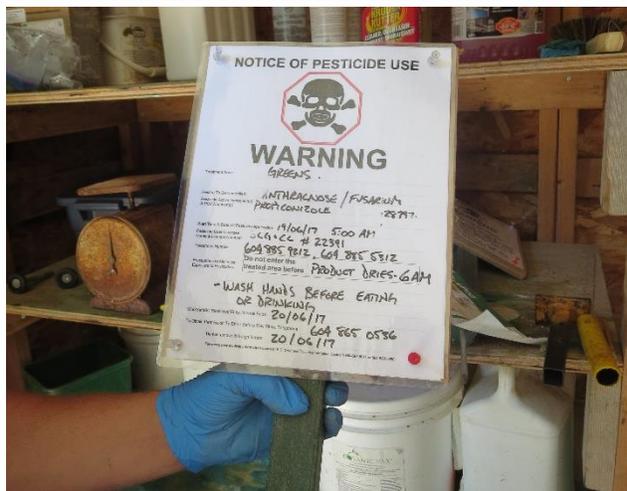




2017

INTEGRATED PEST MANAGEMENT ACT GOLF COURSE COMPLIANCE AUDIT



SUMMARY

Beginning in June 2017, the Ministry of Environment and Climate Change Strategy conducted a compliance audit of BC golf courses to ensure that the industry is following the environmental and human health protection requirements outlined in the *Integrated Pest Management Act* (IPMA or the Act) and Regulation. Amendments made to the IPM Regulation (the Regulation) in 2016 increased regulatory requirements for golf courses using pesticides by requiring licensing, training & certification for pesticide applicators, record keeping, posting of notification of pesticide use, and using the principles of integrated pest management (IPM).

For this report, golf courses that held a valid licence at the time of inspection are referred to as licenced, while golf courses that did not hold a valid licence at the time of inspection are referred to as unlicensed.

A total of 37 inspections were conducted, representing approximately 12% of golf courses in BC:

- Twenty inspections were of licensed golf courses and 17 inspections were of unlicensed golf courses.
- The overall rate of compliance was 32%. Unlicensed golf courses were 35% in compliance, and licensed golf courses were 30% in compliance.
- Licensed golf courses had relatively high (>70%) compliance rates for record-keeping and notification requirements, and 100% compliance with IPM requirements, demonstrating strong and ingrained IPM practices across this sector.
- All non-compliant golf courses received an advisory of non-compliance, which is the lowest level of enforcement response. This in part reflects the fact that non-compliances were relatively minor in nature and that this industry is still adjusting to the new requirements.

Licensed golf course superintendents also answered a questionnaire about the golf course and their pest control practices. The results indicated that the majority of pest control was focused on greens, despite the fact that greens represented only 3% of the turfed area. Preventing pests was the highest priority and was accomplished by keeping the turf healthy through fertilizing, aerating, irrigation schedules, top dressing, decreasing soil compaction, and increasing mowing height.

The required submission of an annual summary of pesticide use was completed by 93% of golf courses licensed in BC in 2017. These summaries generally confirmed the information provided by the superintendents interviewed regarding pesticide use targets. By amount of active ingredient reported, fungicides represented 95% and herbicides represented 5% of the active ingredient use. A total of 27,901 kg of active ingredient was applied by licensed golf courses in BC in 2017. The highest amount of active ingredient was applied on Vancouver Island, followed by the Lower Mainland and then the Interior, while the North had much lower amounts. This is likely a reflection of a number of factors, including the distribution of golf courses in the province, respective growing season lengths and differences in precipitation between regions.

Inspections revealed that while many golf courses were aware of the changes to the Regulation and had taken the appropriate steps to ensure compliance, a number of golf courses were still unaware. As a result, an additional letter explaining the requirements was sent to all golf courses in BC in December 2017. The ministry will continue to inspect golf courses going forward, as well as to work with the BC golf course industry associations to ensure satisfactory compliance rates.

ACKNOWLEDGEMENTS

The Ministry of Environment & Climate Change Strategy gratefully acknowledges the work of Chelsea Eby, IPM Officer in developing the original draft of this report.

CITATION AND FURTHER INFORMATION

This report should be cited as:

2017 Integrated Pest Management Act Golf Course Audit. Regional Operations Branch, British Columbia Ministry of Environment and Climate Change Strategy.

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TABLE OF CONTENTS

Summary	2
Acknowledgements.....	3
Citation and further information	3
Introduction	6
Background	6
Definition of terms used in this report	6
Methods.....	8
Inspections	8
Pesticide Use evaluation	9
Results.....	10
Number of Inspections.....	10
Inspections by Region	10
Compliance outcomes	10
Overall Compliance Rate and Resulting Compliance Response.....	10
Unlicensed Golf Course Inspection Outcomes.....	11
Licensed Golf Course Inspection Outcomes	11
Licensed Golf Courses - Requirements to Use Integrated Pest Management.....	12
Pesticide Use	16
Discussion.....	21
Number of Inspections.....	21
Compliance results.....	21
Compliance with requirements to use IPM	22
Pesticide Use	22
Response to audit findings.....	23

Conclusion and Next Steps..... 24

Appendix A – List of Golf Courses and Compliance Determination Results 25

Appendix B – Amount and type of active ingredients (ai) used on licensed golf courses 27

INTRODUCTION

BACKGROUND

The Ministry of Environment & Climate Change Strategy amended the Integrated Pest Management Regulation in December 2015, with the amendments not coming into force until July 1, 2016 in order to give those affected time to come into compliance. These amendments included changes to the requirements for the use of pesticides on landscaped areas of private land, including most golf courses. The requirements include:

- Having a pesticide use license and certified applicators on staff for application of non-excluded pesticides,
- Keeping a record of each pesticide application and submitting an annual summary of pesticide use to the ministry,
- Notifying the public of pesticide applications, and
- Following the principles of IPM.

In an effort to ensure golf courses could come into compliance with the amended regulation, the Ministry of Environment & Climate Change Strategy developed guidance material that was published on the ministry website and also presented at golf course industry conferences in 2015, 2016, and 2017.

Beginning in June 2017, ministry inspectors conducted an audit of BC golf courses to ensure that the industry is following environmental and human health protection requirements outlined in the Act and Regulation. Approximately 318 golf courses were identified BC, however only 126 of these courses held valid pesticide use licenses. Not all golf courses in BC were aware of the changes to the Regulation, and therefore some had likely not yet obtained a licence. Therefore, ministry inspectors planned inspections of both golf courses that held valid licenses, and golf courses that did not hold valid licenses but were likely to be using pesticides as part of their turf management programs.

DEFINITION OF TERMS USED IN THIS REPORT

Integrated Pest Management (IPM)

Integrated pest management is a process for managing pest populations that forms a cornerstone of the Act and Regulation. IPM includes the following elements: pest prevention, pest identification and monitoring, use of injury thresholds for treatment decisions, and managing pests using strategies that incorporate chemical and non-chemical methods based on environmental and human health protection. These elements ensure that pesticides are only used when necessary, which benefits the industries regulated under the Act, human health and the environment. Under Section 32 of the Regulation, all licensed pesticide users are required to follow the principles of IPM when using pesticides.

PESTICIDES

Pesticides are defined in the Act as “a micro-organism or material that is represented, sold, used or intended to be used to prevent, destroy, repel or mitigate a pest”. The Regulation excludes some pesticides from the definition under the Act. Pesticides that still fall under the Act definition are referred to as non-excluded pesticides.

Pesticides can be broken down into categories based on the pest they are targeting. The following pesticide categories are mentioned in this report:

1. Fungicide –controls fungi (diseases)
2. Herbicide – controls unwanted plants (weeds)
3. Insecticide – controls insects
4. Plant growth regulator – alters the growth of plants
5. Adjuvant/surfactant – increases the efficacy of a pesticide

Pesticide formulations consist of the active ingredient(s) and other formulants. The active ingredients in a pesticide are what control the target pest. The additional formulants may aid in the stabilization, mixing, or application of the pesticide.

AUTHORIZATION STATUS

This report includes a breakdown of compliance results for golf courses based on their authorization status (licensed or unlicensed). A licensed golf course is one that held a valid pesticide use license at the time of inspection. More than one golf course can be listed under a single license. An unlicensed golf course is one that did not hold a valid pesticide use license at the time of inspection. A distinction is made between the authorization status because some requirements apply to golf courses regardless of their authorization status (e.g. pesticide safe storage requirements), while others are required once a facility is licensed.

REGIONS

This report references regions of the province, as shown in figure 1:

- Vancouver Island
- Lower Mainland
- Southern Interior
- Kootenay
- Cariboo
- Skeena
- Omineca
- Peace

Figure 1. Regions in BC



METHODS

INSPECTIONS

Golf courses were inspected by ministry IPM Officers for compliance with the Regulation (IPMR). Depending on the authorization status of the golf course (licensed or unlicensed) the following requirements were checked:

- License and certificate requirements (IPMR Sections 5 & 50)
- Record-keeping requirements (IPMR Section 35)
- Notification requirements (IPMR Sections 10 & 63)
 - Location and timing of posting
 - Content
- Storage requirements (IPMR Sections 65 & 66)
 - Pesticide labels
 - Storage facility
- IPM requirements (IPMR Section 68)
 - Pest prevention
 - Pest identification
 - Pest monitoring
 - Injury thresholds
 - Consideration/use of pesticide alternatives
 - Consideration of protection of human health and the environment when selecting pesticides
 - Evaluation of treatment efficacy

Licensed golf courses received a full inspection of requirements, including answering a detailed questionnaire with the golf course superintendent. The questionnaire was designed to gain a deeper understanding of the practices used by licensed golf courses including the characteristics of the golf course, the pest problems faced, the equipment used, and the methods and tools used that follow IPM principles. Unlicensed golf courses received a storage inspection and education of the requirements.

During the inspection, ministry inspectors answered questions and provided educational material to superintendents and staff as required. If any non-compliance was encountered, it was discussed with the golf course superintendent at the time of inspection. All golf courses were issued an inspection report outlining the compliance status of each requirement that was checked. When all requirements checked were in compliance, a notice letter was sent, while an advisory letter was sent when non-compliances were found.

PESTICIDE USE EVALUATION

Annual pesticide use summaries for a calendar year are required to be submitted to the ministry by licensed golf courses. For each pesticide used, licensees must report the product name, the active ingredient(s), the federal *Pest Control Products (P.C.P) Act* registration number, and the total amount of product used in litres or kilograms. The summaries for all licensed golf courses in 2017 were entered into a database and information management system to calculate the quantity of active ingredient applied.

RESULTS

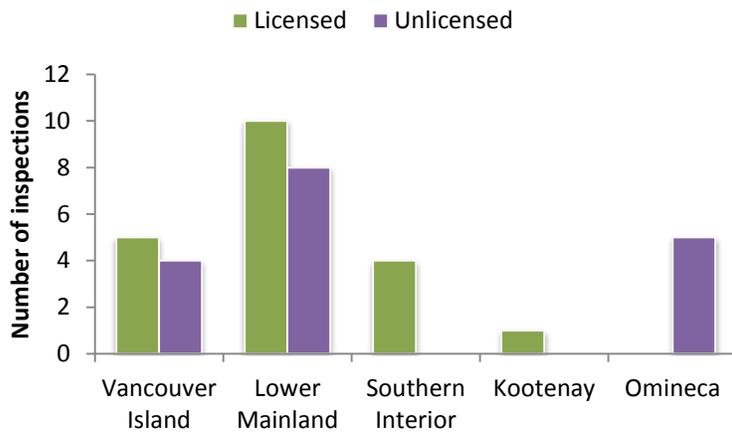
NUMBER OF INSPECTIONS

IPM Officers completed 37 inspections between June 6 and November 1, 2017. Twenty inspections were of licensed golf courses and 17 inspections were of unlicensed golf courses.

INSPECTIONS BY REGION

Inspections of licensed and unlicensed golf courses were conducted across the province in the following regions: Vancouver Island, Lower Mainland, Southern Interior, Kootenay, and Omineca (figure 2).

Figure 2. Number of inspections of licensed and unlicensed golf courses by region

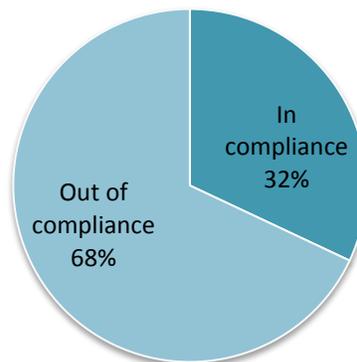


COMPLIANCE OUTCOMES

OVERALL COMPLIANCE RATE AND RESULTING COMPLIANCE RESPONSE

Of the 37 golf courses inspected, 32% were fully in compliance with the Regulation and were issued a notice of compliance (figure 3). The remaining 68% were out of compliance with at least one aspect of the Regulation and were issued an advisory of non-compliance.

Figure 3. Overall compliance rate of inspected golf courses



UNLICENSED GOLF COURSE INSPECTION OUTCOMES

Of the 17 unlicensed golf courses inspected, 35% were fully in compliance with the Regulation and 65% were out of compliance with at least one aspect of the Regulation (figure 4). Figure 4 includes a breakdown of compliance rates for the requirements checked.

In terms of their licencing requirements, 59% (10 golf courses) were using pesticide without a license, while 41% (7 golf courses) did not require a license at the time of inspection.

In terms of pesticide storage requirements, labeling of pesticide containers was in compliance at 92% of the unlicensed golf courses inspected, while the storage facility requirements were 90% in compliance. The most common non-compliances were unlocked storage facilities and failing to have a warning sign on pesticide storage facility doors.

Figure 4. Compliance rate of unlicensed golf courses



LICENSED GOLF COURSE INSPECTION OUTCOMES

Of the 20 licensed golf courses inspected, 30% were fully in compliance with the Regulation and 70% were out of compliance with at least one aspect of the Regulation (figure 5). Figure 5 includes a breakdown of compliance rates for the requirements checked.

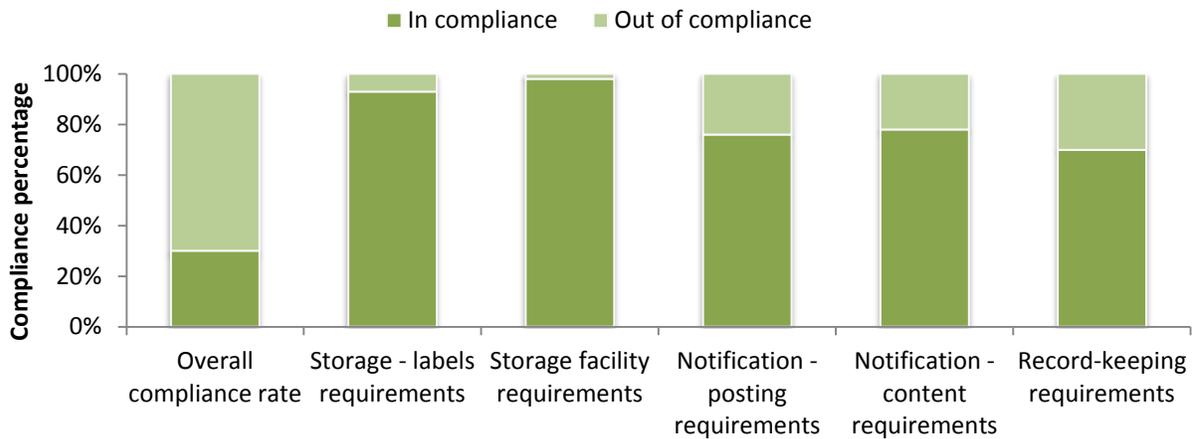
In terms of pesticide storage requirements, labeling of pesticide containers was in compliance at 93% of the licensed golf courses inspected, while the storage facility requirements were 98% in compliance.

In terms of notification requirements, the timing and location of treatment notices were 76% in compliance, while the content was 78% in compliance. The most common non-compliance for notification timing was that notice signs were posted for 24 hours after treatment, rather than the required 48 hours. The most common non-compliance in notification content was not listing the license name and number (often the certified applicator's name and number was used).

In terms of record-keeping requirements, pesticide use records were 70% in compliance for the required content. The most common non-compliance in use record content was that not all the required

meteorological conditions were recorded (temperature, wind speed and direction, and amount of precipitation).

Figure 5. Compliance rate of licensed golf courses

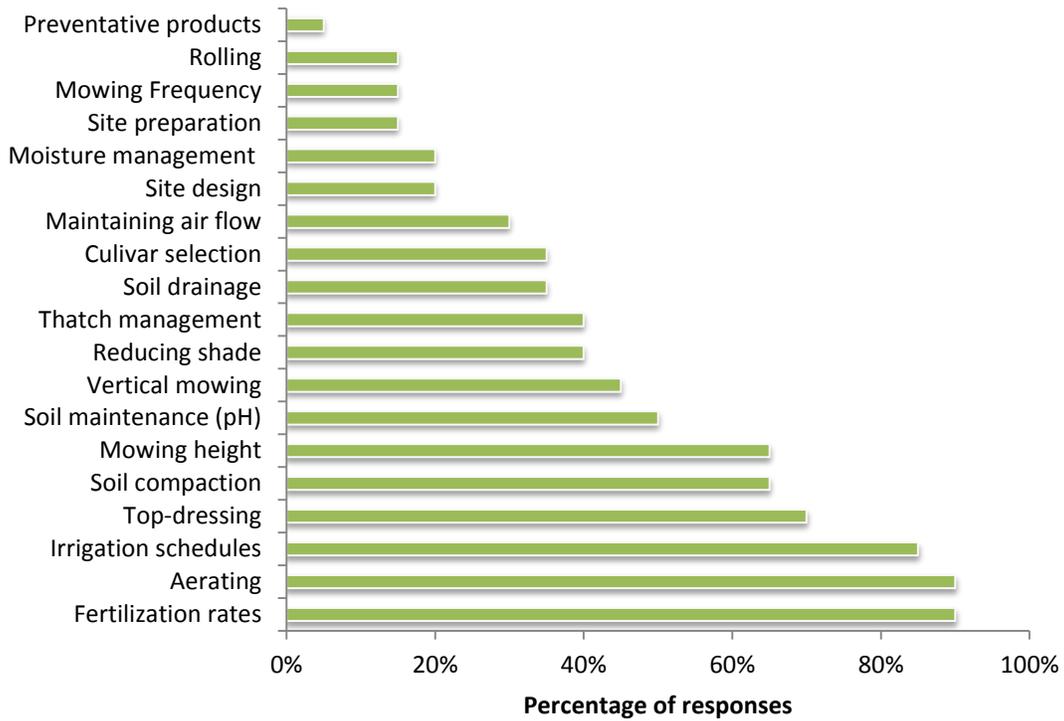


LICENSED GOLF COURSES - REQUIREMENTS TO USE INTEGRATED PEST MANAGEMENT

The results from the detailed survey of each golf course's IPM practices indicated that all licensed golf courses were in full compliance with the IPM requirements. Fifty-five percent of the golf courses had a written IPM plan specific to the pests, thresholds and methods used at their course.

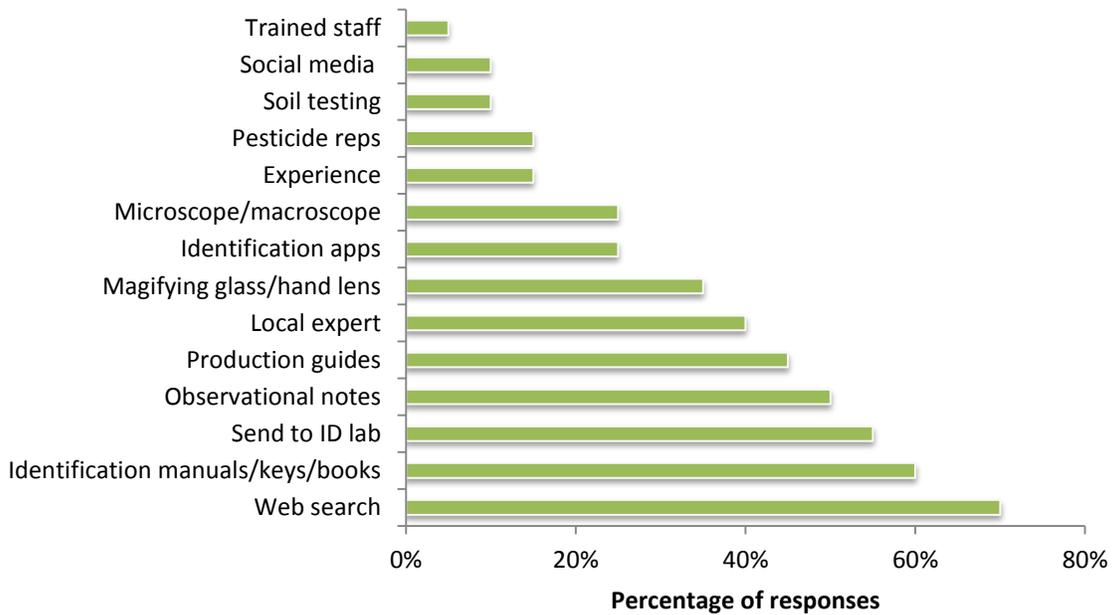
All golf courses stated that the focus was on maintaining healthy turf which helps prevent pests. The most common practices for pest prevention were: fertilization rates (amount of nitrogen, phosphorus and potassium applied per hectare), aerating, managing irrigation schedules, top-dressing, reducing soil compaction and increasing mowing height (figure 6).

Figure 6. Licensed golf course responses for pest prevention methods



For pest identification, most golf courses indicated they used the internet and reference material, but the use of identification lab services was also high (figure 7).

Figure 67. Licensed golf course responses for pest identification tools or resources



Visual inspections and scouting were the most common forms of pest monitoring (figure 8). All golf courses indicated that monitoring for pests occurs on a daily basis, particularly for greens (figure 9). At most golf courses, designated staff (superintendents and assistant superintendents) were the ones doing the monitoring; however, maintenance staff were trained to let the superintendent know when they notice something odd on the course.

Monitoring records were kept at 55% of the licensed golf courses, with the date and location of the pest being recorded most often, followed by weather conditions and the infestation level (counts or percent area affected).

Figure 8. Licensed golf course responses for monitoring methods

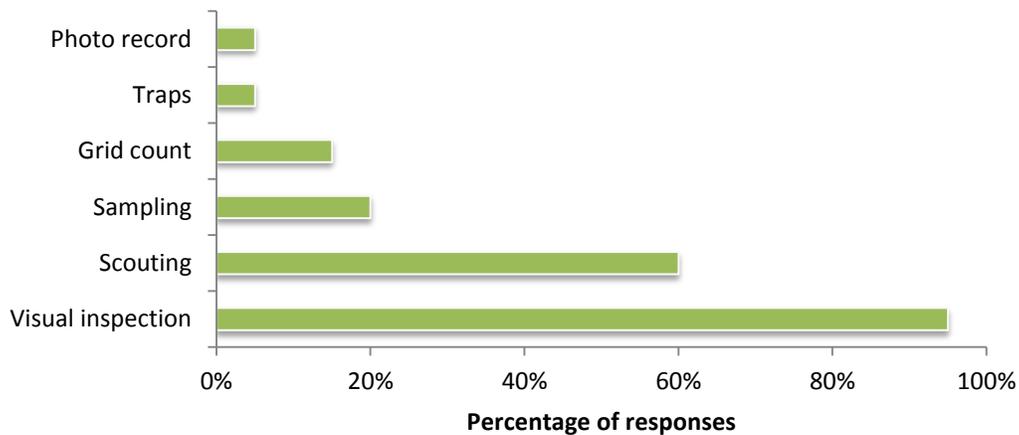
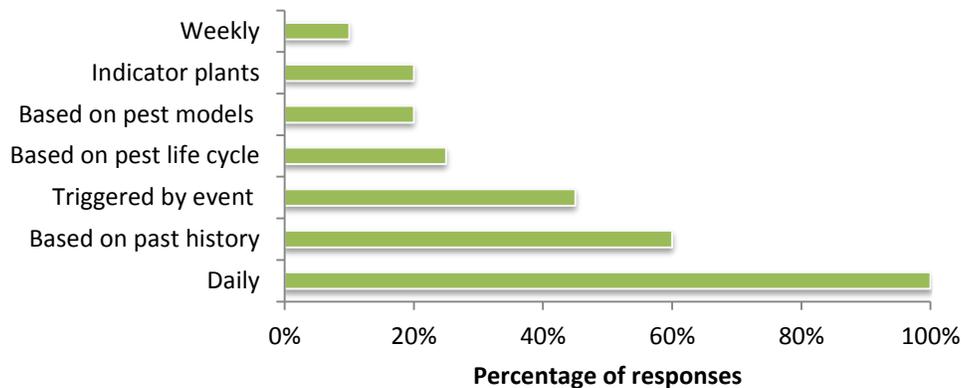
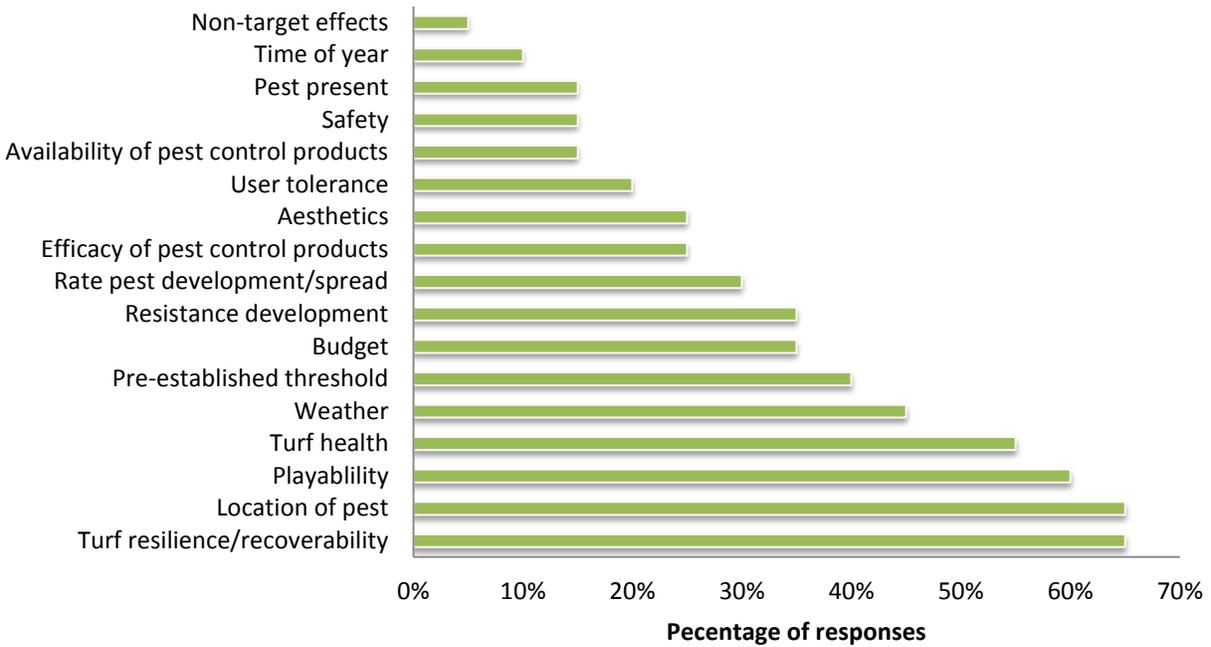


Figure 9. Licensed golf course responses for monitoring frequency



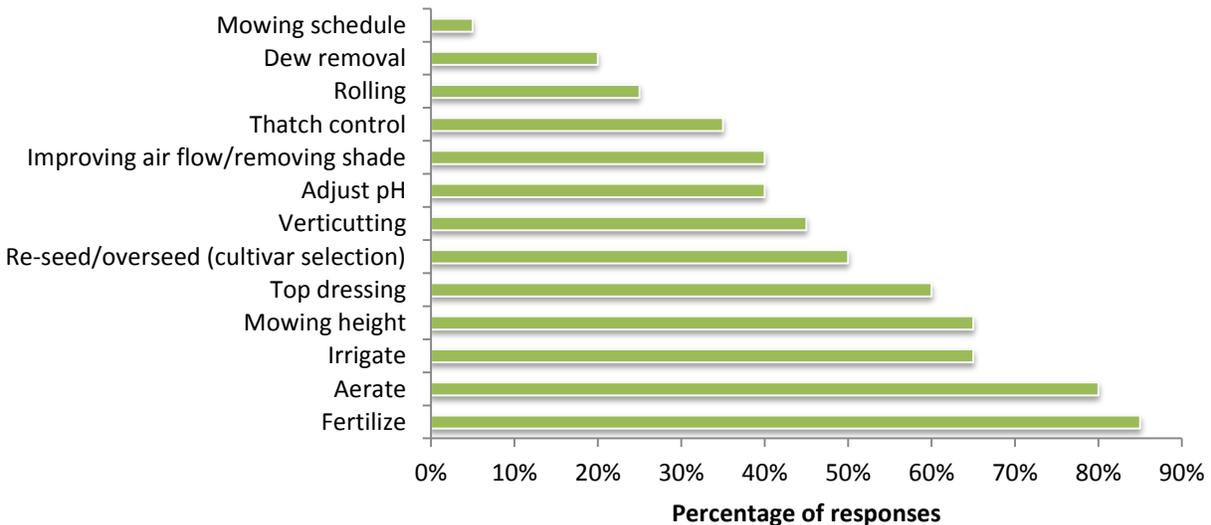
Thresholds for triggering a pesticide application varied for the area of the golf course affected, with greens having the lowest thresholds. Thresholds were based on many factors, with location of pest, turf resilience and playability being mentioned most frequently (figure 10).

Figure 10. Licensed golf course responses for factors contributing to treatment thresholds



The use of pesticide alternatives was considered important for 60% of the superintendents and very important for 30% of the superintendents. Physical, cultural and biological control methods were mentioned, with cultural controls being used the most. Physical controls consisted primarily of pulling weeds and mowing, while biological controls included the use of nematodes and endophyte treated seeds. Maintaining strong and healthy turf by fertilizing and aerating were the most common cultural controls, followed by irrigating, using the highest possible mowing height, top dressing and over-seeding with resistant cultivars (figure 11).

Figure 11. Licensed golf course responses for types of cultural control used



When selecting a pesticide, the superintendents indicated that they took into consideration the toxicity of the product, resistance management and weather conditions around application for the protection of human health and the environment.

Inspection after treatment was the most common method used to evaluate efficacy. Reviewing and comparing records was used to evaluate effectiveness for 55% of the licensed golf courses.

PESTICIDE USE

PESTICIDE USE ON INSPECTED LICENSED GOLF COURSES

As part of the questionnaire, licensed golf course superintendents were asked about the biggest pest problems requiring control, the area of the golf course where pest control was necessary, and the most common type of pesticides used to control pests. Diseases were the biggest pest at all golf courses in the province, with Fusarium (a.k.a. Pink Snow Mould, now reclassified as *Microdochium*) being the biggest disease requiring control (figure 12). Greens were the focus for pest control, with fungicides being the most common type of pesticide applied (figures 13 & 14). The average size of turfed areas of golf courses was 42 ha, with greens covering an average of 1.27 ha (3% of the golf course area) (figure 15).

Figure 12. Biggest pest problems on licensed golf courses

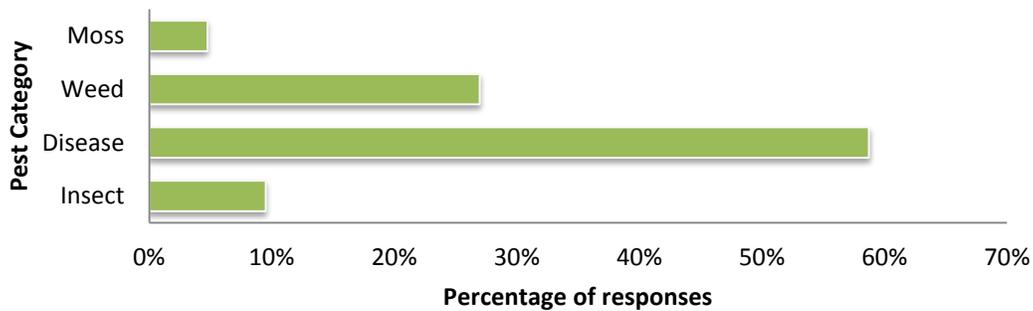


Figure 13. Pesticide application location on licensed golf courses

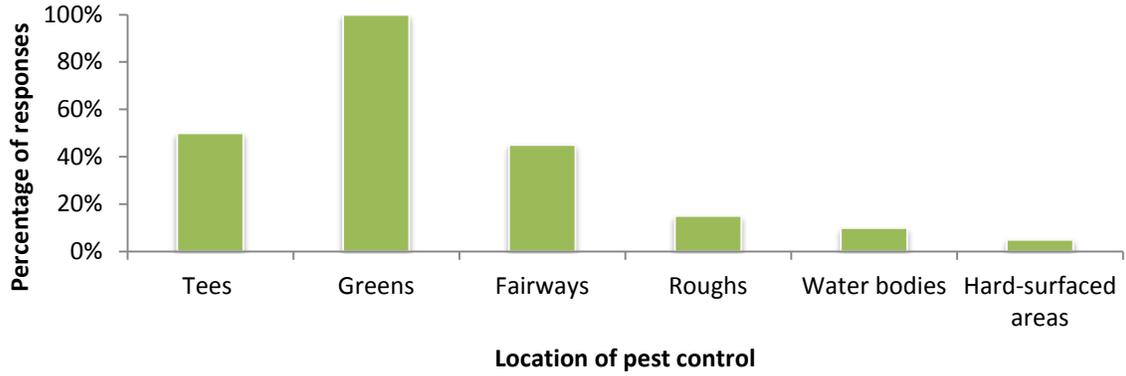


Figure 14. Pesticide type used on licensed golf courses

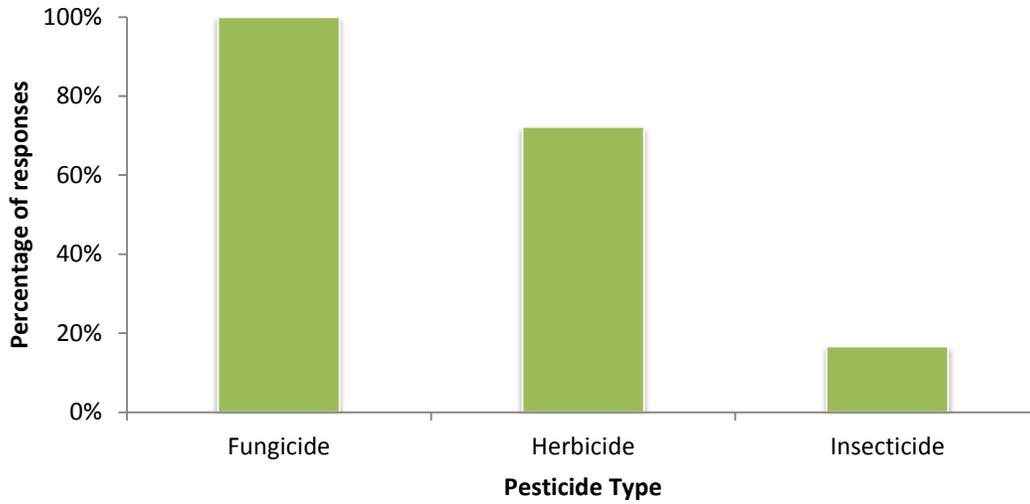
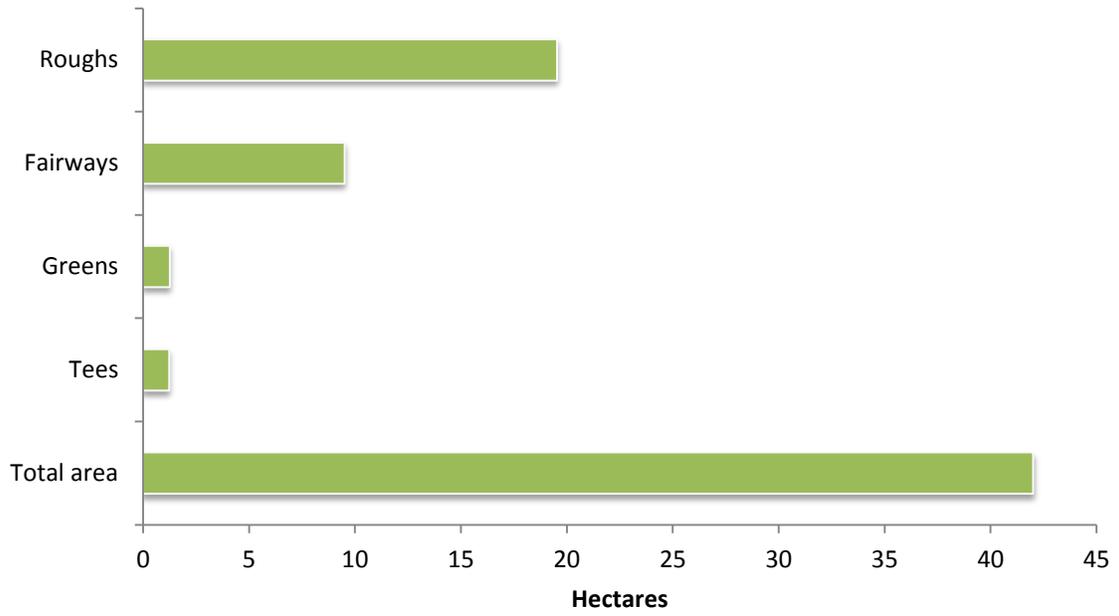


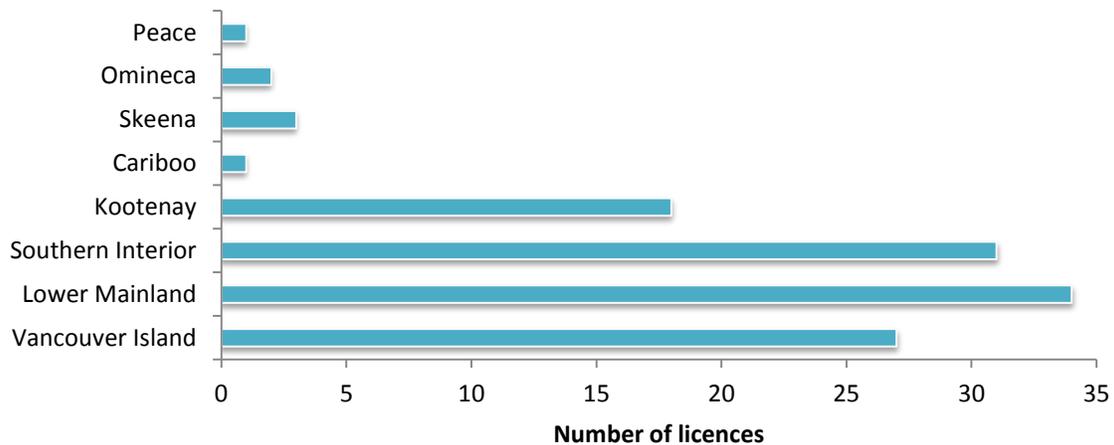
Figure 15. Average size of golf course areas



ANNUAL SUMMARY OF PESTICIDE USE

In 2017 there were 126 active licenses for golf courses in BC. As per the requirements under the Regulation, all license holders are required to submit an annual summary of pesticide use for the calendar year. When preparing this report, 117 summaries (93%) had been received and were analyzed for pesticide use. Most golf courses were located in the Lower Mainland, Southern Interior, Vancouver Island, and in the Kootenays (figure 16).

Figure 16. Number of licenses per region



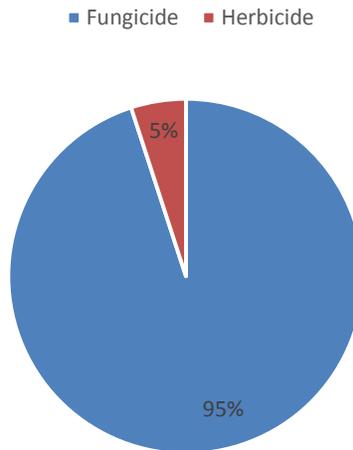
A total of 27,901 kilograms of active ingredient was applied by licensed golf courses in BC in 2017. The highest amount of active ingredient was applied on Vancouver Island, followed by the Lower Mainland, Southern Interior, and the Kootenays, while lower amounts were used in the Cariboo, Skeena, Omineca and Peace regions (table 1). Only one license holder reported that no pesticides had been used in 2017.

Table 1. Total amount of pesticide active ingredient (ai) used by region

	Total Active Ingredient (kg)
Vancouver Island	10,589.2
Lower Mainland	7,925.5
Southern Interior	5,910.2
Kootenay	3,221.6
Cariboo	59.0
Skeena	81.5
Omineca/Peace	114.4

From the reported amounts of active ingredient, fungicides represented 95% of the active ingredient use and herbicides represented 5% of the active ingredient use, while adjuvants/surfactants, insecticides and plant growth regulators accounted for less than 1% of active ingredient use (figure 17).

Figure 17. Percentage of pesticide category used by reported amount of active ingredient



A total of 60 active ingredients were used: 27 were fungicides, 19 were herbicides, 12 were insecticides, 1 was a plant growth regulator, and 1 was an adjuvant/surfactant (appendix B). By amount of active ingredient applied, the top 10 active ingredients were:

1. Chlorothalonil (fungicide)
2. Mineral Oil (fungicide)
3. Iprodione (fungicide)
4. Propiconazole (fungicide)
5. Fosetyl-al (fungicide)
6. 2,4-d (herbicide)
7. Thiophanate-methyl (fungicide)
8. Fludioxonil (fungicide)
9. Mecoprop-p-dimethylammonium (herbicide)
10. Sulphur (fungicide)

DISCUSSION

NUMBER OF INSPECTIONS

Around 12% of the golf courses identified in the province were inspected in the audit. Roughly equal numbers of licensed and unlicensed golf courses were inspected, with inspections occurring in almost all regions of the province. Therefore, it is expected that the results of the audit are a good representation of the golf course industry's compliance with the *Integrated Pest Management Act* and Regulation in BC.

COMPLIANCE RESULTS

The overall compliance rate was low, with only 32% of inspected golf courses being in full compliance with the amended regulation. This result was not unexpected, given that many of these requirements are new for this sector. In addition, it is worth noting that any aspect that is out of compliance, regardless of how minor, results in an "out of compliance" determination. Therefore, an analysis of the compliance rate for each of the requirement categories inspected was used to determine which areas require the most improvement.

The pesticide storage requirements under the Regulation do not depend on authorization status, therefore all golf courses in the audit were inspected for these requirements. Regardless of authorization status, a high compliance rate (>90%) for storage requirements was found at the inspected golf courses. The most common non-compliances were unlocked storage and not having a warning sign on pesticide storage doors. As inspectors were able to provide warning signs during the inspection, this non-compliance was often remedied during the inspection. Pesticide storage is also regulated by Health Canada and WorkSafe BC, which likely contributed to the high compliance rate at both licensed and unlicensed golf courses.

The remaining requirements checked under the Regulation had reasonably high compliance rates, indicating that the compliance promotion work conducted by ministry staff in collaboration with BC golf course industry associations had reached many golf courses, although it is also clear that further education is required to increase understanding of the requirements.

Forty-two percent of unlicensed golf courses did not require a license at the time of inspection because pesticides had not been used since the regulation was amended, or a licensed landscaping company had been hired to apply pesticides. However, many of the unlicensed golf courses indicated they would be using pesticides in the future, and thus would need to obtain a license. Having a certified applicator on staff is a requirement for obtaining a license. Interestingly, 47% of unlicensed golf courses had certified applicators on staff, indicating that many unlicensed golf courses were well-prepared to obtain a license if needed. Many of the unlicensed golf courses mistakenly thought they had a license when all they had

was an applicator certificate. The confusion between a license and a certificate was also encountered at licensed golf courses, highlighting the need for additional education.

The licensed golf courses inspected were keeping pesticide application records, with some using the record forms available on the ministry website and others using in-house forms. Keeping pesticide use records appeared to be an ingrained practice for the industry, which, combined with the use of ministry-provided forms likely resulted in the 70% compliance rate for the required content of pesticide use records. Posting treatment notices was not a regular practice for golf courses prior to being regulated under the Act, however, most licensed golf courses inspected were posting treatment notices and had a relatively high (76-78%) compliance rate for the posting and content requirements. Treatment notices must be visible to anyone approaching the treatment area; to meet this requirement most licensed golf courses were posting notices at the clubhouse and the 1st and 9th/10th tee. Some further education is required to ensure that the required content is recorded and posted on an ongoing basis.

COMPLIANCE WITH REQUIREMENTS TO USE IPM

Remarkably, a 100% compliance rate was found at licensed golf courses for the IPM requirements. Most golf course superintendents felt they had a strong understanding of IPM practices, which were articulated into a written IPM plan for 55% of the licensed golf courses inspected. This level of diligence was a contributing factor to the 100% compliance rate for the IPM requirements.

Many superintendents indicated that user-tolerance for weeds on golf courses has changed, especially as watering restrictions have increased. All superintendents indicated that the focus of pest control was for diseases on greens, where playability is the most important. The turf on greens is kept very short, which weakens the grass and makes it more susceptible to pest problems. Understandably, thresholds for control are very low on greens, however preventing pests by maintaining healthy turf through cultural practices such as fertilizing and aeration was the primary focus. Ninety percent of superintendents at the licensed golf courses inspected indicated that using alternatives to pesticides was either important or very important. Superintendents conduct daily visual inspections of greens to identify pests and monitor treatment effectiveness, however only 55% of the licensed golf courses were keeping and reviewing pest records. Keeping and reviewing records can be an important component of any IPM program, and is recommended for BC golf courses, as is having an articulated IPM plan.

PESTICIDE USE

For the licensed golf courses inspected, the majority of superintendents indicated that diseases were the focus for pest control, followed by weeds. This was reflected in the annual use summary data, where 95% of the active ingredients used were fungicides and 5% were herbicides. A total of 27,901 kg of active ingredient was applied by licensed golf courses in BC in 2017. The average amount of active

ingredient was not calculated as golf courses can vary in size (e.g. number of holes), and more than one golf course can be held under one license. The superintendents interviewed also indicated that the greens were where pest control efforts were focused. Greens represented an average of 3% of the total turfed area; therefore, it is assumed that the vast majority of the active ingredient on all the annual use summaries was applied on a small percentage of the area of each golf course. Most pesticide use occurred on Vancouver Island, the Lower Mainland, the Southern Interior and the Kootenays. These regions are also where the greatest number of licenses are held, and the regions which have longer growing seasons. However, the greatest amount of pesticide used was on Vancouver Island, which does not correspond to the region with the most licenses. It is unclear if this is a reflection of the size of golf courses on Vancouver Island or some other factor such as budget or weather patterns.

The superintendents interviewed also identified their biggest pests of concern. For diseases, Fusarium (a.k.a. Pink Snow Mould, now reclassified as *Microdochium*) was the biggest concern, with Anthracnose, Dollar Spot and Snow Moulds (unspecified and Grey) also being mentioned. For weeds, clover, dandelion, plantain and broadleaf weeds were of concern. Moss was also of concern for some golf courses. Most of the reported fungicides products containing the top ten active ingredients have a broad target of fungal diseases, covering most, if not all of the diseases of concern reported by the superintendents interviewed. Most of the reported herbicides products containing the top ten active ingredients target broadleaf weeds, including all those listed by the superintendents.

The Pest Management Regulatory Agency (PMRA) of Health Canada regularly reviews registered pesticides to ensure that they continue to meet current health and environmental safety standards and continue to have value. Recently, the PMRA has issued re-evaluation decisions for the active ingredients chlorothalonil (RVD2018-11) and iprodione (RVD2018-16). Under the RVD2018-11, the number of applications of chlorothalonil will be limited to two applications per year for turf grass foliar disease management plus one application in the fall for snow mould control. Under RVD2018-16, the use of iprodione on turf will be cancelled. As these two active ingredients are among the top 10 used by BC golf courses, these changes to pesticide labels may significantly impact future pesticide use patterns in the industry.

RESPONSE TO AUDIT FINDINGS

The golf course sector is largely a newly-regulated industry under the Act and Regulation. As with any newly regulated sector, a focus on compliance promotion is the first activity undertaken by the ministry in order to encourage voluntary compliance (ENV Compliance Management Framework, 2007). Compliance promotion was included as a component of the audit inspections, and the audit also identified areas that require further education. An educational letter was mailed to all BC golf courses in December 2017 in an effort to address some of these areas, including clarifying the distinction between a license and a certificate, as well as highlighting other relevant aspects of the Regulation.

The response to non-compliances found during the audit for each inspected party was based on consideration of the Non-Compliance Decision Matrix outlined in the ministry's *Compliance & Enforcement Policy and Procedure* (ENV, Version 3, 2014). All golf courses with non-compliances were issued an advisory, which is the first level enforcement response. This is largely because of the following factors:

- This is a newly regulated sector that is still learning the requirements, and for most golf courses this was the first inspection conducted;
- Most instances of non-compliance were assessed to be minor or administrative in nature (e.g. not having a license, or some information not being recorded or posted); and,
- All golf courses with non-compliances showed a willingness to comply in the future or were already taking measures to come into compliance (e.g. obtaining a license, or posting a warning sign on pesticide storage doors).

One unique non-compliance was determined from the review of annual use data: an advisory letter was sent to one golf course after it was discovered during the review of the top ten active ingredients that they were the sole users of Kumulus (active ingredient sulphur), a product not registered for use on turf in Canada.

CONCLUSION AND NEXT STEPS

The results of this audit suggest that the use of IPM by BC golf courses is not a reflection of the new regulatory requirements, but rather represents an ingrained practice of the industry. The BC golf course industry is committed to continual improvement in IPM techniques, including industry association funding for turfgrass research. In 2002, "IPM for Turfgrass Manager: A guide to disease, insect and weed management in BC" was produced by the BC Ministry of Agriculture in partnership with the Western Canada Turfgrass Association (WCTA), and this is a valuable resource tailored to conditions in BC. A major revision of this manual by a BC Allied Golf Association steering committee is currently underway to ensure it contains current and relevant information.

The Ministry of Environment & Climate Change Strategy will continue to conduct compliance inspections of golf courses, with a focus on golf courses found to be out of compliance during this audit as well as those that have never been inspected. All inspections and enforcement actions conducted will be conducted as per the [Ministry's Compliance & Enforcement Policy and Procedures](#). The inspections conducted in 2017 revealed that while many golf courses were aware of the changes and had taken the appropriate steps to ensure compliance, a number of golf courses were not aware of the changes to the regulation, indicating the need for ongoing outreach and compliance activities. The BC golf course associations have been instrumental in helping to communicate the new rules to their members, and the ministry wishes to thank these associations for their ongoing promotional efforts to ensure compliance.

APPENDIX A – LIST OF GOLF COURSES AND COMPLIANCE DETERMINATION RESULTS

Golf Course Name	License status at time of inspection	Region	Compliance Determination
Gallaghers Canyon Golf and Country Club	Licensed	Southern Interior	Out of compliance
Ledgeview Golf & Country Club	Licensed	Lower Mainland	Out of compliance
Kettle Valley Golf Club	Licensed	Southern Interior	In compliance
Castlegar Golf Club	Licensed	Kootenay	In compliance
Whistler Golf Club	Licensed	Lower Mainland	Out of Compliance
Nicklaus North	Licensed	Lower Mainland	In compliance
The Meadows at Pemberton	Licensed	Lower Mainland	In compliance
Squamish Valley Golf and Country Club	Licensed	Lower Mainland	Out of compliance
Nanaimo Golf Club	Licensed	Vancouver Island	Out of compliance
Comox Golf Club	Licensed	Vancouver Island	Out of compliance
Crown Isle Resort & Golf Community	Licensed	Vancouver Island	Out of compliance
Penticton Golf and Country Club	Licensed	Southern Interior	Out of compliance
Beach Grove Golf Club	Licensed	Lower Mainland	Out of compliance
Storey Creek Golf and Recreation Society	Licensed	Vancouver Island	In compliance
Pender Harbour Golf Club Society	Licensed	Lower Mainland	Out of compliance
Blue Ocean Golf Club	Licensed	Lower Mainland	Out of compliance
Sunshine Coast Golf Club	Licensed	Lower Mainland	Out of compliance
Cordova Bay Golf Course	Licensed	Vancouver Island	In compliance
The Summerland Golf Society	Licensed	Southern Interior	Out of compliance
Gleneagles Golf Course	Licensed	Lower Mainland	Out of compliance
Newlands Golf & Country Club	Unlicensed	Lower Mainland	Out of compliance
Langley Golf Centre	Unlicensed	Lower Mainland	Out of compliance
Point Grey Golf and Country Club	Unlicensed	Lower Mainland	Out of compliance
Langara Golf Course	Unlicensed	Lower Mainland	Out of compliance
Big Sky Golf Course	Unlicensed	Lower Mainland	Out of compliance
Ness Woods Golf Course	Unlicensed	Omineca	In compliance
Alder Hills Golf Course	Unlicensed	Omineca	Out of compliance
Aspen Grove Golf Course	Unlicensed	Omineca	Out of compliance
Mulligans Golf Club	Unlicensed	Vancouver Island	In compliance
Longlands Par 3 Golf Course	Unlicensed	Vancouver Island	Out of compliance
Sequoia Springs Golf Course	Unlicensed	Vancouver Island	In compliance
Guildford Golf and Country Club	Unlicensed	Lower Mainland	In compliance
Eaglequest Golf at Coyote Creek	Unlicensed	Lower Mainland	Out of compliance

Aberdeen Glen Golf Course	Unlicensed	Omineca	Out of compliance
Metchosin Golf and Country Club	Unlicensed	Vancouver Island	In compliance
Links of Maggie May	Unlicensed	Omineca	In compliance
Burnaby Mountain Golf Course	Unlicensed	Lower Mainland	Out of compliance

APPENDIX B – AMOUNT AND TYPE OF ACTIVE INGREDIENTS (AI) USED ON LICENSED GOLF COURSES

This table summarizes the amount of active ingredient (ai) in kilograms reported on golf course annual use summaries in 2017. The table is colour-coded by pesticide type.

Active ingredient	Pesticide type	Amount of active ingredient (kg)
Chlorothalonil	Fungicide	10,843
Mineral Oil	Fungicide	9979
Iprodione	Fungicide	2291
Propiconazole	Fungicide	908
Fosetyl-al	Fungicide	760
2,4-d (present As Amine Salts: Dimethylamine Salt, Diethanolamine Salt, Or Other Amine Salts)	Herbicide	580
Thiophanate-methyl	Fungicide	383
Fludioxonil	Fungicide	290
Mecoprop-p-dimethylammonium	Herbicide	288
Sulphur	Fungicide	216
Glyphosate (present As Potassium Salt)	Herbicide	211
Trifloxystrobin	Fungicide	205
Copper Hydroxide	Fungicide	148
Triticonazole	Fungicide	141
Carbaryl	Insecticide	99
Dicamba (present As Acid, Amine Salt, Ester, Or Sodium Salt)	Herbicide	93
Acetic Acid	Herbicide	79
Azoxystrobin	Fungicide	52
Mono- And Dipotassium Phosphite	Fungicide	52
Fluoxastrobin	Fungicide	49
Tebuconazole	Fungicide	43
Trinexapac-ethyl	Plant Growth Regulator	38
Pyraclostrobin	Fungicide	16
Diquat	Herbicide	13
Metconazole	Fungicide	12
Glyphosate (present As Isopropylamine Salt Or Ethanolamine Salt)	Herbicide	11
Benzovindiflupyr	Fungicide	11

Hydrogen Peroxide	Fungicide	<10
Glyphosate (present As Isopropylamine And Potassium Salt)	Herbicide	<10
Carfentrazone-ethyl	Herbicide	<10
Propamocarb Hydrochloride	Fungicide	<10
Mecoprop-p-potassium	Herbicide	<10
Bacillus Thuringiensis Israelensis (or: Bacillus Thuringiensis Serotype H-14)	Insecticide	<10
Chlorantraniliprole	Insecticide	<10
Triclopyr-butotyl	Herbicide	<10
Penthiopyrad	Fungicide	<10
Mandestrobin	Fungicide	<10
Fluopyram	Fungicide	<10
Imidacloprid	Insecticide	<10
Metalaxyl-m And S-isomer	Fungicide	<10
Myclobutanil	Fungicide	<10
Copper Sulphate	Fungicide	<10
Mecoprop-p	Herbicide	<10
Silica Gel (amorphous)	Insecticide	<10
Cyazofamid	Fungicide	<10
Clopyralid	Herbicide	<10
Glyphosate (present As Dimethylamine Salt)	Herbicide	<10
Piperonyl Butoxide	Insecticide	<10
Mcpa (present As Amine Salts: Diethanolamine, Dimethylamine, Or Mixed Amines)	Herbicide	<10
Amitrole	Herbicide	<10
Iron Hedta	Herbicide	<10
Tetramethrin	Insecticide	<10
Octylbicyclo Heptene Dicarboximide	Insecticide	<10
Permethrin	Insecticide	<10
D-phenothrin	Insecticide	<10
Pyrethrins	Insecticide	<10
Nonylphenoxypolyethoxyethanol	Adjuvant/ surfactant	<10
D-trans Allethrin	Insecticide	<10
Aminopyralid	Herbicide	<10
Dichlobenil	Herbicide	<10