to 2003 and then calculated the percentage of average expenditure that is attributed to pesticides for the time period of 1997 to 2003. We then applied this percentage to 2004-2006 data to estimate household expenditure on pesticides separately from expenditure on fertilizer/soils/soil conditioners.

In 2006, an average Ontario household spent \$10.40 and \$36.61 on pesticides and fertilizer/soils/soil conditioners, respectively. Province-wide, Ontario households spent \$49.3 and \$173 million on pesticides and fertilizer/soils/soil conditioners, respectively. Households' primary lawn care activities are applying pesticides and fertilizer. Soils and soil conditioners play a small part in household's lawn care activities, unless a homeowner is conducting landscape renovations. As such expenditures on fertilizer/soils/soil conditioners can be used as proxy for expenditures on fertilizer alone. Since no more recent data is available, we assumed that 2006 fertilizer and pesticide expenditures apply to 2007.

Table 23. Average and Province-wide Expenditures on Pesticide, Fertilizer, Soils and Soil Conditioners by Ontario Households, 1997-2006¹

Years	Total Number of Households (million)	Pesticides		Fertilizer, Soils and Soil Conditioners ²		Fertilizers, Weed Controls, Herbicides, Insecticides, Pesticides, Soils and Soil Conditioners ³		% of Average Household Expenditure on Pesticides
		Average 2007 CDN \$	Ontario Total ⁵ 2007 CDN \$ million	Average 2007 CDN \$	Ontario Total ⁵ 2007 CDN \$ million	Average 2007 CDN \$	Ontario Total ⁵ 2007 CDN \$ million	
1997	4.09	8.69	35.6	37.24	152	45.93	188	18.9%
1998	4.15	11.05	45.8	38.06	158	49.11	204	22.5%
1999	4.21	12.09	51.0	39.91	168	52.00	219	23.3%
2000	4.29	11.81	50.6	41.34	177	53.15	228	22.2%
2001	4.38	10.23	44.8	35.24	154	45.48	199	22.5%
2002	4.45	11.24	50.0	39.35	175	50.60	225	22.2%
2003	4.52	10.94	49.4	36.09	163	47.03	213	23.3%
2004	4.60	9.21 ⁴	42.3 ⁴	32.42 ⁴	149 ⁴	41.64	191	22.1% ⁴
2005	4.67	8.37 ⁴	39.1 ⁴	29.45 ⁴	138 ⁴	37.82	177	22.1% ⁴
2006	4.74	10.40 ⁴	49.3 ⁴	36.61 ⁴	173 ⁴	47.01	223	22.1% ⁴

Notes:

1. For the years of 1997 to 2003, Statistics Canada (2007d) reported average household expenditure on pesticides separately from average household expenditure on fertilizer, soils and soil conditioners. In 2004, Statistics Canada started to report these values as one figure.
2. Households' primary lawn care activities are applying pesticides and fertilizer. Soils and soil conditioners play a small part in household's lawn care activities, unless a homeowner is conducting landscape renovations.
3. In order to compare 1997-2003 data with 2004-2006 data, we added the 1997-2003 average household expenditure on pesticide to the 1997-2003 average household expenditure on fertilizer, soils and soil conditioners.
4. In order to separate 2004-2006 expenditures into pesticide and fertilizer/soils/soil conditioners components, we calculated the percentage of average expenditure that is attributed to pesticides for 1997 to 2003 and applied this percentage to the 2004-2006 data to estimate household expenditure on pesticides separately from fertilizer/soils/soil conditioners. This percentage is reported in the last three rows of the “% of Average Household Expenditure on Pesticides” column.
5. We calculated province-wide expenditure by multiplying the average household expenditure by the number of households.
6. All monetary figures are adjusted for inflation and reported in the 2007 CDN \$.

Sources: Statistics Canada (2007d)

In Table 24 we report power lawn and garden equipment and snow-blower equipment expenditure by Ontario households for 1997 to 2006. Expenditure on power lawn-mowers, garden, and snow removal equipment refers to the net purchase price (the price after the trade-in allowance is deducted) for such equipment (Statistics Canada 2007d). For the time period of 1997 to 2003, Statistics Canada (2007d) reported average household expenditure on power lawn mowers and garden equipment separately from average household expenditure on snow blowers. In 2004, Statistics Canada started to report these values as one figure. In order to separate 2004-2006 expenditures into power lawn and garden equipment and snow blowers components, we first added expenditures on power lawn and garden equipment and expenditures on snow blowers for the time period of 1997 and 2003. We then calculated the percentage of average expenditure that is attributed to power lawn and garden equipment for the time period of 1997 to 2003 and applied this percentage to the 2004-2006 data to estimate household expenditure on power lawn and garden equipment separately from expenditure on snow blowers.

In 2006, an average Ontario household spent \$59.19 on purchasing power lawn and garden equipment. Province-wide, Ontario households spent \$280 million on purchasing power lawn and garden equipment in 2006. Since no more recent data is available, we assumed that 2006 power lawn and garden equipment expenditures apply to 2007. In Table 25 we report Ontario household expenditure on purchasing non-power lawn, garden and snow removal equipment. In 2006, an average Ontario household spent about \$30.66 on purchasing such equipment, for a total of \$145 million for all Ontario households.

4.3.4 Trends

As can be seen from Figure 5, there was a slight upward trend in average Ontario household expenditure on fertilizer/soils/soil conditioners for 1997 to 2000. Since 2000 there

Table 24. Average and Province-wide Expenditures on Power Lawn, Garden and Snow Removal Equipment¹ by Ontario Households, 1997-2006²

Years	Total Number of Households (million)	Power Lawn and Garden Equipment		Snow Blowers		Power Lawn, Garden and Snow-removal Equipment ³		% of Average Household Expenditure on Power Lawn/Garden Equipment
		Average 2007 CDN \$	Ontario Total ⁵ 2007 CDN \$ million	Average 2007 CDN \$	Ontario Total ⁵ 2007 CDN \$ million	Average 2007 CDN \$	Ontario Total ⁵ 2007 CDN \$ million	
1997	4.09	62.07	254	16.14	66.1	78.21	320	79.4%
1998	4.15	65.07	270	17.19	71.3	82.26	341	79.1%
1999	4.21	61.67	260	29.02	122	90.70	382	68.0%
2000	4.29	64.97	279	38.98	167	103.95	446	62.5%
2001	4.38	56.85	249	31.83	139	88.68	388	64.1%
2002	4.45	62.97	280	21.36	95.0	84.33	375	74.7%
2003	4.52	74.37	336	19.69	89.0	94.06	425	79.1%
2004	4.60	74.98 ⁴	345 ⁴	28.58 ⁴	131 ⁴	103.56	476	72.4% ⁴
2005	4.67	44.12 ⁴	206 ⁴	16.82 ⁴	78.5 ⁴	60.93	285	72.4% ⁴
2006	4.74	59.19 ⁴	280 ⁴	22.56 ⁴	107 ⁴	81.75	387	72.4% ⁴

Notes:

1. Expenditure on power lawn-mowers, garden, and snow removal equipment refers to the net purchase price (the price after the trade-in allowance is deducted).
2. For the years 1997 to 2003, Statistics Canada (2007d) reported average household expenditure on power lawn mowers and garden equipment separately from average household expenditure on snow blowers. In 2004, Statistics Canada started to report these values as one figure.
3. In order to compare 1997-2003 data with 2004-2006 data, we added the 1997-2003 average household expenditure on power lawn and garden equipment to the 1997-2003 average household expenditure on power lawn, garden and snow removal equipment.
4. In order to separate 2004-2006 expenditures into power lawn/garden equipment and snow blowers components, we calculated the percentage of average expenditure that is attributed to lawn/garden equipment for 1997 to 2003 and applied it to 2004-2006 data to estimate household expenditure on lawn/garden equipment separately from snow blowers. This percentage is reported in the last three rows of the “% of Average Household Expenditure on Power Lawn/Garden Equipment” column.
5. We calculated province-wide expenditure by multiplying the average household expenditure by the number of households.
6. All monetary figures are adjusted for inflation and reported in the 2007 CDN \$.

Sources: Statistics Canada (2007d)

Table 25. Average and Province-wide Expenditure on Other Lawn, Garden and Snow-removal Tools and Equipment¹, 1997 – 2006.

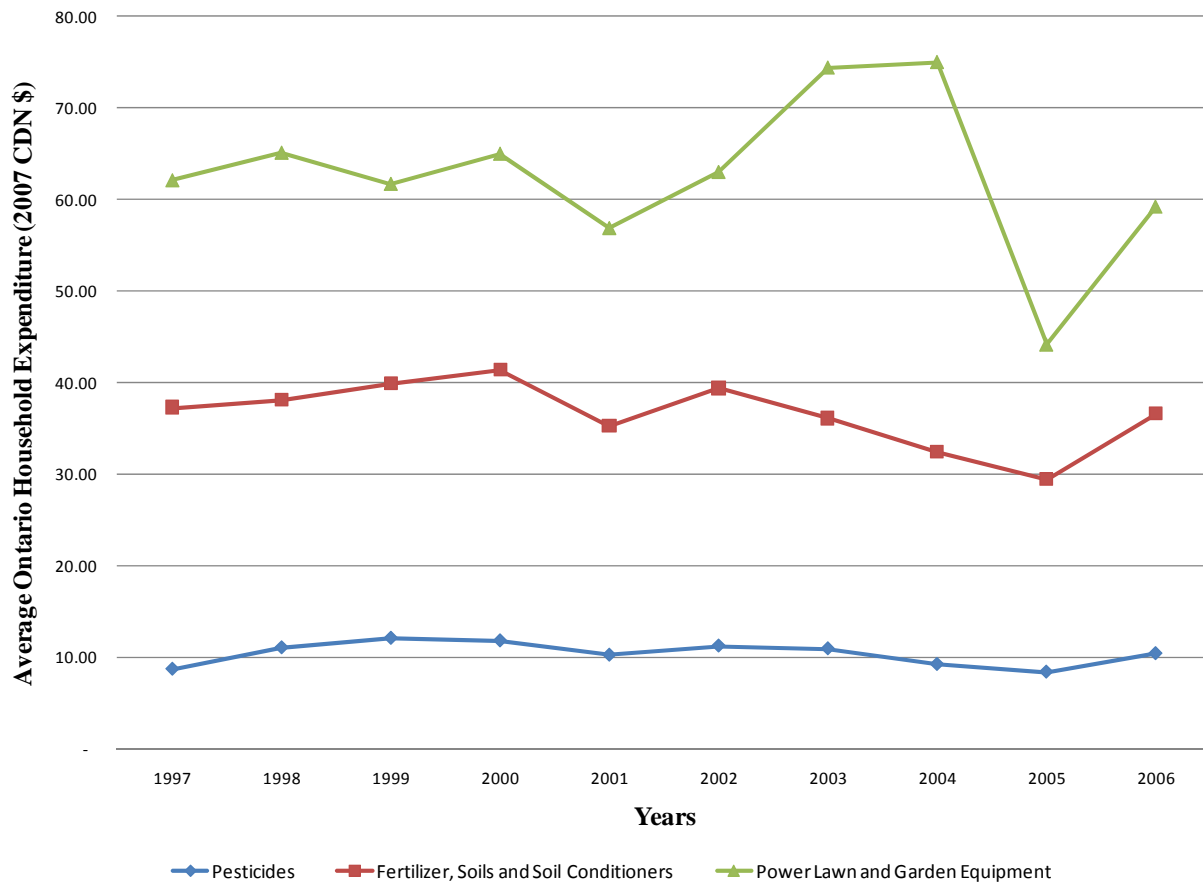
Years	Total Number of Households (million)	Average 2007 CDN \$	Ontario Total² 2007 CDN \$ million
1997	4.09	28.55	117
1998	4.15	35.61	148
1999	4.21	36.28	153
2000	4.29	37.80	162
2001	4.38	30.70	134
2002	4.45	38.23	170
2003	4.52	36.09	163
2004	4.60	30.96	142
2005	4.67	37.82	177
2006	4.74	30.66	145

Notes:

1. Expenditure on other lawn garden and snow removal tools and equipment refers to the net purchase price (the price after the trade-in allowance is deducted) for non-power lawn mowers, hoses, sprinklers, clippers, shovels, flower pots, stakes, sprayers, spreaders.
2. We calculated province-wide expenditure by multiplying the average household expenditure by the number of households.

Sources: Statistics Canada (2007d)

Figure 5. Time Series of Average Ontario Household's Expenditures on Pesticide, Fertilizer, Soils and Soil Conditioners, and Power Lawn and Garden Equipment, 1997 – 2006.



Notes:

1. Monetary values are adjusted for inflation and reported in real 2007 CDN \$.

Sources: Statistics Canada (2007d)

has been a downward trend, with expenditure reaching their 1997 level in 2006. Average household pesticide expenditures have been relatively constant throughout the years. Average Ontario household expenditures on power lawn and garden equipment were stable until 2001, when they increased substantially up until 2004. The expenditures dropped to their lowest level in 2005 and increased somewhat in 2006.

Sears and Gimplej (1984) estimated lawn care maintenance activities in Guelph, Ontario and then extrapolated these data to all Ontario households. According to Sears and Gimplej (1984), Ontario households spent \$82.7 million on fertilizer application and \$28.0 million on pesticide application. We estimated that Ontario households spent \$173 and \$49.3 million on fertilizer and pesticide purchases, respectively. These trends mean that the fertilizer expenditures increased by about 109% and pesticide expenditures increased by about 76.1% since 1982.

According to our survey and Sears and Gimplej (1984), the area of turfgrass maintained by Ontario households has decreased. The area of turfgrass that was maintained by Ontario households in 1982 was 191 thousand acres, compared to 122 thousand acres in 2007. This may seem unusual since the number of households increased since 1982. Sears and Gimplej (1984) estimated that the total number of dwellings in 1982 was 3.03 million. One possible reason for this discrepancy lies in the difference between the average lawn size adopted in our study and in Sears and Gimplej (1984). We used the assumption of 1,500 square feet, while Sears and Gimplej assumed that the average lawn size was 3,050 square feet. Our estimate of the area of turfgrass that was maintained by Ontario households in 2007 is conservative.

4.4 Municipalities

4.4.1 Definitions and Methods

We distributed the survey to 156 members of the Sports Turf Association of Ontario, 735 members of the Ontario Parks Association, and 1,200 members of the Ontario Recreation Facilities Association. We received 66 responses from municipalities. We received 22 responses from the Sports Turf Associations of Ontario, 61 responses from the Ontario Parks Association, and 16 responses from the Ontario Recreation Facilities Association, resulting in 14.3%, 8.30%, and 1.33% response rates, respectively. We recognize that the response rate for the Ontario Recreation Facilities Association is low. There are two reasons for such a low response rate. Firstly, the membership list for the association is diverse, containing workers that maintain non-turfgrass recreation facilities as well as turfgrass recreation facilities. Secondly, there were some issues with respect to delivering survey notifications and reminders to the membership list.

The responses from each association were used jointly to develop a profile of municipalities. Although, the response rate of the Ontario Recreation Facilities Association is low, the completed surveys represent responses from municipalities that help build a profile of the municipal sector. The memberships of the Ontario Recreation Facilities Association, Sports Turf Association of Ontario and Ontario Parks Association are not used to produce aggregate estimate of economic activity of municipalities. We used the Statistics Canada' 2006 Census of Population to obtain data on the total number of municipalities and universities, which we then used to produce aggregate estimates.

On few occasions there were multiple responses for one municipality. This occurrence can be explained by the nature of each association's membership list. All of the associations have more than one member from a given municipality. For example, an association may have a given

municipality's parks manager, district parks manager, landscape architect, and foreman as members. We adopted the following procedure for analyzing such responses:

- a) If multiple responses to quantitative questions for a particular municipality were significantly different, we assumed that respondents were from different departments providing data on different geographical areas within a municipality. We added such responses in order to capture the entire municipality.
- b) If multiple responses to quantitative questions for a particular municipality were similar, we assumed that respondents were from different departments but provided data for the whole municipality. We chose the most comprehensive response out of all possible responses.
- c) We used a similar procedure as in a) and b) when dealing with qualitative responses that were relevant to the entire municipality, such as irrigation sources and the most difficult management problems.
- d) For questions about opinions on future trends and turfgrass research, we used all of the responses, including multiple responses from a particular municipality. We were interested in opinions of all turfgrass managers that work in a particular municipality.

After conducting these adjustments, the number of responses for types of questions described in a), b) and c) decreased to 50.

The standard aggregation procedure for quantitative survey data was to multiply the response average by the total number of relevant Ontario operations. According to the Statistics Canada' 2006 Census of Population, there are 555 municipalities and Aboriginal reserves in Ontario (2007e). However, 327 municipalities and Aboriginal reserves have population less than 5,000 people. In our sample, we do not have municipalities with a population of less than 5,000 people. Therefore, we cannot use 555 municipalities as an aggregation factor. According to the 2006 Census of Population, there were 228 municipalities with population of over 5,000 people in 2006. We used 228 as an aggregation factor. In order to account for variations in turfgrass maintenance activities by different sized municipalities, we created four population categories of

municipalities and determined the total number of Ontario municipalities that belong to each category using the 2006 Census of Population:

- Category 1 includes municipalities in the population range of 5,000 to 50,000 people. There are 188 municipalities in Ontario that belong to Category 1.
- Category 2 includes municipalities in the population range of 50,000 to 100,000 people. There are 17 municipalities in Ontario that belong to Category 2.
- Category 3 includes municipalities in the population range of 100,000 to 500,000 people. There are 19 municipalities in Ontario that belong to Category 3.
- Category 4 includes municipalities in the population range of 500,000 or higher. There are 4 municipalities in Ontario that belong to Category 4.

We calculated the average value for questions such as the area of maintained turfgrass, number of employees, and turfgrass maintenance expenditure. We then multiplied this average value by the number of Ontario municipalities in each category in order to determine the province-wide total for each category of municipalities. For questions about opinions on future trends and turfgrass research, we did not separate responses by category of municipalities. Instead we reported the responses for the whole sample, as separating the opinions of turfgrass managers by the category of municipality was not relevant in this case.

Category 4 municipalities in our survey sample did not report any turfgrass maintenance expenditures. Toronto, Hamilton, Mississauga and Ottawa belong to Category 4. In order to estimate turfgrass expenditures by the province's biggest municipalities, we used their operating parks budgets and municipal performance measures. For more detail, please see Table 29.

For comparison purposes, we included secondary data on the open space area and operating parks expenses reported by the Municipal Performance Measurement Program. This program was developed by the Ontario Ministry of Municipal Affairs and Housing in 2000 in order to track municipal performance measures. In particular, the program tracks municipally

provided information on the efficiency and effectiveness of municipal services, such as fire protection, police services, public transit, drinking water, waste management, parks and recreation and others. For more detail, please see Tables 28 and 32.

4.4.2 Area and Use of Maintained Turfgrass

In Table 26 we list the distribution of responses on the use of turfgrass on municipal grounds for each municipal category. Turfgrass can be used in parks, sports fields, and municipal golf courses. It can also be used for lawn bowling and boulevards/medians/cul-de-sacs. Category 1 municipalities maintained turfgrass primarily for the use in parks, sports fields, and road side. Category 2 municipalities maintained turfgrass for a variety of uses, the most common ones being parks, sports fields and road side. The pattern of turfgrass use for Category 3 municipalities was similar to Categories 1 and 2. The largest municipalities in the province had the widest use of turfgrass. Category 4 municipality maintained turfgrass for all of the uses indicated in Table 26.

According to the data in Table 27, Ontario municipalities with population of more than 5,000 people maintained 93.2 thousand acres in 2007. The greater the number of people that resided in a municipality, the larger was the average acreage of maintained turfgrass. As can be seen from Table 27, the average area of maintained turfgrass was 179, 762, 1,148, and 6,199 acres for Category 1, 2, 3 and 4 municipalities, respectively. Often, municipalities maintain turfgrass that is owned by such organizations as public and private schools, Catholic schools, school boards, sport clubs and conservation authorities. Approximately 44% of Category 1 municipalities, 71.4% of Category 2 municipalities, 64.3% of Category 3 municipalities, and 100% of Category 4 municipalities maintained turfgrass that is owned by other organizations.

Table 26. The Use of Turfgrass Maintained by Ontario Municipalities with Population of over 5,000 People¹.

	Category 1¹ (5,000 to 50,000)	Category 2¹ (50,000 to 100,000)	Category 3¹ (100,000 to 500,000)	Category 4¹ (over 500,000)
	% of responses	% of responses	% of responses	% of responses
Parks	96.0%	87.5%	100.0%	100.0%
Sports Turf	100.0%	87.5%	100.0%	100.0%
Golf Courses	0.0%	25.0%	21.4%	100.0%
Lawn Bowling	20.0%	12.5%	21.4%	100.0%
Boulevards/Médians/ Cul-de-sac	68.0%	75.0%	92.9%	100.0%
Other²	20.0%	12.5%	21.4%	66.7%

Notes:

1. According to the Statistics Canada's 2006 Census of Population (2007e), there are 228 municipalities with population of more than 5,000 people. There are 188 municipalities in Ontario and 25 municipalities in the University of Guelph 2007 Turfgrass Survey sample that belong to Category 1 (population of 10,000 to 50,000). There are 17 municipalities in Ontario and 8 municipalities in the University of Guelph 2007 Turfgrass Survey sample that belong to Category 2 (population of 50,000 to 100,000). There are 19 municipalities in Ontario and 14 municipalities in the University of Guelph 2007 Turfgrass Survey sample that belong to Category 3 (population of 100,000 to 500,000). There are 4 municipalities in Ontario and 3 municipalities in the sample that belong to Category 4 (population of over 500,000).
2. Other uses of turfgrass include cemeteries, hydro corridors, trails, ravines, parking lots, and rooftop gardens

Sources:

1. University of Guelph 2007 Turfgrass Survey, Parks and Rec, 4.2: Does your municipality maintain turfgrass? The table is based on the follow-up question 4.3 - If so, for what purpose?

Table 27. Area of Turfgrass Maintained by Ontario Municipalities with Population of over 5,000 People¹.

Category	Turfgrass area that is maintained by municipalities ²		Turfgrass owned by public and/or Catholic school boards, private schools, sports clubs, conservation authorities and other organizations that is maintained by municipalities	
	Average per Municipality (Acres)	Ontario Total for a Category ³ (Acres thousands)	Average per Municipality (Acres)	Ontario Total for a Category ³ (Acres thousands)
Category 1 ¹ (5,000 to 50,000)	179	33.6	13.8	2.60
Category 2 ¹ (50,000 to 100,000)	762	13.0	122	2.07
Category 3 ¹ (100,000 to 500,000)	1,148	21.8	64.0	1.22
Category 4 ¹ (over 500,000)	6,199	24.8	403	1.61
Total (All Categories)³	8,288	93.2	602	7.50

Notes:

1. According to the Statistics Canada's 2006 Census of Population (2007e), there are 228 municipalities with population of more than 5,000 people. There are 188 municipalities in Ontario and 25 municipalities in the University of Guelph 2007 Turfgrass Survey sample that belong to Category 1 (population of 10,000 to 50,000). There are 17 municipalities in Ontario and 8 municipalities in the University of Guelph 2007 Turfgrass Survey sample that belong to Category 2 (population of 50,000 to 100,000). There are 19 municipalities in Ontario and 14 municipalities in the University of Guelph 2007 Turfgrass Survey sample that belong to Category 3 (population of 100,000 to 500,000). There are 4 municipalities in Ontario and 3 municipalities in the sample that belong to Category 4 (population of over 500,000).
2. This area includes total turfgrass area maintained by municipalities (owned by municipalities and by other organizations).
3. The survey results were aggregated to the province-wide level for each category using the following formula: Average Value for Land Area Reported in the University of Guelph Turfgrass Survey (Municipalities) for Category i × Population (number of municipalities in Category i), i = 1,2,3,4 (Categories). The province-wide total for all categories (228 municipalities) was a sum of total land area for each category.

Sources:

1. University of Guelph 2007 Turfgrass Survey, Parks and Rec, 4.6/4.7: Does your municipality maintain turfgrass that is owned by public and/or Catholic school boards, private schools, sports clubs, conservation authorities, or other agencies or boards?, If so, what is the approximate area of turfgrass owned by these organizations that your municipality maintains?
2. University of Guelph 2007 Turfgrass Survey, Parks and Rec, 4.5: Please indicate the total area of turfgrass that your municipality maintains.

We estimated that the total area of turfgrass owned by such organizations but maintained by municipalities was 7.50 thousand acres in 2007.

In Table 28 we report median and total acres of open space for Ontario municipalities that participate in the Municipal Performance Measurement Program. Open space includes parks, natural areas and managed forests (Ontario Ministry of Municipal Affairs and Housing 2006a). By this definition, open space is not limited to turfgrass.

According to the Ontario Ministry of Municipal Affairs and Housing (2006a), Northern municipalities can be distinguished from Southern municipalities by primarily rural composition, more dispersed settlement patterns and higher costs for municipal service delivery relative to Southern Ontario. Regions and former regions are upper-tier municipalities with significantly greater responsibilities than counties. According to the Ontario Ministry of Municipal Affairs and Housing (2006a), upper-tier municipalities deliver services to local municipalities within its boundaries. This group includes single-tier municipalities which were previously regional governments, Toronto, Ottawa, Hamilton and Greater Sudbury. County is a federation of local municipalities within the same geographic area. An example of a county is the County of Renfrew. We found that the number of municipalities that reported operating open space area is smaller than the actual Ontario-wide number of municipalities in each category. The total area of open space for each category of municipalities was calculated by multiplying the median acres in each category by the number of municipalities belonging to each category as specified by the 2006 Municipal Performance Measurement Program Report.

As can be seen from the data in Table 28, the total open space area maintained by Ontario municipalities was 49.5 and 50.6 thousand acres in 2005 and 2004, respectively. Our estimated total Ontario area of maintained turfgrass, 93.2 thousand acres is larger than the total Ontario

Table 28. Area of Municipal Open Space¹ as Reported by the 2005 Municipal Performance Measurement Program, Ontario Ministry of Municipal Affairs and Housing.

Population	Reporting # ²	Ontario Total # ²	2005 Median (Acres)	2005 Total ⁷ (Acres thousands)	2004 Median (Acres)	2004 Total ⁷ (Acres thousands)
North						
<5,000	65	125	24.7	3.09	27.2	3.40
5,000 – 19,999	10	14	151	2.11	98.8	1.38
20,000 +	3	4	2,224	8.90	2,224	8.90
South						
Regions and Former Regions ³	2	12	1,846	22.2	5,990	71.9
Counties ⁴	1	22	1,495	32.9	1,495	32.9
Single-Tiers⁵						
<10,000	3	5	79.1	0.237	74.1	0.222
10,000 – 99,999	15	17	650	9.75	563	8.45
100,000 +	4	4	1,001	4.00	996	3.98
Lower-Tiers⁶						
<5,000	39	69	24.7	1.71	24.7	1.71
5,000-9,999	54	71	69.2	4.91	69.2	4.91
10,000-19,999	57	64	151	9.65	151	9.65
20,000-39,999	13	15	240	3.60	242	3.63
40,000-99,999	11	11	1,043	11.5	1,053	11.6
100,000+	11	11	2,439	26.8	2,432	26.8
All Municipalities	288	445	111	49.5	114	50.6

Notes:

1. Open space includes parks, natural areas, managed forests.
2. The number of municipalities that reported operating open space area (Reporting #) is smaller than the actual Ontario-wide number of municipalities in each category (Ontario Total #). 2005 Municipal Performance Measurement Program Report listed over 400 municipalities in Ontario.
3. Regions and former regions are upper-tier municipalities with greater responsibilities than counties. Upper-tier municipalities deliver services to local municipalities within its boundaries. This group includes the following single-tier municipalities which were previously regional governments: Toronto, Ottawa, Hamilton and Greater Sudbury.
4. County is a federation of local municipalities within the same geographic area. An example of a county is the County of Renfrew.
5. A municipality is called single-tier when there is only one level of municipal government in an area.
6. A municipality is called lower-tier when there is another level of municipal government, such as a county or region, involved in providing services to residents.
7. Total area of open space for each category of municipalities was calculated by multiplying the median acres in each category by the number of municipalities belonging to each category (Ontario total#) as specified by the 2006 Municipal Performance Measurement Program Report.

Sources: Ontario Ministry of Municipal Affairs and Housing (2006a)

area of open space as reported by the Municipal Performance Measurement Program. Possible reasons for this discrepancy may be differences in survey years and in differences in the aggregation methods. More importantly, our estimate consisted of sports fields, road side, and bowling greens, as well as parks. The Municipal Performance Measurement Program's estimate consisted of parks, natural areas and managed forests, where parks were most likely the only open space that had turfgrass.

4.4.3 Costs

We have no information on the revenues that municipalities earned from turfgrass operations, therefore we can only report costs of turfgrass maintenance. None of the Category 4 municipalities that responded to our survey provided turfgrass expenditures. In order to approximate expenditures associated with turfgrass operations for the four largest Ontario municipalities, we consulted their latest budgets. In particular we examined 2007 Budgets for Toronto, Hamilton, and Mississauga. City of Ottawa's budget did not provide adequate information on parks expenditures. We were able to obtain the City of Ottawa's 2006 Municipal Performance Measurement Program's completed form, which included operating expenditures for Ottawa parks. We also reviewed the duties of parks and recreation departments for each municipality, which are reported in Table 29. Recreation departments most commonly managed arenas, skate rinks, pools, community centres, along with turfgrass operations such as golf courses and sports fields. Parks departments most commonly managed parks as well as sports fields. Expenditures on arenas, skate rinks, pools, community centres and other non-turfgrass recreation facilities were likely to be significant and should not be included in the estimate of turfgrass maintenance expenditures. As such, we only used Parks departments' operating expenses as proxies for turfgrass maintenance expenses for Category 4 municipalities. These

Table 29. An Approximation of Turfgrass Maintenance Expenditures by Category 4 (Population of over 500,000 People) Municipalities.

	Toronto	Hamilton	Mississauga	Ottawa
Source of Information	2007 Budget ¹	2007 Requested Operating Budget ³	2007 Business and Budget Plan ⁵	2006 Municipal Performance Measurement Program ⁷
Recreation Programs and Departments	Parks, Forestry and Recreation Community Recreation Services - Camps - Aquatics - Skating Strategic Services - Ferry service - Golf Operations	Community Services - Museums - Heritage buildings and structures/landscapes - Community centres - Pools - Arenas - Football fields - Soccer pitches - Ball diamonds - Golf courses - Park buildings - Stadium	Community Services - Recreation Facilities and Program o Community centres o Ice pads, o Pools o Museum o Theatre - Golf/Marinas and Hershey Centre	Community and Protective Services - Aquatics -Fitness -Skating -Swimming -Arenas -Seniors Centre -Community Buildings -Arenas -Soccer Fields -Ball diamonds
Parks Programs and Departments	Parks Services - 1,455 named parks - 839 sports fields - 203 tennis courts - 833 playgrounds - 40 splash pads Urban Forestry - Trees and Natural areas	Public Works Department - Operating and maintenance: - 3,100 acres of parkland - 690 acres of open space - 486 acres of municipal cemeteries	Boulevards and Forestry - Management of woodlands - Enforcement of Private Tree By-Law - Cemeteries Operation - Maintenance of boulevards Parks Maintenance - Turf maintenance - Sports field maintenance - Snow clearance - Outdoor rink	Community and Protective Services - Green space -Sports fields (ball diamonds, cricket, soccer, football and ultimate fields). City spends over \$3.3 million annually for cutting, aerating, top dressing, seeding
Proxy for Turfgrass Maintenance Expenditures	2007 Parks Service Operating Budget²	2007 Parks and Cemeteries Operating Expenditures⁴	2007 Parks Maintenance Operating Expenditures⁶	2006 Parks Operating Expenditures⁸
Operating Expenditures (2007 CDN \$ million)	71.0	14.6	14.9	26.6

Table 29 continues on page 76

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Notes:

1. The City of Toronto's 2007 Budget lists operating expenditures by program and by service. The Parks, Forestry and Recreation program consists of parks, community recreation, urban forestry, strategic services, development, infrastructure and management, division coordination and compliance, and management services.
2. The City of Toronto's parks service's budget includes expenditures on maintenance of parks and sports fields. As such, the parks service budget is the best proxy for turfgrass maintenance expenditures of the City of Toronto.
3. The City of Hamilton's 2007 Requested Operating Budget lists operating expenditures by department and by division. Community Services department includes the culture and recreation division. Public Works department includes maintenance of parks.
4. The City of Hamilton's Public Works department maintains sports fields as well as other recreation facilities, such as pools and museums. We used the parks and cemeteries operating expenditures as a proxy for turfgrass maintenance expenditures.
5. The City of Mississauga's 2007 Budget lists operating expenditures by department and by program. Community Services Department includes Parks Maintenance Program.
6. The City of Mississauga's 2007 projected operating expenditures by the Parks Maintenance Program include turfgrass and sports field maintenance, as well as snow clearance and rink management. These expenditures are the closest proxy for the City of Mississauga turfgrass maintenance expenditures.
7. The City of Ottawa provided 2006 expenditures on three areas of parks and recreation: parks, recreation facilities and recreation programs to the Municipal Performance Measurement Program.
8. The City of Ottawa's recreation facilities include community buildings, arenas and pools. It would not be useful to include expenditures on such facilities in the turfgrass maintenance expenditures. Therefore, we assume that operating expenditures for parks is the best proxy for operating turfgrass maintenance expenditures for the City of Ottawa.

Sources: City of Hamilton (2007), City of Ottawa (2006), City of Ottawa (2008), City of Mississauga (2007), City of Toronto (2007).

expenses are reported in Table 29. Assuming that the City of Ottawa's 2006 parks operating expenditures were similar to its 2007 expenditures, we estimated that Category 4 municipalities spent about \$127 million on turfgrass maintenance in 2007.

Other categories of municipalities provided operating expenditures associated with turfgrass maintenance in our survey. We report these expenditures in Table 30. For all categories of municipalities, payroll was by far the largest expenditure item. For some items, as the size of municipality increased, so did the average expenditure. For example, an average Category 1 municipality spent \$5.34 thousand on fertilizer in 2007, compared to \$9.00 and \$71.8 thousand for average municipalities in Categories 2 and 3, respectively. However, in some cases, the size of municipality did not seem to have a bearing on certain items. For example, an average Category 1 municipality spent \$13.8 thousand on equipment repair and maintenance, while an average Category 2 municipality did not incur this type of expense. This lack of expenditure may be attributed to the lack of responses for this particular question or misreporting. We estimated that the province-wide operating turfgrass maintenance expenditures by Categories 1, 2, and 3 municipalities were \$39.0, \$5.55 and \$33.3 million, respectively. In order to estimate total expenditures on specific turfgrass maintenance items by Category 4 municipalities, we calculated average share of each specific item of the total expenditures for Category 1, 2 and 3 municipalities. We then applied these shares to the total operating expenditures by Category 4 municipalities to get an estimate of expenditure on each specific item. These shares and expenditures for each item are illustrated in the last two columns of Table 30.

Table 31 reports total operating expenditures by expenditure item for all municipalities with population of over 5,000 people. The total expenditure for each item was calculated by adding expenditures on each item across all categories of municipalities in Table 30. According

Table 30. Operating Turfgrass Maintenance Expenditures by Categories¹ 1, 2, 3 and 4 Ontario Municipalities in 2007²

Item	Category 1 (5,000 to 50,000)		Category 2 (50,000 to 100,000)		Category 3 (100,000 to 500,000)		Category 4 ³ (over 500,000)	
	Average per Municipality (2007 CDN \$ thousand)	Ontario Total ⁴ Category 1 (2007 CDN \$ million)	Average per Municipality (2007 CDN \$ thousand)	Ontario Total ⁴ Category 2 (2007 CDN \$ million)	Average per Municipality (2007 CDN \$ thousand)	Ontario Total ⁴ Category 3 (2007 CDN \$ million)	% of Ontario Total Category 4 ⁵	Ontario Total ⁵ Category 4 (2007 CDN \$ million)
Payroll	153	28.7	188	3.19	967	18.4	62.0%	78.9
Lawn Care	8.00	1.50	85.0	1.45	174	3.31	13.3%	16.9
Equipment Repair and Maintenance	13.8	2.60	-	0	287	5.45	7.67%	9.75
Equipment Rental	1.69	0.317	25.0	0.425	66.0	1.25	4.08%	5.18
Fuel/Gas	11.1	2.09	0.333	0.00567	70.0	1.33	3.15%	4.01
Fertilizer	5.34	1.00	9.00	0.153	71.8	1.36	3.14%	4.00
Purchased Irrigation Water	5.21	0.979	0.667	0.0113	30.0	0.570	1.48%	1.88
Seed	2.01	0.378	6.67	0.113	21.7	0.412	1.41%	1.80
Top Dressing Material	2.96	0.556	3.67	0.0623	18.3	0.347	1.20%	1.52
Topsoil	1.23	0.231	5.67	0.0963	11.0	0.209	0.98%	1.25
Other	0	0	0	0	27.7	0.526	0.53%	0.668
Sod	0.983	0.185	1.67	0.0283	8.33	0.158	0.486%	0.619
Herbicide	1.20	0.226	1.42	0.0241	0.167	0.00317	0.341%	0.434
Alternative Pesticide Treatments	0.472	0.0887	0.167	0.00283	1.53	0.0291	0.122%	0.155
Turfgrass Consultant	0.364	0.0684	0	0	0	0	0.058%	0.0744
Fungicide	0.167	0.0313	0	0	0.0667	0.00127	0.0281%	0.0357
Insecticide	0.0917	0.0172	0	0	0.0667	0.00127	0.0160%	0.0204
Wetting Agents	0	0	0	0	0.100	0.00190	0.00190%	0.00242
Growth Regulators	0	0	0	0	0	0	0%	0
Total	207	39.0	327	5.55	1,754	33.3		127

Table 30 continues on page 79

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Notes:

1. According to the Statistics Canada's 2006 Census of Population (2007e), there are 228 municipalities with population of more than 5,000 people. There are 188 municipalities in Ontario and 25 municipalities in the University of Guelph 2007 Turfgrass Survey sample that belong to Category 1 (population of 10,000 to 50,000). There are 17 municipalities in Ontario and 8 municipalities in the University of Guelph 2007 Turfgrass Survey sample that belong to Category 2 (population of 50,000 to 100,000). There are 19 municipalities in Ontario and 14 municipalities in the University of Guelph 2007 Turfgrass Survey sample that belong to Category 3 (population of 100,000 to 500,000). There are 4 municipalities in Ontario and 3 municipalities in the sample that belong to Category 4 (population of over 500,000).
2. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.
3. None of the Category 4 municipalities filled out questions on turfgrass maintenance expenditures. In order to approximate operating turfgrass maintenance expenditures for Category 4 municipalities we used 2007 operating budgets of all four municipalities that belong to this category, Toronto, Hamilton, Mississauga, and Ottawa. Table 29 describes how we used this secondary data to approximate turfgrass maintenance expenditures.
4. The survey results were aggregated to the province-wide level for each category using the following formula: Average Expenditures Reported in the University of Guelph Turfgrass Survey (Municipalities) for Category $i \times$ Population (number of municipalities in Category i), $i = 1,2,3,4$ (Categories).
5. In order to estimate total expenditures by Category 4 municipalities on specific turfgrass maintenance items, we calculated an average share of each specific item of total turfgrass operating expenditures across Categories 1, 2 and 3. We then added the approximated turfgrass maintenance expenditures (Table 29) across Toronto, Hamilton, Mississauga and Ottawa in order to get total turfgrass maintenance expenditure for all Category 4 municipalities. The total turfgrass expenditure by Category 4 municipalities is reported in the last cell of column "Ontario Total Category 4". We then applied the average shares to the total expenditure by Category 4 municipalities in order to approximate expenditure on each specific item by Category 4 municipalities.

Sources:

1. Toronto 2007 Budget.
2. Hamilton 2007 Requested Operating Budget.
3. Mississauga 2007 Business and Budget Plan.
4. Ottawa 2006 Municipal Performance Measurement Program Operating Expenditures on Parks.
5. University of Guelph 2007 Turfgrass Survey, Parks and Rec, 10.1/10.2/10.3/10.4/10.7: Please approximate your organization's total payroll costs related to turfgrass maintenance in your most recent fiscal year, If your organization hired a professional lawn care and/or landscaping company, what was the approximate cost of this service in your most recent fiscal year?, If your organization hired a turfgrass consultant, other than a professional lawn care and/or landscaping company, what was the approximate total cost of this service in your most recent fiscal year?, Approximately, what were your organization's expenditures on turfgrass maintenance equipment in your most recent fiscal year?, Approximately, what were your organization's expenditures on supplies in your most recent fiscal year?

Table 31. Total Operating Turfgrass Maintenance Expenditures by Ontario Municipalities with Population larger than 5,000 people¹ in 2007²

Item	Ontario Total ³ (2007 CDN \$ million)	% of Ontario Total
Payroll	129	63.0%
Lawn Care Service	23.1	11.3%
Equipment Repair and Maintenance	17.8	8.68%
Fuel/Gas	7.44	3.63%
Equipment Rental	7.18	3.50%
Fertilizer	6.52	3.18%
Purchased Irrigation Water	3.44	1.68%
Seed	2.70	1.32%
Top Dressing Material	2.49	1.21%
Topsoil	1.79	0.87%
Other	1.19	0.58%
Sod	0.990	0.483%
Herbicide	0.688	0.335%
Alternative Pesticide Treatments	0.276	0.135%
Turfgrass Consultant	0.143	0.0696%
Fungicide	0.0683	0.0333%
Insecticide	0.0389	0.0190%
Wetting Agents	0.00432	0.00211%
Growth Regulators	-	0%
Total	205	

Notes:

1. According to the Statistics Canada's 2006 Census of Population (2007e) there are 228 municipalities with population of more than 5,000 people.
2. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.
3. We used secondary data to calculate operating expenditures on turfgrass maintenance by Category 4 municipalities. For Toronto, Mississauga and Hamilton we used operating parks expenditures as reported in their 2007 budgets. For Ottawa, we used 2006 operating parks expenditures reported in the municipal performance measurement program. Monetary values are adjusted for inflation and reported in constant 2007 CDN \$.
4. The Ontario total expenditures were calculated by adding turfgrass maintenance expenditures for each Category of municipalities as reported in Table 30.

to Table 31, the total operating expenditures on turfgrass maintenance by Ontario municipalities were \$205 million in 2007. Payroll was the largest expenditure item with \$129 million, followed by expenditures on lawn care services with \$23.1 million and equipment repair and maintenance with \$17.8 million.

Since we did not receive any responses from Category 4 municipalities on their turfgrass maintenance capital expenditures, we can report capital expenditures for Categories 1, 2 and 3 only. An average Category 1 municipality spent \$18.0 thousand on equipment purchase in 2007, for a province-wide total of \$3.38 million. An average Category 2 municipality spent \$92.5 thousand on equipment purchase in 2007, for a province-wide total of \$1.57 million CDN. Finally, an average Category 3 municipality spent \$213 thousand on equipment purchase in 2007, for a total of \$4.04 million CDN province-wide. The value of equipment as of 2007 was \$157, \$400, and \$1,850 for average municipalities in Categories 1, 2, and 3, respectively. In total, all municipalities in Categories 1, 2, and 3 spent \$9.00 million on equipment purchases in 2007. The total value of equipment for these municipalities as of 2007 was \$71.4 million.

Table 32 illustrates municipal operating costs for parks in 2005 as reported by the 2006 Municipal Performance Measurement Program report. According to the Ontario Ministry of Municipal Affairs and Housing (2006b), Ontario municipalities incurred \$328 million in parks' operating costs. This value is larger than our estimate of total operating expenditure by over \$100 million. Possible reasons for this discrepancy may be differences in survey years and in differences in the aggregation methods. Furthermore, we adopted measures to make sure that our estimate of operating costs is turfgrass specific, while the Ministry's estimate may include various administrative costs. In any case, this discrepancy suggests that we did not overestimate costs.

Table 32. Municipal Operating Costs¹ for Parks as Reported by the 2005 Municipal Performance Measurement Program, Ontario Ministry of Municipal Affairs and Housing.

Population	Reporting # ²	Ontario Total # ²	2005 Population (millions)	2005 Median \$ 2005 CDN per Person	2005 Median \$ 2007 CDN per Person	2005 Total ⁷ \$ 2007 CDN (millions)
North						
<5,000	71	125	0.147	12.0	12.6	1.85
5,000 – 19,999	11	14	0.118	40.0	41.9	4.95
20,000 +	4	4	0.270	41.0	42.9	11.6
South						
Regions and Former Regions ³	5	12	6.99	28.0	29.3	205
Counties ⁴	4	22	1.54	0.230	0.241	0.371
Single-Tiers⁵						
<10,000	4	5	0.0233	31.0	32.5	0.755
10,000 – 99,999	16	17	0.709	29.0	30.4	21.5
100,000 +	4	4	0.843	21.0	22.0	18.5
Lower-Tiers⁶						
<5,000	37	69	0.194	8.0	8.4	1.63
5,000-9,999	53	71	0.528	12.0	12.6	6.64
10,000-19,999	56	64	0.855	20.0	20.9	17.9
20,000-39,999	13	15	0.454	20.0	20.9	9.50
40,000-99,999	11	11	0.763	31.0	32.5	24.8
100,000+	11	11	2.24	39.0	40.8	91.3
All Municipalities	300	445	15.7	20.0	20.9	328

Notes:

1. Operating costs include salaries, wages, employee benefits, materials, contracted services, rents and financial expenses, external transfers, transfers to own funds, transfers between departments, allocation of program support, principal and interest payments on long term debt.
2. The number of municipalities that reported operating open space expenditures (Reporting #) is smaller than the total number of municipalities in each category (Ontario Total #). 2005 Municipal Performance Measurement Program Report listed over 400 municipalities in Ontario.
3. Regions and former regions are upper-tier municipalities with significantly greater responsibilities than counties. Upper-tier municipalities deliver services to local municipalities within its boundaries. This group includes the following single-tier municipalities which were previously regional governments: Toronto, Ottawa, Hamilton and Greater Sudbury.
4. County is a federation of local municipalities within the same geographic area. An example of a county is the County of Renfrew.
5. A municipality is called single-tier when there is only one level of municipal government in an area.
6. A municipality is called lower-tier when there is another level of municipal government like a county or region involved in providing services to residents.
7. Total operating costs were based on the total population for each municipal categories (2007 CDN\$ Median × Number of people in each category).

Sources: Ontario Ministry of Municipal Affairs and Housing (2006b)

4.4.4 Employment

In Table 33 we show the average and the Ontario total number of turfgrass management employees for each Category of municipalities for 2007. For municipalities with population of over 5,000 people, the total number of year round full-time equivalent employees in 2007 was 3,840. According to the data in Table 33, the average number of year round full-time equivalent employees increased as a municipality increased in size. An average Category 1 municipality hired 7.12 full-time equivalent employees in 2007, whereas an average Category 4 municipality hired 382 full-time equivalent employees in 2007. Approximately 45.8%, 57.1%, 58.3% and 66.7% of Category 1, 2, 3, and 4 municipalities hired a lawn care company in 2007, respectively. Approximately 20.8%, 42.9%, 25.0% and 66.7% of Category 1, 2, 3, and 4 municipalities, respectively, hired a turfgrass consultant in 2007.

We asked municipalities to indicate which training or qualifications are required for positions of Turfgrass Manager, Assistant/Supervisor/Foreman, and Machine Operator. The responses are presented in Table 34. All categories of municipalities most commonly required the completion of Grade 12 in order to qualify for the position of Machine operator. According to the data in Table 34, all municipalities in Category 4 responded that a position of Turfgrass Manager required a completion of the Turf Managers' Short Course.

In Table 35 we list training completed by turfgrass maintenance employees in the last two years for each municipal category. According to the data in Table 35, the most common training completed was Workplace Hazardous Materials Information Systems/Hazardous Products and Health and Safety for all categories of municipalities.

Table 33. Number of Full-time and Part-time Municipal Parks and Recreation Employees Responsible for Maintaining Turfgrass in 2007¹ at Ontario Municipalities with Population of over 5,000 People.

Type of Employee	Category 1 ² (5,000 to 50,000)		Category 2 ² (50,000 to 100,000)		Category 3 ² (100,000 to 500,000)		Category 4 ² (over 500,000)		All Categories
	Average per Municipality	Ontario Total for Category 1 ³	Average per Municipality	Ontario Total for Category 2 ³	Average per Municipality	Ontario Total for Category 3 ³	Average per Municipality	Ontario Total for Category 4 ³	Ontario Total
Year round full-time	2.75	517	5.00	85.0	17.3	329	201	804	1,735
Seasonal full-time	4.04	760	6.43	109	28.5	542	221	883	2,293
Year round part-time	1.25	235	0.857	14.6	4.00	76.0	0	0	326
Seasonal part-time	4.21	791	6.57	112	10.4	198	137	549	1,650
Total full-time equivalent⁴	7.12	1,339	11.36	193	40.9	778	382	1,530	3,840
# of Students	6.33	1,191	10.1	172	26.6	505	162	648	2,516

Notes:

1. Respondents were asked to provide data on their most recent fiscal year. We assume that this year was 2007.
2. According to the Statistics Canada's 2006 Census of Population (2007e), there are 228 municipalities with population of more than 5,000 people. There are 188 municipalities in Ontario and 25 municipalities in the University of Guelph 2007 Turfgrass Survey sample that belong to Category 1 (population of 10,000 to 50,000). There are 17 municipalities in Ontario and 8 municipalities in the University of Guelph 2007 Turfgrass Survey sample that belong to Category 2 (population of 50,000 to 100,000). There are 19 municipalities in Ontario and 14 municipalities in the University of Guelph 2007 Turfgrass Survey sample that belong to Category 3 (population of 100,000 to 500,000). There are 4 municipalities in Ontario and 3 municipalities in the sample that belong to Category 4 (population of over 500,000).
3. The survey results were aggregated to the province-wide level using the following formula: Average Number of Employees Reported in the University of Guelph 2007 Turfgrass Survey for Category $i \times$ Population (# of municipalities in Category i), $i = 1,2,3,4$ (Categories).
4. We assume that in an average season full-time employees work 8 months. Year round part-time employees work 6 months. Seasonal part-time employees work 3 months. Formula: Full-time equivalent employees = Year-round full-time employees + $(8/12) \times$ seasonal full-time employees + $(1/2) \times$ year round part-time employees + $(1/4) \times$ seasonal part-time employees.

Sources:

1. University of Guelph 2007 Turfgrass Survey, Parks and Rec, 9.1/9.2: How many people, including yourself, were employed for the purpose of turf maintenance by your organization in your most recent fiscal year?/ How many students did your organization employ in full time, part time, and seasonal positions for the purpose of turfgrass maintenance in your most recent fiscal year?

Table 34. Current Qualifications of Municipal Parks and Recreation Employees Responsible for Maintaining Turfgrass, Ontario Municipalities with Population of over 5,000 People.

Qualification	Turfgrass Manager (% of responses) ¹	Assistant/ Supervisor/Foreman (% of responses) ¹	Machine Operator (% of responses) ¹
Category 1² (5,000 to 50,000)			
Grade 12	14.3%	50.0%	80.0%
2-year Certificate/Diploma in Landscape Management	28.6%	31.3%	0%
2-year Certificate/Diploma in Turfgrass Management	7.14%	12.5%	0%
Turf Managers' Short Course	14.3%	12.5%	5.00%
Undergraduate/Bachelors Degree	14.3%	0%	5.00%
Graduate Degree	7.14%	0%	0%
Other	21.4%	12.5%	25.0%
Category 2² (50,000 to 100,000)			
Grade 12	16.7%	42.9%	71.4%
2-year Certificate/Diploma in Landscape Management	50.0%	42.9%	14.3%
2-year Certificate/Diploma in Turfgrass Management	33.3%	14.3%	14.3%
Turf Managers' Short Course	0%	14.3%	14.3%
Undergraduate/Bachelors Degree	16.7%	14.3%	14.3%
Graduate Degree	16.7%	14.3%	14.3%
Other	33.3%	14.3%	28.6%
Category 3² (100,000 to 500,000)			
Grade 12	40.0%	45.5%	90.9%
2-year Certificate/Diploma in Landscape Management	50.0%	54.6%	0%
2-year Certificate/Diploma in Turfgrass Management	90.0%	63.6%	0%
Turf Managers' Short Course	60.0%	18.2%	0%
Undergraduate/Bachelors Degree	10.0%	0%	0%
Graduate Degree	20.0%	0%	0%
Other	0%	0%	27.3%
Category 4² (over 500,000)			
Grade 12	66.7%	66.7%	100%
2-year Certificate/Diploma in Landscape Management	66.7%	66.7%	33.3%
2-year Certificate/Diploma in Turfgrass Management	33.3%	66.7%	33.3%
Turf Managers' Short Course	100%	66.7%	33.3%
Undergraduate/Bachelors Degree	66.7%	0%	0%
Graduate Degree	0%	0%	0%
Other	33.3%	33.3%	66.5%

Table 34 continues on page 86

Notes

1. Each cell in the table reports the percentage of responses for each combination of a qualification and a position. Respondents were instructed to select multiple options, if applicable. For example, a position of turfgrass manager could require Grade 12 and 2-year Certificate/Diploma in Turfgrass Management and Turf Managers' Short Course. The number of responses for each qualification was divided by the total number of responses for each column, or in other words, for each position. This proportion was then converted to a percentage format.
2. According to the Statistics Canada's 2006 Census of Population (2007e), there are 228 municipalities with population of more than 5,000 people. There are 188 municipalities in Ontario and 25 municipalities in the University of Guelph 2007 Turfgrass Survey sample that belong to Category 1 (population of 10,000 to 50,000). There are 17 municipalities in Ontario and 8 municipalities in the University of Guelph 2007 Turfgrass Survey sample that belong to Category 2 (population of 50,000 to 100,000). There are 19 municipalities in Ontario and 14 municipalities in the University of Guelph 2007 Turfgrass Survey sample that belong to Category 3 (population of 100,000 to 500,000). There are 4 municipalities in Ontario and 3 municipalities in the sample that belong to Category 4 (population of over 500,000).

Sources:

1. University of Guelph 2007 Turfgrass Survey, Parks and Rec, 9.6: What are the typical entry-level qualifications for your organization's employees in the following positions? Please check all that apply.

Table 35. Training Completed in the Last Two Years by Municipal Parks and Recreation Employees Responsible for Maintaining Turfgrass, Ontario Municipalities with Population of over 5,000 people.

Training	Category 1 ¹	Category 2 ¹	Category 3 ¹	Category 4 ¹
	(5,000 to 50,000)	(50,000 to 100,000)	(100,000 to 500,000)	(over 500,000)
	% of responses	% of responses	% of responses	% of responses
Turfgrass Management Diploma	4.17%	14.3%	0%	33.3%
Turf Managers' Short Course	20.8%	0%	25.0%	66.7%
Workplace Hazardous Materials Information Systems/Hazardous Products	91.7%	85.7%	100%	100%
Health and Safety	91.7%	85.7%	91.7%	66.7%
Pesticide Applicator's License	33.3%	42.9%	58.3%	66.7%
Voluntary IPM Accreditation	16.7%	57.1%	50.0%	66.7%
Other Turfgrass Courses/Workshops	62.5%	85.7%	83.3%	100%
None	4.17%	0%	0%	0%
Other (please specify)	12.5%	28.6%	16.7%	66.7%

Notes:

1. According to the Statistics Canada's 2006 Census of Population (2007e), there are 228 municipalities with population of more than 5,000 people. There are 188 municipalities in Ontario and 25 municipalities in the University of Guelph 2007 Turfgrass Survey sample that belong to Category 1 (population of 10,000 to 50,000). There are 17 municipalities in Ontario and 8 municipalities in the University of Guelph 2007 Turfgrass Survey sample that belong to Category 2 (population of 50,000 to 100,000). There are 19 municipalities in Ontario and 14 municipalities in the University of Guelph 2007 Turfgrass Survey sample that belong to Category 3 (population of 100,000 to 500,000). There are 4 municipalities in Ontario and 3 municipalities in the sample that belong to Category 4 (population of over 500,000).
2. Respondents were instructed to select multiple options if applicable.

Sources:

1. University of Guelph 2007 Turfgrass Survey, Parks and Rec, 9.7: What training or further qualifications have you and your employees completed in the past two years? Please check all that apply.

4.4.5 Trends

The area of maintained turfgrass by municipalities increased more than twofold since 1982. Sears and Gimplej (1982) estimated that municipalities with population over 5,000 maintained a total area of 43.5 thousand acres in 1982, compared to the 2007 estimate of 93.2 thousand acres. Municipal expenditures associated with maintaining turfgrass increased substantially since 1982. Sears and Gimplej (1982) estimated total expenditures to be over \$36.6 million, compared to our estimate of \$205 million, which represents a 460% increase in expenditures since 1982. Sears and Gimplej (1982) estimated the total number of permanent and seasonal employees at Ontario municipalities to be 725 and 1.15 thousand in 1982. We estimated the total number of employees in year round and seasonal part-time and full-time positions to be 72.8 thousand in 2007.

4.5 Universities

4.5.1 Definitions and Methods

We distributed the survey to 156 members of the Sports Turf Association of Ontario, 735 members of the Ontario Parks Association, and 1,200 members of the Ontario Recreation Facilities Association. The respondents consisted of municipalities, colleges, universities and other organizations. We received 6 responses from universities. We also received one response from an Ontario college. Due to such small sample size, we limited our quantitative analysis to universities only. We received 22 responses from the Sports Turf Associations of Ontario, 61 responses from the Ontario Parks Association, and 16 responses from the Ontario Recreation Facilities Association, resulting in 14.3%, 8.30%, and 1.33% response rates for each association, respectively. We recognize that the response rate for the Ontario Recreation Facilities Association is low. There are two reasons for such a low response rate. Firstly, the membership

list for the association is diverse, containing workers that maintain non-turfgrass recreation facilities as well as turfgrass recreation facilities. Secondly, there were some issues with respect to delivering survey notifications and reminders to the membership list.

The responses from each association were used jointly to develop a profile of municipalities. Although, the response rate of the Ontario Recreation Facilities Association is low, the completed surveys represent responses from municipalities that help build a profile of the municipal sector. The memberships of the Ontario Recreation Facilities Association, Sports Turf Association of Ontario and Ontario Parks Association are not used to produce aggregate estimate of economic activity of municipalities. We used an independent source to obtain data on the total number of municipalities and universities. We used these data to produce aggregate estimates.

The standard aggregation procedure for quantitative survey data is to multiply the response average by the total number of relevant Ontario operations. According to Ontario Ministry of Training, Colleges and Universities (2008), there are 19 publicly funded universities in Ontario. Therefore, in order to calculate province-wide values, we multiplied each average response by 19.

4.5.2 Area of Maintained Turfgrass

The average area of turfgrass maintained by Ontario universities in 2007 was 44.2 acres. The province-wide total of area of maintained turfgrass by all Ontario universities in 2007 was 839 acres.

4.5.3 Costs

According to the data in Table 36, Ontario universities spent \$7.72 million on operating turfgrass maintenance expenditures in 2007 (Table 36). Payroll represented the largest share of

Table 36. Operating Turfgrass Maintenance Expenditures by Ontario Universities, 2007¹

Item	Average per University (2007 CDN \$ thousand)	Ontario Total² (2007 CDN \$ million)	% of Total Expenditure
Payroll	368	6.98	90.4%
Equipment Repair and Maintenance	22.0	0.418	5.41%
Fuel/Gas	5.50	0.105	1.35%
Top Dressing Material	3.00	0.0570	0.738%
Topsoil	2.75	0.0523	0.676%
Fertilizer	2.75	0.0523	0.676%
Seed	2.25	0.0428	0.553%
Sod	0.333	0.00633	0.0820%
Turfgrass Consultant	0.300	0.00570	0.0738%
Alternative Pesticide Treatments	0.125	0.00238	0.0307%
Lawn Care	0	0	0%
Equipment Rental	0	0	0%
Herbicide	0	0	0%
Insecticide	0	0	0%
Fungicide	0	0	0%
Purchased Irrigation Water	0	0	0%
Wetting Agents	0	0	0%
Growth Regulators	0	0	0%
Other	0	0	0%
Total	407	7.72	

Notes:

1. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.
2. We used the following aggregation procedure: Ontario Total = Response Average × Population (19 universities).

Sources:

3. University of Guelph 2007 Turfgrass Survey, Parks and Rec, 10.1/10.2/10.3/10.4/10.7: Please approximate your organization's total payroll costs related to turfgrass maintenance in your most recent fiscal year, If your organization hired a professional lawn care and/or landscaping company, what was the approximate cost of this service in your most recent fiscal year?, If your organization hired a turfgrass consultant, other than a professional lawn care and/or landscaping company, what was the approximate total cost of this service in your most recent fiscal year?, Approximately, what were your organization's expenditures on turfgrass maintenance equipment in your most recent fiscal year?, Approximately, what were your organization's expenditures on supplies in your most recent fiscal year?

total operating expenditures incurred by all Ontario universities in 2007 (90.4%). An average university spent about \$368 thousand on payroll in 2007, for the province-wide total of \$6.98 million. Equipment repair and maintenance by all Ontario universities comprised about half of the remaining expenditures. An average university spent about \$22 thousand on equipment repairs and maintenance in 2007, for the province-wide total of \$418 thousand.

An average Ontario university spent about \$1.83 thousand on purchasing turfgrass maintenance equipment in 2007, for the province-wide total of \$34.8 thousand. The value of turfgrass maintenance equipment for an average Ontario university as of 2007 was \$253 thousand. The province-wide value of turfgrass maintenance equipment owned by Ontario universities as of 2007 was \$4.81 million.

4.5.4 Employment

We only received four responses for the employment questions, therefore the results presented in section should be interpreted with caution. The total number of year round full-time equivalent turfgrass maintenance employees at Ontario universities was 357 in 2007 (Table 37). The number of year round full-time employees is larger than seasonal full-time employees, which is inconsistent with other industry segments, where the majority of employees were seasonal. The total number of year round full-time and seasonal full-time employees for all Ontario universities was 279 and 88.7, respectively. According to the data in Table 37, an average Ontario university employed 8.33 students in 2007, for the province-wide number of 158 students. There were only three responses to questions about training and qualifications of employees and the training courses completed in the last two years. Since the number of responses is so small, we decided not to report answers to these questions.

Table 37. Number of Full-time and Part-time Turfgrass Maintenance Employees employed by Ontario Universities in 2007¹.

Category	Average per University	Ontario Total²
Year round full-time	14.7	279
Seasonal full-time	4.67	88.7
Year round part-time	0	0
Seasonal part-time	4.00	76.0
Total full-time equivalent³	18.8	357
Number of Students	8.33	158

Notes:

1. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.
2. We used the following aggregation procedure: Ontario Total = Response Average × Population (19 universities)
3. We assume that in an average season full-time employees work 8 months. Year round part-time employees work 6 months. Seasonal part-time employees work half of the time of year-round part-time employment. In order to calculate the total number of full-time equivalent employees employed by universities, we used the following formula:
 Total full-time equivalent employees = year round full-time employees + (8/12)×seasonal full-time employees + (1/2)×year round part-time employees + (1/4)×seasonal part-time employees.

Sources:

University of Guelph 2007 Turfgrass Survey, Parks and Rec, 9.1/9.2: How many people, including yourself, were employed for the purpose of turf maintenance by your organization in your most recent fiscal year?/ How many students did your organization employ in full time, part time, and seasonal positions for the purpose of turfgrass maintenance in your most recent fiscal year?"

4.6 Provincial Highways and Roadside

We obtained turfgrass maintenance data for provincial highways and roadside by contacting the Ontario Ministry of Transportation directly. This data are available only for provincially owned roads. Airports are not included. According to the Ministry of Transportation (2006), the Ministry is required to practice grass control, which is the reduction in the growth of grass by mowing and trimming operations. The purpose of Grass Control is to improve sight distances, provide an unobstructed view of signs, improve landscape of the roadside, control noxious weeds, extend the life of the infrastructure, improve turf cover, and reduce drainage impairment (Ministry of Transportation 2006). Grass Control may be also performed for aesthetic purposes.

The Ontario Ministry of Transportation maintained 38.5 thousand acres of mowable grass in 2007 (Nick Close pers. comm. 2007), which represents about 20% decrease since the 1982 level. Sears and Gimplej estimated that Ontario Ministry of Transportation maintained 48.2 thousand acres in 1982. This decrease is likely due to the fact that the Ministry has transferred 3.5 thousand km of roads to lower tiered governments in the late 90s (Nick Close pers. comm. 2007).

The primary turf maintenance activity is mowing. No data are available on mowing expenditures. The expenditure data are available only for construction activities such as laying sod and seed. In Table 38 we provide a breakdown of the reported Ministry's expenditures. The Ontario Ministry of Transportation spent \$6.3 million CDN in 2006 and 2007 (up to October 15, 2007) on various turf related construction activities, including seed and mulch, seed and erosion control blanket, seed and bonded fibre matrix, and sod (Nick Close pers. comm. 2007). In order to obtain 2007 expenditures only, we divided this value by two, to obtain \$3.15 million.

Table 38. Expenditures on Turfgrass Maintenance Construction Activities on Provincial Highways and Roads, Ontario Ministry of Transportation, 2006 and 2007¹

Activity²	Acres	Average Cost (2007 CDN \$ thousand per Acre)	Total Cost (2007 CDN \$ million)
Seed and Mulch	1,438	2.02	2.91
Seed and Erosion Control Blanket	164	9.83	1.62
Seed and Bonded Fibre Matrix	59.2	7.04	0.417
Sod	66.0	20.7	1.36
Total (2006 and 2007)	1,728		6.31
Total (2007 only)³			3.15

Notes:

1. The expenditures include the Ministry's 2006 construction season as well as the 2007 construction season to October 15, 2007.
2. The expenditures on turfgrass maintenance construction activities do not include mowing.
3. In order to estimate 2007 expenditures, we divided the 2006 and 2007 Total by two.

Sources: Nick Close pers. comm. 2007

4.7 Lawn Care Companies

4.7.1 Methods and Definitions

According to the Professional Lawn Care Association of Ontario, lawn care companies offer the following services: mowing, maintenance, aeration, seeding, landscaping, fertilizer and pest controls applications and ornamental and small tree care (2008). There are 1,300 lawn care operators that hold an Ontario Ministry of Environment pesticide license (Tony DiGiovanni pers. comm. 2008). We assume that this number represents the Ontario population of lawn care companies. In addition, there are approximately 1,200 certified technicians in 2008, which we do not count towards the Ontario population of lawn care companies.

We distributed the survey to 197 members of the Professional Lawn Care Association of Ontario and to 2,000 members of the Landscape Ontario, approximately half of which are lawn care companies. We received 120 fully and partially completed surveys. After removing one response due to inapplicability, we had 119 fully and partially completed surveys, which represents about 9.94% response rate. In order to obtain province-wide figures, we first calculated an average response to each quantitative survey question and then multiplied each average response by the number of Ontario lawn care companies (1,300). The responses to qualitative questions were formatted as percentages.

4.7.2 Area of Maintained Turfgrass and Customer Distribution

The average and province-wide areas for which Ontario lawn care companies provided turfgrass maintenance services were 866 acres and 1.13 million acres, respectively. The average number of customers of an Ontario was 2.30 thousand in 2007. The total province-wide number

of customers for all Ontario lawn care companies was 2.99 million in 2007. Figure 6 illustrates the distribution of customers for an average Ontario lawn care company.

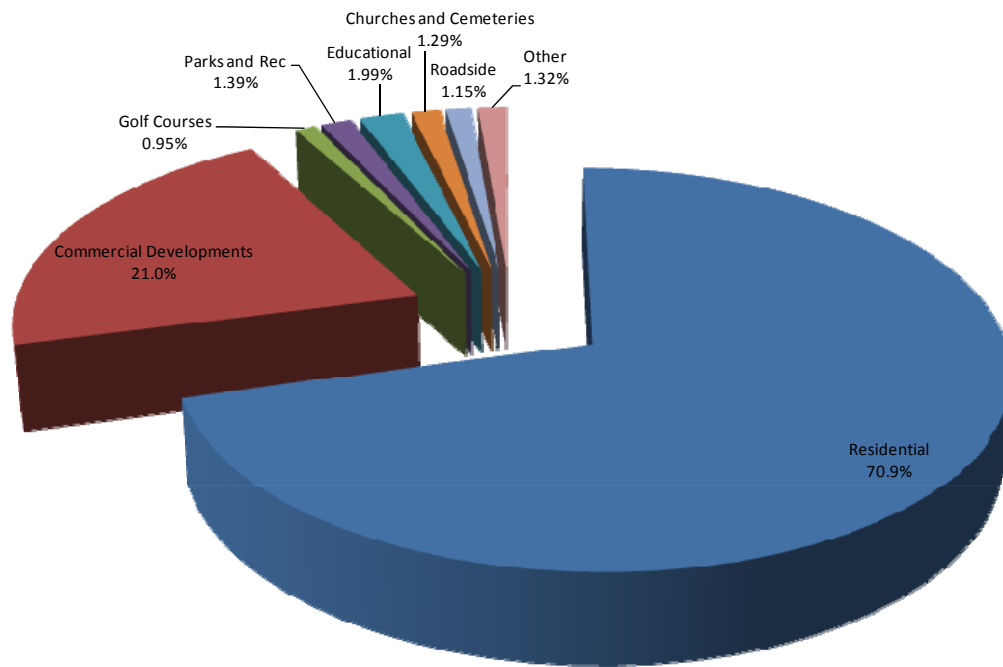
As can be seen from Figure 6, Ontario lawn care companies predominantly had residential properties as their customers with 70.9%. The second largest category of customers was commercial properties with 21.0%. Turfgrass users, such as golf courses, parks and recreational facilities and cemeteries, represent a small share of lawn care companies' consumers with about 8.10%.

4.7.3 Revenue and Costs

An average sales value earned by an Ontario lawn care company from providing turfgrass maintenance services was \$966 thousand in 2007. The total sales value of turfgrass maintenance services for Ontario lawn care companies was \$1.26 billion in 2007. Figure 7 illustrates the distribution of specific lawn care services that comprised the 2007 sales value. As can be seen from Figure 7, the majority of revenues for an average lawn care company are attributed to mowing and trimming and fertilizer application services. Pest control also represented a significant share of an average lawn care company's sales value with approximately 20.4%.

In Table 39 we list operating expenditures incurred by Ontario lawn care companies in 2007. Ontario lawn care companies spent \$580 million on operating expenditure in 2007. It is important to note that we gave an option to respondents to either provide a breakdown of expenditures on supplies or to provide total expenditures on all supplies. The majority of respondents provided a breakdown of supplies' expenditures. However, some respondents only provided total expenditures on all supplies. Incorporating these responses into our calculation resulted in total province-wide expenditures of \$590 million. Since we are interested in

Figure 6. The Distribution of Customer Categories for an Average Ontario Lawn Care Company, 2007¹.



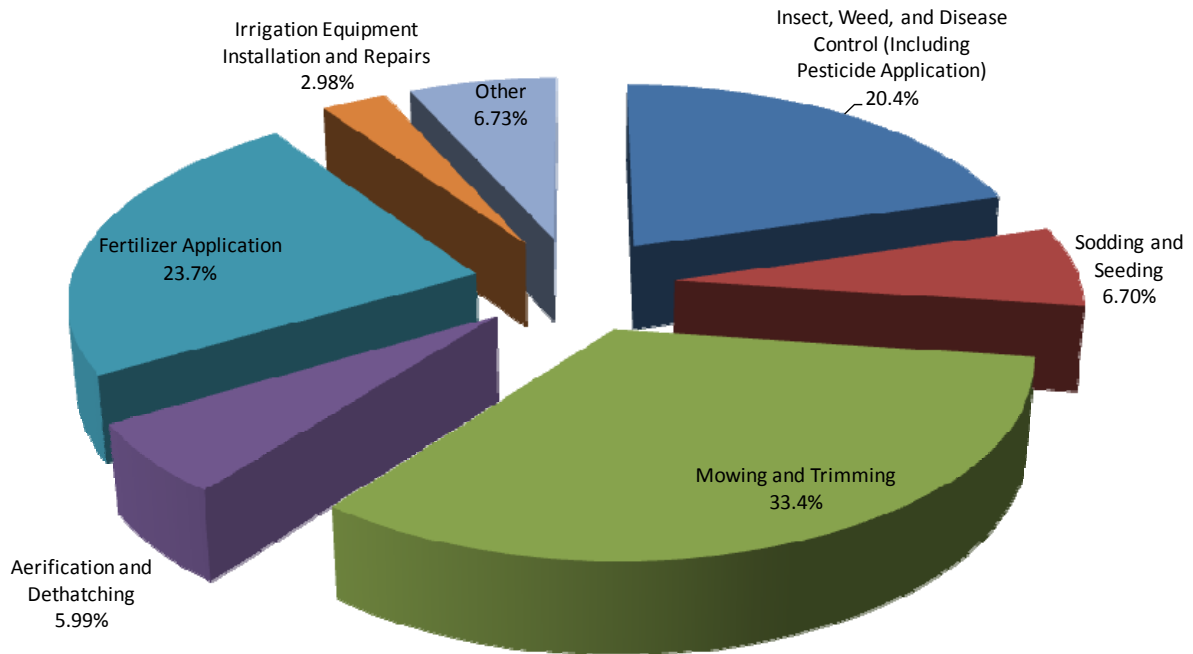
Notes:

1. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.

Sources:

1. University of Guelph 2007 Turfgrass Survey, Lawn Care, 3.5: Please approximate the percentage of your customers that fall in the following categories

Figure 7. The Distribution of Lawn Care Services that Comprised the Total Sales Value of an Average Ontario Lawn Care Company, 2007¹.



Notes:

1. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.

Sources:

1. University of Guelph 2007 Turfgrass Survey, Lawn Care, 3.5: Please approximate the percentage of your total sales value from the previous fiscal year that came from the following services.

Table 39. Operating Turfgrass Maintenance Expenditures by Ontario Lawn Care Companies, 2007¹.

Item	Average per Company (2007 CDN \$ thousand)	Ontario Total² (2007 CDN\$ million)	% of Ontario Total
Payroll	304	395	68.1%
Fertilizer	36.8	47.9	8.27%
Fuel/Gas	32.4	42.1	7.26%
Insecticide	20.1	26.2	4.52%
Herbicide	13.8	18.0	3.10%
Equipment Repair and Maintenance	10.9	14.1	2.44%
Seed	6.96	9.05	1.56%
Equipment Rental	5.59	7.27	1.25%
Other	4.06	5.27	0.91%
Alternative Pesticide Treatments	3.91	5.08	0.88%
Topdressing Material	3.06	3.98	0.69%
Sod	2.20	2.86	0.493%
Topsoil	1.60	2.08	0.359%
Purchased Irrigation Water	0.604	0.785	0.136%
Fungicide	0.233	0.303	0.0523%
Wetting Agents	0.0278	0.0361	0.0062%
Growth Regulators	0	0	0%
All Expenditures³	446	580	

Notes:

1. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.
2. The survey results were aggregated to the province-wide level using the following formula: Question Average × Population (1,300 lawn companies that have pesticide permits).
3. Some respondents did not provide a breakdown of supplies, but instead reported the cost of all supplies. These types of responses were excluded when calculating the total operating expenditures for all Ontario lawn care companies. When such responses were included, the total province-wide operating expenditures were calculated to be \$590 million 2007 CDN.

Sources:

1. University of Guelph 2007 Turfgrass Survey, Lawn Care, 5.1: Approximately, what were your company's total payroll costs related to turfgrass maintenance in your most recent fiscal year?
2. University of Guelph 2007 Turfgrass Survey, Lawn Care, 5.2: Approximately, what were your company's total expenditures on turfgrass maintenance equipment in your most recent fiscal year?
3. University of Guelph 2007 Turfgrass Survey, Lawn Care, 5.3: In your estimation, approximately, what were your company's total expenditures on the following supplies in your most recent fiscal year? If you cannot provide expenditures on specific supplies, please approximate your company's total expenditures on all supplies associated with turfgrass maintenance in your most recent fiscal year.

expenditures on specific supplies, we assumed that lawn care companies spent \$580 million on total operating expenditures.

Payroll was the largest expenditure item for Ontario lawn care companies, with an average lawn care company spending \$304 thousand on payroll in 2007 for a province-wide total of \$395 million. According to the data in Table 39, fertilizer was the second largest expenditure item with an average company spending \$36.8 thousand on fertilizer in 2007 for a province-wide total of \$47.9 million. Out of pesticides, lawn care companies spent the most on insecticide (\$26.2 million) and the least on fungicide (\$303 thousand) in 2007.

In terms of capital expenditure, an average Ontario lawn care company purchased \$17.5 thousand worth of turfgrass maintenance equipment in 2007. The value of equipment for an average lawn care company was \$129 thousand in 2007. Province-wide, Ontario lawn care companies spent \$22.8 million on purchasing turfgrass maintenance equipment in 2007. The value of equipment owned by all Ontario lawn care companies as of 2007 was \$167 million.

4.7.4 Employment

In Table 40 we report the average and total number of employees that Ontario lawn care companies had in 2007. In total, Ontario lawn care companies hired 20.8 thousand year round full-time equivalent employees in 2007. According to the data in Table 40, the largest number of employees at an average Ontario lawn care company in 2007 was the seasonal full-time category with 12.6 employees, for a province-wide total of 16.3 thousand employees.

In Table 41 we report current qualifications of employees at Ontario lawn care companies. According to the data in Table 41, there was not one specific qualification or training for a turfgrass manager that dominated the responses. The completion of Grade 12 yielded the

Table 40. Number of Full-time and Part-time employees employed by Ontario Lawn Care Companies in 2007¹

Type of Employee	Average per Lawn Care Company (employees)	Ontario Total² (employees)
Year round full-time	6.26	8,134
Seasonal full-time	12.6	16,339
Year round part-time	1.38	1,789
Seasonal part-time	2.73	3,554
Total full-time equivalent³	16.0	20,810
Number of Students	4.13	5,367

Notes:

1. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.
2. The survey results were aggregated to the province-wide level using the following formula:
 Question Average × Population (1,300 lawn companies that have pesticide permits).
3. We assume that in an average season full-time employees work 8 months. Year round part-time employees work 6 months. Seasonal part-time employees work half of the time of year-round part-time employment. In order to calculate the total number of full-time equivalent employees employed by lawn care companies, we used the following formula:
 Total full-time equivalent employees = year round full-time employees + (8/12)×seasonal full-time employees + (1/2)×year round part-time employees + (1/4)×seasonal part-time employees.

Sources:

1. University of Guelph 2007 Turfgrass Survey, Lawn Care and Grounds, 4.1: How many people, including yourself, were employed in turfgrass maintenance positions in your company in your most recent fiscal year?
2. University of Guelph 2007 Turfgrass Survey, Lawn Care, 4.2: How many students did your company employ in full-time, part-time, and seasonal turfgrass maintenance positions in your most recent fiscal year?

Table 41. Current Employee Qualifications at Ontario Lawn Care Companies.

Qualification	Turfgrass Manager (% of responses) ¹	Assistant/ Supervisor/ Foreman (% of responses) ¹	Machine Operator/ Ground Crew (% of responses) ¹
Grade 12	23.0%	39.0%	68.0%
2-year Certificate/Diploma in Landscape Management	18.0%	15.0%	2.00%
2-year Certificate/Diploma in Turfgrass Management	16.0%	7.00%	2.00%
Turf Managers' Short Course	13.0%	7.00%	4.00%
Undergraduate/Bachelors Degree	10.0%	7.00%	3.00%
Graduate Degree	5.00%	8.00%	3.00%
Other	18.0%	21.0%	23.0%

Notes:

1. Respondents were instructed to check all employee qualifications that applied to their lawn care company.
2. Each cell in the table reports the percentage of responses for each combination of a qualification and a position. Respondents were instructed to select multiple options, if applicable. For example, a position of turfgrass manager could require Grade 12 and 2-year Certificate/Diploma in Turfgrass Management and Turf Managers' Short Course. The number of responses for each qualification was divided by the total number of responses for each column, or in other words, for each position. This proportion was then converted to a percentage format.

Sources:

1. University of Guelph 2007 Turfgrass Survey, Lawn Care, 4.3: What are the typical entry-level qualifications for your company's employees in the following positions? Please check all that apply.

highest number of responses with 23% for a position of turfgrass manager. According to the data in Table 41, positions of Assistant/Supervisor/Foreman and Machine Operator/Ground Crew also primarily required the completion Grade 12. In Table 42 we report training completed in the last two years by Ontario lawn care employees. The training courses with the most responses were Health and Safety (69.5% of responses) and WHIMS/Hazardous Products (64.8% of responses) courses. About 41% of the sample's respondents indicated that their lawn care company completed a Voluntary IPM Accreditation.

4.7.5 Trends

Sears and Gimplej (1984) estimated the 1982 gross revenue of Ontario lawn care companies to be \$95.7 million. We estimated the 2007 gross revenue of Ontario lawn care companies to be \$1.26 billion. This means that the Ontario lawn care industry has undergone an expansion since in the last twenty five years. However, the shares of total gross revenue attributed to different lawn care services have remained approximately the same since 1982. According to Sears and Gimplej (1984), pesticide and fertilizer applications accounted for 43% of the 1982 revenues. We estimated that pest control and fertilizer application accounted for 44.1% of the 2007 revenues. In both 2007 and 1982 households constituted the majority of lawn care companies' customers.

4.8 Related Products Industry

The Canadian Fertilizer Institute reported retail sales up to and including 2006. In 2006 (fertilizer year ended June 30th, 2006), Ontario retail sales of nitrogen, phosphate, potash and other fertilizer materials were 418, 115, 121, and 33.0 thousand metric tonnes, respectively (Canadian Fertilizer Institute 2007).

Table 42. Training Completed by Ontario Lawn Care Companies' Employees in the Last Two Years.

Training	% of responses
Health and Safety	69.4%
WHIMS/Hazardous Products	64.8%
Pesticide Applicator's License	60.2%
Other Turfgrass Courses/Workshops	49.1%
Voluntary IPM Accreditation	40.7%
Other (please specify)	18.5%
Turf Managers' Short Course	9.26%
None	7.41%
Turfgrass Management Diploma	5.56%

Notes:

1. Respondents were instructed to check all training activities that applied to their lawn care company.

Sources:

1. University of Guelph 2007 Turfgrass Survey, Lawn Care, 4.4: "What training or further qualifications have you and your employees completed in the past two years? Please check all that apply."

There is a lack of secondary data on the Ontario sales of fertilizer and pesticide for the use by the Ontario turfgrass industry. In order to determine the sales value of fertilizer and pesticide used for turfgrass maintenance, we added fertilizer and pesticide expenditures across this study's industry segments. We found that in 2007 Ontario golf courses, sod farms, households, municipalities, universities, and lawn care companies spent \$252 and \$125 million on fertilizers and pesticides, respectively. Using these expenditures as proxies for fertilizer and pesticide sales, we conclude that the retail and wholesale sales values of fertilizers and pesticides in Ontario in 2007 were \$252 and \$125 million, respectively. Similarly, for seed, we found that in 2007 Ontario turfgrass industry spent \$23.4 million on seed. Using this expenditure as a proxy for seed sales, we conclude that the retail and wholesale sales value of seed in Ontario in 2007 was \$23.4 million.

5. Strategic Policy and Management Issues Analysis

5.1 Definitions and Methods

The general purpose of this section is to discuss the future of the turfgrass industry and the factors that may influence the turfgrass industry in a positive or a negative way. We developed a list of factors that may potentially influence the Ontario turfgrass operations by reviewing secondary literature (GroundWorks 1999, Justason 2006, New York Agricultural Statistics Service 2004). We included these factors in the survey. In particular we asked respondents about their most difficult turfgrass management problems. In Table 43 we listed the percentage of responses for each problem and for each turfgrass industry segment. In order to understand how mandatory training affects the industry, we enquired about the ease of completing required training courses. In Table 44 we list the responses to this question for

Table 43. Most Difficult Management Problems for Turfgrass Managers at Golf Courses, Sod Farms, Lawn Care Companies, and Municipalities (Population of over 5,000 People) in 2007¹.

Management Problem	Golf Courses % of responses	Sod Farms % of responses	Lawn Care Companies % of responses	Municipalities % of responses
Disease	39.1%	22.2%	12.0%	9.09%
Drought	78.1%	88.9%	74.7%	86.4%
Frost	3.13%	0%	1.20%	0%
Poor Drainage	18.8%	33.3%	13.3%	22.7%
Erosion	3.13%	11.1%	0%	4.55%
Equipment Maintenance	15.6%	22.2%	16.9%	27.3%
Insects	28.1%	33.3%	41.0%	13.6%
Weeds	18.8%	22.2%	42.2%	40.9%
Excessive Shade	14.1%	0%	15.7%	0%
Poor Soil	26.6%	0%	34.9%	45.5%
Thatch	25.0%	0%	8.43%	0%
Wear and Compaction	42.2%	22.2%	16.9%	72.7%
Water Availability	45.3%	66.7%	31.3%	22.7%
Water Quality	18.8%	0%	2.41%	4.55%
Labour	34.4%	44.4%	56.6%	22.7%
Land Availability	1.56%	33.3%	1.20%	18.2%
Trespassing and Vandalism	9.38%	33.3%	2.41%	50.0%
Wildlife	6.25%	0%	3.61%	0%
Other	7.81%	11.1%	16.9%	4.55%

Notes:

1. Respondents were asked to provide data for their most recent fiscal year. We assume that this year was 2007.
2. Universities were not included, as there were only three responses to this question.
3. Values highlighted using bold font formatting represent the highest percentage of responses.

Sources:

1. University of Guelph 2007 Turfgrass Survey, Golf Courses/Lawn Care, 6.1/6.1: Please identify the most difficult management problems in your most recent fiscal year.
2. University of Guelph 2007 Turfgrass Survey, Sod Farms/Parks, 6.1/11.1: Please identify the most challenging management problems in your most recent fiscal year.

Table 44. The Ease of Requirements of a Pesticide Technician Program for Golf Course Superintendents, Lawn Care Professionals, Municipalities' Turfgrass Managers, and the Ease of Requirements of Grower's Pesticide Safety Course and a Trained Agricultural Assistant Course for Sod Farm Operators.

	Golf Courses	Sod Farms	Lawn Care Companies	Municipalities ¹
	% of respondents	% of respondents	% of respondents	% of respondents
Very easy	12.3%	37.5%	12.1%	9.09%
Quite easy	49.1%	50.0%	43.9%	36.4%
Quite difficult	31.6%	12.5%	34.8%	54.5%
Very difficult	7.02%	0%	9.09%	0%

Notes:

1. Our sample consists of municipalities with population of over 5,000 people.
2. Universities were not included, as there were only three responses to this question.
3. Values highlighted using bold font formatting represent the highest percentage of respondents.

Sources:

1. University of Guelph 2007 Turfgrass Survey, Golf Courses/Lawn Care/Parks, 6.2/6.2/11/3: How easy is it to meet the requirements of a pesticide technician program?
2. University of Guelph 2007 Turfgrass Survey, Sod Farms, 6.3: How easy is it to meet the requirements of a Grower's Pesticide Safety Course and a Trained Agricultural Assistant Course?

different turfgrass industry segments. We also asked respondents if their turfgrass operation is subject to a municipal ban or moratorium and if so, for how long. In the case of lawn care companies we asked if their customers are subject to a Municipal pesticide ban or moratorium. In Table 45, we report the answers to these questions.

In order to understand turfgrass operators' perception about their own professionalism and their superiors' and public perception of their professionalism, we asked a series of questions the answers to which are presented in tables 46 to 50. In these tables we report responses in the percentage format for each industry segment and for each question. The respondents could vary the strength of their opinion by checking off "Strongly Agree/Disagree" or simply "Agree/Disagree".

Tables 51 to 55 are a useful tool to gauge the effect of future regulations, changes in prices and available quantity of various turf, population and tourism trends, and public opinion on the size of the Ontario turfgrass industry. The tables contain factors that may influence the size of the golf courses, sod farms, lawn care companies, municipal and universities/colleges' turfgrass facilities over the next five to ten years. We asked the respondents to indicate whether a specific factor will cause the size of their turfgrass operation to grow, to get smaller, or if the factor will not have any effect on the size of their turfgrass operation. Respondents could also specify a "Don't know/Undecided" option. We then classified the factors as expansion factors, contraction factors or neutral factors by the number of responses that each factor received in each category. For example, most respondents (44.4%) in the golf course sample (Table 55) indicated that cost of labour will cause the size of their turf operation to get smaller. Therefore, the cost of labour was classified as a contraction factor for the golf course industry segment. Factors that received the largest number of responses in the "Will cause the size of our turf operation to

Table 45. The Frequency of Municipal Pesticide Ban and Moratorium and the Number of Years under Municipal Pesticide Ban or Moratorium, Golf Course, Lawn Care Companies, Municipalities and Universities/Colleges.

Industry Segment	% of Turfgrass Operations subject to Municipal Pesticide Ban or Moratorium	Average Number of Years under Municipal Pesticide Ban or Moratorium
Golf Courses	18.5%	1.89
Lawn Care Companies ¹	33.0%	not available
Municipalities ²	52.2%	2.91
Universities/Colleges ³	100%	3

Notes:

1. In the survey, we asked lawn care companies how many of their customers are subject to municipal pesticide ban or moratorium. We did not ask for the number of years under a ban or moratorium.
2. Our sample consists of municipalities with population of over 5,000 people.
3. There are only four responses for this question, therefore the results should be interpreted with caution.

Sources:

1. University of Guelph 2007 Survey, Golf Courses, 6.3/6.4: Is your golf course subject to a municipal pesticide use ban or moratorium? / If so, for how many years?
2. University of Guelph 2007 Survey, Lawn Care, 6.3: Approximately, what percentage of your customers are subject to a municipal pesticide use ban or moratorium?
3. University of Guelph 2007 Survey, Parks, 11.4 /11.5: Is your organization subject to a municipal pesticide use ban or moratorium? / If so, for how many years?

Table 46. Comparison of Golf Course Superintendents' Perceptions of their Professionalism with the Perception of Golf Course Superintendents' Professionalism by their Superiors and General Public.

	Strongly Agree % of respondents	Agree % of respondents	Don't know/ Undecided % of respondents	Disagree % of respondents	Strongly Disagree % of respondents
People in the turfgrass industry are much better qualified than they used to be.	54.5%	39.4%	3.03%	3.03%	0%
I am constantly expected to do more with fewer resources.	38.5%	40.0%	1.54%	20.0%	0%
Turfgrass professionals do not command the respect they deserve.	35.4%	44.6%	3.08%	15.4%	1.54%
There is a lack of understanding of turfgrass management by people to whom you are accountable and by public that uses your facilities.	53.8%	35.4%	0%	10.8%	0%

Sources:

1. University of Guelph 2007 Survey, Golf Courses, 6.7: Please indicate your level of agreement with the following statements.

Table 47. Comparison of Sod Farm Operators' Perceptions of their Professionalism with the Perception of Sod Farm Operators' Professionalism by their Customers and General Public.

	Strongly Agree % of respondents	Agree % of respondents	Don't know/ Undecided % of respondents	Disagree % of respondents	Strongly Disagree % of respondents
People in the turfgrass industry are much better qualified than they used to be.	22.2%	66.7%	11.1%	0%	0%
I am constantly expected to do more with fewer resources.	44.4%	55.6%	0%	0%	0%
Turfgrass professionals do not command the respect they deserve.	44.4%	55.6%	0%	0%	0%
There is a lack of understanding of the turfgrass management by my customers and by general public.	100%	0%	0%	0%	0%

Sources:

1. University of Guelph 2007 Survey, Sod Farms, 6.2: Please indicate your level of agreement with the following statements.

Table 48. Comparison of Lawn Care Operators' Perceptions of their Professionalism with the Perception of Lawn Care Operators' Professionalism by their Customers and General Public.

Statement	Strongly Agree % of respondents	Agree % of respondents	Don't know/ Undecided % of respondents	Disagree % of respondents	Strongly Disagree % of respondents
People in the turfgrass industry are much better qualified than they used to be.	31.3%	59.0%	2.41%	6.02%	1.20%
I am constantly expected to do more with fewer resources.	32.5%	34.9%	6.02%	24.1%	2.41%
Turfgrass professionals do not command the respect they deserve.	49.4%	36.1%	2.41%	9.64%	2.41%
There is a lack of understanding of turfgrass management by my customers.	26.5%	54.2%	0%	16.9%	2.41%

Sources:

1. University of Guelph 2007 Survey, Lawn Care, 6.5: Please indicate your level of agreement with the following statements.

Table 49. Comparison of Municipal Turfgrass Managers' Perceptions of their Professionalism with the Perception of Municipal Turfgrass Managers' Professionalism by their Superiors and General Public, Ontario Municipalities with Population of over 5,000 People.

Statement	Strongly Agree % of respondents	Agree % of respondents	Undecided % of respondents	Disagree % of respondents	Strongly Disagree % of respondents
People in the turfgrass industry are much better qualified than they used to be.	52.0%	44.0%	0%	4.00%	0%
I am constantly expected to do more with fewer resources.	60.0%	24.0%	4.00%	12.0%	0%
Turfgrass professionals do not command the respect they deserve.	40.0%	36.0%	4.00%	16.0%	4.00%
There is a lack of understanding of the turfgrass management by people to whom I am accountable and by public that uses my facilities.	28.0%	52.0%	4.00%	12.0%	4.00%

Sources:

1. University of Guelph 2007 Survey, Parks and Rec, 11.2: Please indicate your level of agreement with the following statements.

Table 50. Comparison of Universities and Colleges' Turfgrass Managers' Perceptions of their Professionalism with the Perception of Universities and Colleges' Turfgrass Managers' Professionalism by their Superiors and General Public.

Statement	Strongly Agree % of respondents	Agree % of respondents	Undecided % of respondents	Disagree % of respondents	Strongly Disagree % of respondents
People in the turfgrass industry are much better qualified than they used to be.	25.0%	50.0%	0%	25.0%	0%
I am constantly expected to do more with fewer resources.	75.0%	0%	0%	25.0%	0%
Turfgrass professionals do not command the respect they deserve.	0%	75.0%	0%	25.0%	0%
There is a lack of understanding of the turfgrass management by people to whom I am accountable and by public that uses my facilities.	25.0%	50.0%	0%	25.0%	0%

Notes:

1. There are only four responses for this question; therefore these results should be interpreted with caution.

Sources:

1. University of Guelph 2007 Survey, Parks and Rec, 11.2: Please indicate your level of agreement with the following statements.

Table 51. Ontario Golf Course Superintendents' Expectations about Effects of Various Factors on their Golf Course over the Next 5 to 10 Years.

Factors	Will cause the size of our turf operation to grow	Will not affect the size of our turf operation	Will cause the size of our turf operation to get smaller	Don't know/Undecided
	% of respondents	% of respondents	% of respondents	% of respondents
Expansion Factors				
Retirement Trends	42.9%	41.3%	6.35%	9.52%
Marketing	34.4%	34.4%	15.6%	15.6%
Contraction Factors				
Cost of Labour	3.17%	39.7%	44.4%	12.7%
Water Use Policies	13.8%	32.3%	32.3%	21.5%
Neutral Factors				
Cost of Fuel	4.76%	46.0%	39.7%	9.52%
Cost of Pesticides	6.35%	46.0%	34.9%	12.7%
Cost of Fertilizers	3.17%	50.8%	33.3%	12.7%
Cost of Water	1.56%	48.4%	31.3%	18.8%
Availability of Qualified Labour	4.76%	50.8%	30.2%	14.3%
Cost of Equipment	4.76%	55.6%	28.6%	11.1%
Staff Retention	10.9%	53.1%	23.4%	12.5%
Cost of Seed/Sod	3.13%	57.8%	21.9%	17.2%
Local Pesticide Use Policies	14.1%	32.8%	20.3%	32.8%
New Equipment and Technology	20.3%	51.6%	17.2%	10.9%
Federal Pesticide Regulations	15.4%	30.8%	15.4%	38.5%
Municipal or Provincial Land Use Policies	10.8%	43.1%	12.3%	33.8%
Public Perception of Turfgrass Management	10.9%	59.4%	10.9%	18.8%
Trends in Overall Tourism	20.3%	54.7%	9.38%	15.6%
Policies Related to Wildlife Habitat	10.8%	58.5%	9.23%	21.5%
New Turfgrass Species and Varieties	21.9%	57.8%	6.25%	14.1%
Population Growth and Urbanization	35.9%	53.1%	4.69%	6.25%

Notes:

1. Factors that received majority of responses in the “Will cause the size of our turfgrass operation to grow” category were classified as expansion factors.
2. Factors that received the majority of responses in the “Will cause the size of our turfgrass operation to get smaller” were classified as contraction factors.
3. Factors that received the majority of responses in either “Will not affect the size of our turfgrass operation” or “Don't know/Undecided” were classified as neutral factors.

Sources: University of Guelph 2007 Turfgrass Survey, Golf Courses, 6.8: Please tell us the effect that you expect the following factors will have on the size of your turfgrass operation over the next 5 to 10 years.

Table 52. Ontario Sod Farm Operators' Expectations about Effects of Various Factors on the Size of their Sod Farm over the Next 5 to 10 Years.

Factors	Will cause the size of our sod operation to grow % of respondents	Will not affect the size of our sod operation % of respondents	Will cause the size of our sod operation to get smaller % of respondents	Don't know/Undecided % of respondents
Expansion Factors				
Population Growth and Urbanization	66.7%	22.2%	11.1%	0%
New Equipment and Technology	66.7%	11.1%	0%	22.2%
New Turfgrass Species and Varieties	55.6%	33.3%	0%	11.1%
Marketing	44.4%	44.4%	11.1%	0%
Contraction Factors				
Cost of Equipment	0%	37.5%	50.0%	12.5%
Cost of Seed/Sod	0%	50.0%	50.0%	0%
Cost of Water	0%	37.5%	50.0%	12.5%
Cost of Fertilizers	0%	37.5%	50.0%	12.5%
Cost of Labour	0%	37.5%	50.0%	12.5%
Cost of Fuel	0%	25.0%	50.0%	25.0%
Neutral Factors				
Price Competition	0%	55.6%	44.4%	0%
Water Use Policies	0%	44.4%	33.3%	22.2%
Availability of Qualified Labour	0%	55.6%	33.3%	11.1%
Cost of Pesticides	0%	62.5%	25.0%	12.5%
Local Pesticide Use Policies	22.2%	44.4%	22.2%	11.1%
Retirement Trends	11.1%	55.6%	22.2%	11.1%
Public Perception of Turfgrass Management	11.1%	33.3%	22.2%	33.3%
Federal Pesticide Regulations	0%	55.6%	22.2%	22.2%
Staff Retention	0%	55.6%	22.2%	22.2%
Municipal or Provincial Land Use Policies	0%	66.7%	11.1%	22.2%
Trends in Overall Tourism	11.1%	44.4%	0%	44.4%
Policies Related to Wildlife Habitat	0%	77.8%	0%	22.2%

Notes:

1. Factors that received majority of responses in the “Will cause the size of our sod operation to grow” category were classified as expansion factors.
2. Factors that received the majority of responses in the “Will cause the size of our sod operation to get smaller” were classified as contraction factors.
3. Factors that received the majority of responses in either “Will not affect the size of our sod operation” or “Don't know/Undecided” were classified as neutral factors.

Sources: University of Guelph 2007 Turfgrass Survey, Sod Growers 6.7: Please tell us the effect that you expect the following factors will have on the size of your sod operation over the next 5 to 10 years.

Table 53. Ontario Lawn Care Operators' Expectations about Effects of Various Factors on the Size of their Lawn Care Company over the Next 5 to 10 Years.

Factors	Will cause the size of our turf operation to grow	Will not affect the size of our turf operation	Will cause the size of our turf operation to get smaller	Don't know/Undecided
	% of respondents	% of respondents	% of respondents	% of respondents
Expansion Factors				
Population Growth and Urbanization	77.8%	13.6%	1.23%	7.41%
Retirement Trends	64.2%	19.8%	8.64%	7.41%
New Equipment and Technology	59.5%	20.3%	8.86%	11.4%
Marketing	56.8%	29.6%	4.94%	8.64%
New Turfgrass Species and Varieties	43.6%	27.5%	2.50%	26.3%
Contraction Factors				
Local Pesticide Use Policies	13.4%	23.2%	48.8%	14.6%
Availability of Qualified Labour	14.6%	24.4%	42.7%	18.3%
Public Perception of Turfgrass Management	24.7%	21.0%	29.6%	24.7%
Neutral Factors				
Cost of Labour	2.50%	46.3%	38.8%	12.5%
Cost of Fuel	2.56%	50.0%	38.5%	8.97%
Federal Pesticide Regulations	12.2%	32.9%	34.2%	20.7%
Cost of Fertilizers	6.17%	53.1%	24.7%	16.1%
Cost of Pesticides	4.94%	53.1%	23.5%	18.5%
Cost of Water	6.10%	62.2%	23.3%	8.54%
Staff Retention	27.9%	35.4%	22.8%	13.9%
Water Use Policies	13.4%	43.9%	22.0%	20.7%
Municipal or Provincial Land Use Policies	11.0%	43.9%	20.7%	24.4%
Cost of Equipment	6.17%	66.7%	18.5%	8.64%
Policies Related to Wildlife Habitat	4.94%	55.6%	11.1%	28.4%
Cost of Seed/Sod	8.64%	74.1%	9.88%	7.41%
Trends in Overall Tourism	10.3%	55.1%	2.56%	32.1%

Notes:

1. Factors that received majority of responses in the "Will cause the size of our turfgrass operation to grow" category were classified as expansion factors.
2. Factors that received the majority of responses in the "Will cause the size of our turfgrass operation to get smaller" were classified as contraction factors.
3. Factors that received the majority of responses in either "Will not affect the size of our turfgrass operation" or "Don't know/Undecided" were classified as neutral factors.

Sources: University of Guelph 2007 Turfgrass Survey, Lawn Care, 6.6: Please tell us the effect that you expect the following factors will have on the size of your turf operation over the next 5 to 10 years.

Table 54. Ontario Municipal Turf Managers' Expectations about Effects of Various Factors on the Size of their Turfgrass Operation over the Next 5 to 10 Years, Ontario Municipalities with Population over 5,000 People.

Factors	Will cause the size of our turf operation to grow % of respondents	Will not affect the size of our turf operation % of respondents	Will cause the size of our turf operation to get smaller % of respondents	Don't know/Undecided % of respondents
Expansion Factors				
Population Growth and Urbanization	87.5%	4.2%	4.17%	4.17%
Neutral Factors				
Trends in Overall Tourism	30.4%	56.5%	4.35%	8.70%
Retirement Trends	26.1%	56.5%	4.35%	13.0%
Local Pesticide Use Policies	26.1%	43.9%	21.7%	8.70%
New Equipment and Technology	26.1%	47.8%	4.35%	21.7%
Cost of Fuel	21.7%	56.5%	21.7%	0%
Staff Retention	18.2%	63.6%	9.09%	9.09%
New Turfgrass Species and Varieties	17.4%	47.8%	8.70%	26.1%
Cost of Equipment	16.7%	50.0%	16.7%	16.7%
Cost of Seed/sod	16.7%	62.5%	12.5%	8.33%
Cost of Labour	16.7%	54.2%	25.0%	4.17%
Municipal or Provincial Land Use Policies	13.6%	50.0%	9.09%	27.3%
Availability of Qualified Labour	13.6%	77.3%	4.55%	4.55%
Water Use Policies	13.0%	56.5%	26.1%	4.35%
Public Perception of Turfgrass Management	13.0%	60.9%	13.0%	13.0%
Cost of Fertilizers	12.5%	62.5%	16.7%	8.33%
Federal Pesticide Regulations	8.7%	52.2%	13.0%	26.1%
Cost of Water	8.3%	45.8%	29.2%	16.7%
Cost of Pesticides	4.4%	69.6%	13.0%	13.0%
Policies Related to Wildlife Habitat	4.2%	66.7%	12.5%	16.7%

Notes:

1. Factors that received majority of responses in the “Will cause the size of our turfgrass operation to grow” category were classified as expansion factors.
2. Factors that received the majority of responses in the “Will cause the size of our turfgrass operation to get smaller” were classified as contraction factors.
3. Factors that received the majority of responses in either “Will not affect the size of our turfgrass operation” or “Don't know/Undecided” were classified as neutral factors.

Sources: University of Guelph 2007 Turfgrass Survey, Parks and Rec, 11.8: Please tell us the effect that you expect the following factors will have on the size of your organization's turf operation over the next 5 to 10 years.

Table 55. Ontario Universities and Colleges' Turf Managers' Expectations about Effects of Various Factors on the Size of their Turfgrass Operation over the Next 5 to 10 Years.

Factors	Will cause the size of our turf operation to grow % of respondents	Will not affect the size of our turf operation % of respondents	Will cause the size of our turf operation to get smaller % of respondents	Don't know/Undecided % of respondents
Contraction Factors				
Population Growth and Urbanization	0%	50.0%	50.0%	0%
Water Use Policies	0%	25.0%	50.0%	25.0%
Cost of Equipment	0%	50.0%	50.0%	0%
Cost of Water	0%	25.0%	50.0%	25.0%
Cost of Labour	0%	50.0%	50.0%	0%
Neutral Factors				
Cost of Fuel	0%	75.0%	25.0%	0%
Retirement Trends	0%	100%	0%	0%
Local Pesticide Use Policies	25.0%	75.0%	0%	0%
Federal Pesticide Regulations	0%	75.0%	0%	25.0%
Municipal or Provincial Land Use Policies	0%	75.0%	0%	25.0%
Policies Related to Wildlife Habitat	0%	100%	0%	0%
Public Perception of Turfgrass Management	25.0%	75.0%	0%	0%
Trends in Overall Tourism	25.0%	75.0%	0%	0%
Availability of Qualified Labour	25.0%	75.0%	0%	0%
Staff Retention	25.0%	50.0%	0%	25.0%
Cost of Seed/sod	0%	100%	0%	0%
Cost of Pesticides	0%	100%	0%	0%
Cost of Fertilizers	0%	100%	0%	0%
New Equipment and Technology	25.0%	50.0%	0%	25.0%
New Turfgrass Species and Varieties	25.0%	75.0%	0%	0%

Notes:

1. There are only four responses for this question; therefore results should be interpreted with caution.
2. Factors that received majority of responses in the “Will cause the size of our turfgrass operation to grow” category were classified as expansion factors.
3. Factors that received the majority of responses in the “Will cause the size of our turfgrass operation to get smaller” were classified as contraction factors.
4. Factors that received the majority of responses in either “Will not affect the size of our turfgrass operation” or “Don’t know/Undecided” were classified as neutral factors.

Sources: University of Guelph 2007 Turfgrass Survey, Parks and Rec, 11.8: Please tell us the effect that you expect the following factors will have on the size of your organization’s turf operation over the next 5 to 10 years

grow” category were classified as expansion factors. Factors that received the largest number of responses in the “Will not affect the size of our turf operation” or “Don’t know/Undecided” categories, were classified as neutral factors. However if a factor received the same number of responses in the neutral category and in the expansion category, the factor was classified as an expansion factor. Similarly, if a factor received the same number of responses in the neutral category as in the contraction category, the factor was classified as a contraction factor. For example, the same number of respondents (32.3%) in the golf course sample (Table 51) indicated that water use policies will not affect the size of their turf operation and will cause the size of their turf operation to get smaller. As such, the water use policies were classified as a contraction factor.

We also included questions in the surveys about the expectations of turf managers about the growth of their turfgrass operation. We asked golf superintendents about their expectations on the future number of rounds played at their golf course. We asked sod farm operators and lawn care operators about their expectations on the future sales of sod and on the future number of customers, respectively. We asked sports turf and parks managers about their expectation on their future organization’s turfgrass budget. In Table 56 we report the distribution of responses for each industry segment.

The strategic policy analysis is organized in the following way. We discuss the factors that are most important to expansion and contraction of Ontario turfgrass industry segments. We follow up with a discussion of perception of the turfgrass industry by public and by turfgrass professionals. Finally we finish with a general prognosis of the future growth of the Ontario turfgrass industry. In each section we discuss similarities and differences between turfgrass industry segments.

Table 56. Ontario Turf Managers Expectations about the Trend in the Growth of their Turfgrass Operation over the Next 5 to 10 Years: Golf Courses, Sod Farms, Lawn Care Companies, Municipalities and Universities/Colleges.

Trend	Golf Courses ¹	Sod Farms ²	Lawn Care Companies ³	Municipalities ^{4,5}	Universities/Colleges ⁶
	% of respondents	% of respondents	% of respondents	% of respondents	% of respondents
Increase substantially	1.52%	0%	31.3%	8.00%	0%
Increase somewhat	43.9%	33.3%	34.9%	44.0%	0%
Remain stable	48.5%	55.6%	19.3%	20.0%	75.0%
Decrease somewhat	6.06%	0%	7.23%	0%	25.0%
Decrease substantially	0%	11.1%	7.23%	28.0%	0%

Notes:

1. Golf course superintendents were asked about the growth in the number of rounds played at their golf course.
2. Sod farm operators were asked about the growth in the sales of their farm's sod.
3. Lawn Care operators were asked about the growth in the number of their lawn care company's customers.
4. Our sample consists of municipalities with population of over 5,000 people.
5. Municipalities and Universities/Colleges were asked about the increase in their organization's budget for turfgrass maintenance.
6. There are only four responses for this question; therefore the results should be interpreted with caution.
7. Values highlighted using bold font formatting represent the highest percentage of respondents.

Sources:

1. University of Guelph 2007 Turfgrass Survey, Golf Courses 6.6: Over the next five years, do you expect the number of rounds of golf played at your golf course, generally, to...?
2. University of Guelph 2007 Turfgrass Survey, Lawn Care, 6.4: Over the next five years, do you expect the number of your customers, generally, to...?
3. University of Guelph 2007 Turfgrass Survey, Parks and Rec, 11.7: Over the next 5 to 10 years, do you expect your organization's budget for turfgrass maintenance generally to...?
4. University of Guelph 2007 Turfgrass Survey, Sod Growers, 6.6: Over the next 5 to 10 years, do you expect the sales of your operation's sod to generally...?

5.2 Opportunities for Expansion of the Ontario Turfgrass Industry

There are several factors that may represent an opportunity for an expansion of the Ontario turfgrass industry. These factors include new turfgrass species and varieties, population growth and urbanization and retirement trends. Only lawn care professionals and sod growers that responded to our survey indicated that new turfgrass species and varieties may positively affect their turfgrass operation. About 21.9% of golf course superintendents that responded to our survey considered new turfgrass species and varieties as an expansion factor. The majority of municipal and universities/colleges' turf managers that responded to our survey indicated turfgrass species and varieties as having no effect on their turfgrass operation over the next 5 to 10 years.

According to the data in Tables 51 to 55, respondents in all turfgrass industry segments, except for universities and colleges, indicated that either population growth and urbanization or retirement trends or both may have a positive effect on their turfgrass operation in the future. Ipsos Reid (2006) defined core golf players as adults over 18 years who played at least one to seven rounds of golf or more in the last year, respectively. According to Ipsos Reid (2006), core golfers are most profitable golf participants, as they spend most of all other types of golf participants on greens fees or membership fees annually. According to Statistics Canada (2008b), the average retirement age was 61.6 years in 2007. Ipsos Reid (2006) estimated that persons aged 50 to 65 and over comprise 48.1 % of core golf players in 2006 (persons aged 65+ comprised 15.6%). These values suggest that retirees may contribute significantly to the Canadian golf course participation. Furthermore, according to Bowlby (2007), a considerable number of Canadians will retire in coming years because the eldest baby boomers turned 60 in

2006. Canadian golf courses could stand to benefit from such an increase in the number of retirees.

The majority of lawn care respondents (64.2%) indicated that retirement trends will have a positive effect on their lawn care company (Table 53). An overwhelming majority of lawn care respondents (77.8%) indicated that population growth and urbanization will cause the size of their turfgrass operation to grow. Population growth may result in new real estate development, which in turn may increase the demand for lawn care services.

According to the data in Table 52, population growth and urbanization is an expansion factor for sod farms, as well. Approximately, 66.7% of sod farms' respondents expected population growth and urbanization to cause their sod operation to grow. As cities and towns grow the demand for sod for the use on residential properties, commercial developments, parks, and recreation facilities may increase.

The sole expansion factor for the municipal sector was population growth and urbanization. According to the data Table 53, 87.5% of municipal respondents indicated that population growth and urbanization will increase the size of their turfgrass operation. As population grows, so does the demand for public parks and recreation facilities. This demand should result in larger budgets for municipal turfgrass operations. Approximately, 50% of universities/colleges' respondents indicated that the population growth and urbanization will cause their turf operation to get smaller.

5.3 Constraints to Expansion of the Ontario Turfgrass Industry

According to the data in Table 43, about 41.0 % and 42.2% of lawn care professionals that responded to our survey considered insects and weeds, respectively, a difficult problem in 2007. About 39.1% of golf superintendents that responded to our survey considered diseases a

difficult management problem in 2007. Although, few municipal respondents considered disease a difficult problem in 2007, about 40.9% and 33.3% of municipal respondents, respectively, found managing weeds a difficult problem in 2007.

Drought was the most frequently chosen management problem in 2007 as indicated by the data in Table 43. Water availability elicited the second largest number of responses from golf courses' and sod farms' respondents. A possible reason for drought being the most frequently chosen management problem is that the 2007 summer was dry. By comparison, the 2008 summer has been characterized by an abundance of rain. Nevertheless, there are likely to be dry seasons in the future and future water policies may affect the way turfgrass managers deal with drought. In fact, according to the data in Table 51, future water use policies were classified as a contraction factor by golf courses' respondents with 32.3% of responses. Furthermore, according to the data in Table 52, sod farms' respondents were concerned about how the cost of water will affect their sod operation in the future.

All operations are faced with pesticide restrictions and some of them are subject to a pesticide ban or moratorium. According to the data in Table 44, about 33 % of Ontario lawn care companies have customers that are subject to municipal pesticide bans. Approximately, 18.5%, 52.2%, and 100% of our sample's golf courses, municipalities, and post secondary institutions, respectively, are subject to municipal ban or moratorium. Furthermore, on June 18, 2008 the Ontario legislature passed the Cosmetic Pesticides Ban Act, which is a province-wide ban on the use and sale of pesticides that may be used for cosmetic purposes (Ontario Ministry of Environment 2008). The ban should take effect in the spring of 2009. Notable exceptions to this ban are agriculture, forestry, the promotion of public safety, and golf courses.

Only lawn care professionals indicated that they view local pesticide policies as having a negative effect on the expansion of their turfgrass operation. The Act affects all residential, industrial, commercial and institution properties including parks, school yards, cemeteries and rights-of-way. Considering that 70.9% of an average lawn company' customers are residential properties that use pesticides for cosmetic purposes, lawn care companies are likely to be affected most by this ban. Many of lawn care respondents commented about the negative effect of these new pesticide regulations. Other than the loss of pesticide revenues, the respondents brought up concerns about educating customers about the changes in turfgrass maintenance practices. Only some lawn care companies mentioned that there are future business opportunities in the form of alternative pest control measures and other turf maintenance solutions that could capitalize on the sustainability trend.

Gold courses' and sod farms' respondents did not consider local pesticide policies or federal pesticide regulations as contraction factors. Similarly, these factors were not classified as contraction factors for municipal and universities/colleges' respondents. About 26.6% of municipal respondents indicated that they believe local pesticide policies to affect their operation in a positive way (Table 54) and about 75% of universities/colleges' respondents indicated that they believe local pesticide policies will not have any effect on the size of their turfgrass operation (Table 55).

About 42.7% of lawn care respondents indicated that they consider the availability of qualified labour as a contraction factor for their turfgrass operations (Table 53). In comments section of the survey, many lawn care respondents elaborated further about the need for a reliable supply of qualified labour. According to the data in Table 53, about 29.6% of lawn care

respondents believe the public perception of turfgrass management to be a problem for their turfgrass operations.

Other contraction factors are the cost of inputs. Approximately 44.4% of golf course superintendents that responded to our survey indicated that they believe cost of labour to cause their turfgrass operation to get smaller (Table 51). In the comments section, some respondents commented that costs of maintaining turfgrass are going up, while the pressure to compete with other golf courses is increasing. The responses from sod farm operators placed the costs of equipment, seed, water, fertilizer, labour and fuel in the contraction factor category (Table 52). The majority of universities/colleges' respondents also indicated that they consider costs of equipment, water and labour as impediments to growth of their turfgrass operation (Table 55).

The recent trends in fertilizer prices suggest that the cost of fertilizer is a problem for turfgrass managers in 2008 and will continue as such. According to Oehmke et al. (2008), "Canadian fertilizer prices are high, increasing, and becoming more volatile" (pg 1). The increase in fertilizer prices are caused by rising input prices, exchange rate fluctuations, and increasing global demand for limited supplies (Oehmke et al. 2008). Oehmke et al. suggested that such risks appear to be persistent in the future. They also suggested that for farms these risks are mitigated by the current high prices for most crops. They also recommended additional management strategies, which although were developed for farms, could still apply to the turfgrass industry at large. According to Oehmke et al. (2008), the risk management strategies for mitigating rising and volatile fertilizer prices include pre-purchasing fertilizer, forward contracting, volume purchases either individually or in groups, and maintaining relationship with dealers based on price, service, and consistency of product. Oehmke et al. also recommended that farmers could re-evaluate their management practices.

5.4 Perception of the Ontario Turfgrass Industry by Turfgrass Professionals and by Public

According to the data in Tables 46 to 50, respondents all industry segments indicated that turfgrass professionals are much better qualified than they used to be. Respondents also provided their opinion on how the public and their superiors view the turfgrass managers. Across all surveyed industry segments, the majority of respondents selected “Strongly Agree” and “Agree” with the statement that “turfgrass professionals do not command the respect they deserve”. These results suggest a potential lack of knowledge about the turfgrass management and possible negative perception of the turfgrass industry by the public.

This perceived lack of knowledge about the turfgrass management by the public is emphasized by the responses to the following statement – “there is a lack of understanding of turfgrass management by people to whom you are accountable and by public that uses your facilities” (or “by your customers”, in a case of lawn care companies). According to the data in Tables 46 to 50, 53.8% of golf courses’ respondents strongly agreed with this statement, 55.6% of sod farms’ respondents agreed with this statement, 49.4% of lawn care respondents strongly agreed with this statement, 52.0% municipal respondents agreed with this statement and 50.0% of universities/colleges’ respondents agreed with this statement. According to the data in Tables 49 and 50, 60% of municipal respondents and 75% if universities/colleges’ respondents strongly agree with statement that they are constantly expected to do more with fewer resources.

5.5 Future of the Ontario Turfgrass Industry: General Prognosis

In Sections 5.2 and 5.3, we identified opportunities and constraints for expansion of the Ontario turfgrass industry. The opportunities for the expansion included new turfgrass species and varieties and population trends. The constraints to the expansion included local pesticide policies, costs of inputs, availability of labour and water. We also asked survey respondents to

directly specify whether their turfgrass operation will expand or contract in the future. The respondents across all industry segments were cautiously optimistic about the future of their turfgrass operations. According to the data in Table 56, the majority of respondents indicated that the size of their turfgrass operation will either increase somewhat or remain stable.

Even lawn care respondents, who are affected the most by the recent pesticide legislation prohibiting use and sales of pesticides for cosmetic purposes, had a positive future outlook. Approximately 31.3% of lawn care respondents indicated that the number of their customers will increase substantially and 34.9% indicated that it will increase somewhat over the next 5 to 10 years.

6. Turfgrass Research

The final section of our survey contained questions on turfgrass research. We asked survey respondents about their main sources of research information about turfgrass, the kind of information they look for and the frequency of searching for turfgrass research information. The answers to such questions could inform the Guelph Turfgrass Institute about which of their services and which research subjects are most frequently chosen by turfgrass operators. The frequency of reading research material by turfgrass professionals could be useful in evaluating the frequency of providing the research information to turfgrass professionals.

In Table 57 we list main sources of research information about turfgrass used by Ontario turfgrass managers. According to the data in Table 57, the sources that yielded the most responses from golf course respondents were peers with 89.2% of responses and industry journals with 81.5% of responses. Out of the research information sources provided by the Ontario Turfgrass Research Foundation, the Guelph Turfgrass Institute Advisor was most frequently used with 44.6% of responses and the Guelph Turfgrass Institute Field Day was least

Table 57. Main Sources of Research Information for Turfgrass Managers, Golf Courses, Sod Farms, Lawn Care Companies, Municipalities.

Information Source	Golf Courses	Sod Farms	Lawn Care Companies	Municipalities
	% of respondents	% of respondents	% of respondents	% of respondents
Consultants	47.7%	44.4%	16.9%	25.0%
Guelph Turfgrass Institute Advisor	44.6%	33.3%	28.9%	29.2%
Guelph Turfgrass Institute Annual Report	16.9%	0%	2.41%	0%
Guelph Turfgrass Institute Courses	15.4%	22.2%	7.23%	8.33%
Guelph Turfgrass Institute Field Day	1.54%	44.4%	16.9%	20.8%
Industry Association(s)	76.9%	77.8%	68.7%	70.8%
Industry Journals	81.5%	55.6%	51.8%	29.2%
Internet	70.8%	33.3%	74.7%	79.2%
Ontario Ministry of Agriculture, Food and Rural Affairs Turfgrass Management Update	43.1%	44.4%	49.4%	50.0%
Ontario Turfgrass Research Foundation/OTRF Members	27.7%	22.2%	6.02%	0%
Ontario Turfgrass Symposium	52.3%	77.8%	37.3%	50.0%
Other (please specify)	3.08%	22.2%	14.5%	0%
Other Regional Conferences	64.6%	33.3%	16.9%	33.3%
Peers	89.2%	77.8%	49.4%	75.0%
Suppliers' Representatives	73.8%	44.4%	49.4%	62.5%
Text Books	69.2%	44.4%	48.2%	45.8%
University Faculty	16.9%	0%	4.82%	8.33%

Notes:

1. Universities and colleges were not included, since there were only three responses for this question.
2. Values highlighted using bold font formatting represent the highest percentage of respondents.
3. The respondents were instructed to specify all options that applied to their turfgrass operation.

Sources:

1. University of Guelph 2007 Turfgrass Survey, Golf Courses 7.1: What are your main sources of research information about turfgrass?
2. University of Guelph 2007 Turfgrass Survey, Lawn Care, 7.1: What are your main sources of research information about turfgrass?
3. University of Guelph 2007 Turfgrass Survey, Parks and Rec, 12.1: What are your main sources of research information about turfgrass?
4. University of Guelph 2007 Turfgrass Survey, Sod Growers, 7.1: What are your main sources of research information about turfgrass?

frequently used with 1.54% of responses. Sod farm respondents, lawn care respondents and municipal respondents indicated that they used the Guelph Turfgrass Institute Field Day as an information source with 44.4%, 16.9% and 20.8% of responses, respectively. Sod farm respondents also frequently chose Ontario Turfgrass Symposium as a source of turfgrass information with 77.8% of responses. Other sources of information that were frequently used among sod farm respondents were peers with 77.8% of responses and industry association, namely the Nursery Sod Growers Association of Ontario, with 77.8% of responses. None of sod farm and municipal respondents chose the Guelph Turfgrass Institute Annual Report as a source of information, while only 2.41% of lawn care respondents chose it. Internet yielded the most responses from both lawn care operators (74.7%) and municipal turfgrass managers (79.2%). In comparison, 1982, Ontario turfgrass managers most frequently consulted trade journals or books or association members (Sears and Gimplej 1984)

In Table 58 we list turfgrass research subjects that are of interest to sod farms, municipalities, golf courses, lawn care companies and universities/colleges. Golf course respondents frequently chose soil fertility with 78.5% of respondents. All of sod farm respondents chose soil fertility as a subject about which they look for information. About 77.1% of lawn care respondents chose the alternative pest control as a research subject they look for. Soils and soil management yielded a large number of responses among lawn care and municipal respondents with 70.8% and 75.0% of respondents, respectively. All of universities/colleges' turf sod farms' respondents look for information on equipment innovations.

In Table 59 we report the frequency of reading turfgrass research materials by sod farm, municipal, golf course, lawn care and universities/colleges respondents. The majority of respondents, except municipalities and universities/colleges, read turfgrass research materials

Table 58. Research Information on Turfgrass that Turfgrass Managers Look for: Golf Courses, Sod Farms, Lawn Care Companies, Municipalities and Universities/Colleges

Research Information	Golf Courses	Sod Farms	Lawn Care Companies	Municipalities	Universities/Colleges ¹
	% of respondents	% of respondents	% of respondents	% of respondents	% of respondents
Alternative Pest Control	72.3%	33.3%	77.1%	58.3%	75.0%
Chemical Innovations	Not asked	77.8%	45.8%	29.2%	0%
Conventional Pest Control	61.5%	44.4%	57.8%	16.7%	25.0%
Equipment Innovations	69.2%	100%	34.9%	70.8%	100%
Human Resource Management	67.7%	66.7%	24.1%	33.3%	0%
Irrigation	67.7%	Not asked	47.0%	50.0%	50.0%
Landscaping	33.8%	33.3%	45.8%	37.5%	50.0%
New Turf Species/Varieties	63.1%	66.7%	8.43%	54.2%	25.0%
Other	1.54%	0%	45.8%	25.0%	25.0%
Root Zone Construction	35.4%	Not asked	Not asked	Not asked	Not asked
Soil Fertility	78.5%	100%	Not asked	Not asked	Not asked
Soils and Soil Management	70.8%	Not asked	70.8%	75.0%	50.0%
Soil Physical Properties	35.4%	Not asked	Not asked	Not asked	Not asked
Tourism Statistics	13.8%	11.1%	1.20%	8.33%	0%
Water Conservation	69.2%	55.6%	24.1%	Not asked	Not asked
Water Quality	40.0%	22.2%	8.43%	Not asked	Not asked

Notes:

1. There are only four responses for this question (universities/colleges), therefore the results should be interpreted with caution.
2. Values highlighted using bold font formatting represent the highest percentage of respondents.
3. The respondents were instructed to specify all options that applied to their turfgrass operation.

Sources:

1. University of Guelph 2007 Turfgrass Survey, Golf Courses 7.3: What types of research information on turfgrass do you look for?
2. University of Guelph 2007 Turfgrass Survey, Lawn Care, 7.3: What types of research information on turfgrass do you look for?
3. University of Guelph 2007 Turfgrass Survey, Parks and Rec, 12.3: What types of research information on turfgrass do you look for?
4. University of Guelph 2007 Turfgrass Survey, Sod Growers, 7.3: What types of research information on turfgrass do you look for?

Table 59. Frequency of Reading Turfgrass Research Material by Ontario Turfgrass Managers: Golf Courses, Sod Farms, Lawn Care Companies, Municipalities and Universities/Colleges.

	Golf Courses	Sod Farms	Lawn Care Companies	Municipalities	Universities/Colleges¹
	% of respondents	% of respondents	% of respondents	% of respondents	% of respondents
Once a week	78.8%	55.6%	42.2%	29.2%	25.0%
Once a month	16.7%	44.4%	39.8%	50.0%	25.0%
Once every two months	3.03%	0%	8.43%	0%	25.0%
Less than once every two months	1.52%	0%	9.64%	20.8%	25.0%

Notes:

1. There are only four responses for this question, therefore the results should be interpreted with caution.
2. Values highlighted using bold font formatting represent the highest percentage of respondents.

Sources:

1. University of Guelph 2007 Turfgrass Survey, Golf Courses 7.2: How often do you read any type of research material related to turfgrass?
2. University of Guelph 2007 Turfgrass Survey, Lawn Care, 7.2: How often do you read any type of research material related to turfgrass?
3. University of Guelph 2007 Turfgrass Survey, Parks and Rec, 12.2: How often do you read any type of research material related to turfgrass?
4. University of Guelph 2007 Turfgrass Survey, Sod Growers, 7.2: How often do you read any type of research material related to turfgrass?

once a week. About 50.0% of municipal respondents read turfgrass research materials once a month. For universities/colleges the responses were equally distributed among each category. It is important to remember that we only had four responses from post-secondary institutions, thus the results for this sector should be interpreted with caution.

7. Conclusion

The purpose of this study was to develop an economic profile of the Ontario turfgrass industry and to identify strategic policy and research issues that face the industry. The lack of recent studies on the economic profile of the Ontario turfgrass industry was the motivation behind this research. Prior to this project, the most recent economic profile of the Ontario turfgrass industry was produced in 1984. Since that time, the turfgrass industry has grown and changed significantly. In order to fulfill the purpose of this study, we conducted primary and secondary data collection. We developed and distributed surveys to such industry segments, as golf courses, sod farms, parks and recreation facilities, and lawn care companies. We used Statistics Canada data and other secondary data sources for households, sod farms, provincial roads and highways and seed companies.

We found that the turfgrass industry contributes significantly to the economy of Ontario. The gross revenue of Ontario sod farms was \$108 million in 2007. The gross revenue from round and membership fees of Ontario golf courses was \$1.25 billion in 2007. The gross revenue of Ontario lawn care companies was \$1.26 billion in 2007. The total gross revenue of the Ontario turfgrass industry was \$2.61 billion in 2007.

The Ontario turfgrass industry segments spent \$1.39 billion on turfgrass maintenance operating expenditures in 2007. Payroll accounted for the largest share of total operating expenditures with \$788 million. The next largest share belonged to fertilizer with \$252 million.

Ontario turfgrass industry segments spent \$360 million on turfgrass maintenance equipment in 2007. The total value of turfgrass maintenance equipment for all Ontario turfgrass industry segments as of 2007 was \$778 million. Ontario golf courses' value of equipment was the highest among turfgrass industry segments with \$467 million. Households spent the most on equipment purchases in 2007 with \$280 million.

Ontario turfgrass industry hired 32.8 thousand year round full-time equivalent employees in 2007. Lawn care companies were the largest employers with the total of 20.8 thousand year round full-time equivalent employees. The most prevalent type of employment was seasonal full-time with 24.9 thousand people employed in 2007. The industry also employed a significant number of students.

We estimated that sod farms, golf courses, households, municipalities, universities and the Ontario Ministry of Transportation maintained 390 thousand acres of turfgrass in 2007. Ontario households had the largest share of the total area by maintaining 122 thousand acres in 2007. Ontario golf courses had the second largest share with 98.6 thousand acres. Ontario municipalities maintained 93.2 thousand acres of turfgrass.

Contraction factors for the Ontario turfgrass industry included pesticide regulations, water use policies, cost of inputs, and availability of qualified labour. Opportunities for expansion included population growth and urbanization, retirement trends, and new turfgrass species and varieties. Overall, all industry segments that we surveyed had a positive outlook about the future of their turfgrass operation. The majority of respondents indicated that they expect the size of their turfgrass operation to either increase somewhat or remain stable over the next 5 to 10 years.

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Appendix 1. Log of Survey Distribution

Organization	Members	Responses (Response Rate)	Primary Contact	1st Contact with Members	2nd Contact with Members	3rd Contact with Members	4 th + Contact with Members
Golf Superintendents Association of Ontario	388	105 (27.1%)	Dorothy Hills, Executive Manager	An advertisement in Green is Beautiful (Oct issue)	A link to online survey in an email newsletter (E-bulletin "Clippings") (Oct 31)	Another advertisement in Green is Beautiful (December issue)	A link to the survey in E-bulletin "Clippings" (Oct 31st)/personalized email to members (Jan 28, 2008)
Sports Turf Association of Ontario	154	21 (14.3%)	Lee Huether, Executive Manager	A notice in Sports Turf Manager (Oct issue)	A link to online survey was sent in an email on Nov 6	Survey were mailed on Nov 13	Survey Reminder in Sports Turf Manager (Dec 12) /website link
Ontario Parks Association	735	61 (8.30%)	Eric Trogdon, Executive Director	Link to survey emailed to members on Oct 29	Survey reminder emailed to members on Dec 3		
Ontario Recreation Facilities Association	1,200	16 (1.33%)	John Milton, Executive Director	Survey emailed to members on Nov 2	Not possible	Not possible	Not possible
Professional Lawn Care Association of Ontario	197	30 (15.2%)	Cheryl Machan, Executive Manager	A notice on website (end of Sept)	Surveys were mailed on Nov 6	Survey link was placed on the website (Nov 8)	
Landscape Ontario	1,000	90 (9.00%)	Tony DiGiovanni, Executive Director	A post on a Landscape Ontario website (online issue of Horticulture Trades) on Oct 28	A link to an online survey emailed to every member of Association on Nov 11	Reminder email sent to Lawn Care and Grounds Maintenance only on Nov 25	Advertisement in Horticultural Review (Jan issue)
Nursery Sod Growers Association of Ontario	43	9 (20.9%)	Barbara Tweedle, Executive Secretary	Survey send by mail on Nov 22	An advertisement in a newsletter, mid Dec	Reminder at a meeting in Jan (38 members present)	
Total	3,717	332 (8.93%)					

Notes:

1. Golf Superintendents of Ontario have over 800 members, but only 388 are superintendents
2. Landscape Ontario has over 2000 members, but only about 1000 members are lawn care and grounds maintenance companies
3. Memberships may overlap for: (i) Ontario Parks Association, Ontario Recreation Facilities Association, Sports Turf; (ii) Landscape Ontario and Professional Lawn Care Association of Ontario