

University of Northern Iowa

UNI ScholarWorks

Iowa Waste Reduction Center Book Gallery

Iowa Waste Reduction Center

2004

Golf Course Pollution Prevention Guide

Iowa Waste Reduction Center

Copyright ©2004 Iowa Waste Reduction Center

Follow this and additional works at: https://scholarworks.uni.edu/iwrc_facbook

 Part of the [Environmental Sciences Commons](#)

Let us know how access to this document benefits you

Recommended Citation

Iowa Waste Reduction Center, "Golf Course Pollution Prevention Guide" (2004). *Iowa Waste Reduction Center Book Gallery*. 9.

https://scholarworks.uni.edu/iwrc_facbook/9

This Book is brought to you for free and open access by the Iowa Waste Reduction Center at UNI ScholarWorks. It has been accepted for inclusion in Iowa Waste Reduction Center Book Gallery by an authorized administrator of UNI ScholarWorks. For more information, please contact scholarworks@uni.edu.



IOWA WASTE REDUCTION CENTER
University of Northern Iowa



Golf Course Pollution Prevention Guide

The Golf Manual project team would like to extend a special thanks to the following people for their valuable input: Rick Tegtmeier, Golf Course Superintendent of Elmcrest County Club in Cedar Rapids; Brett Hetland, Golf Course Superintendent of Brooks Golf Club in Okoboji; and Kevin Fletcher, Director of Programs and Administration for the Audubon Cooperative Sanctuary Program for Audubon International.

Photos courtesy of Elmcrest Country Club, Cedar Rapids.

table of contents

Introduction: Golf Course Maintenance Pollution Prevention	1
1.0 Waste: Hazardous or Non-Hazardous	3
1.1 Characteristic Hazardous Wastes.....	3
1.2 Listed Hazardous Wastes	3
1.3 Liability and Choosing a Waste Management Company	6
1.4 Non-Hazardous Waste and Special Waste Authorizations.....	7
2.0 Parts Washing	9
2.1 Substitute Non-Hazardous Cleaning Methods	9
2.2 Reduce Toxicity of Solvents	11
2.3 Maximize Solvent Life	13
2.4 Solvent Distillation	14
3.0 Used Oil & Oily Wastes	15
3.1 Road Oiling Ban	15
3.2 Minimize Used Oil-Contaminated Wastes	15
3.3 Recycle Used Oil	17
3.4 Recycle Used Oil Filters	17
4.0 Used Antifreeze	19
4.1 Avoid Improper Disposal	19
4.2 Minimize Spent Antifreeze	19
4.3 On-Site Recycling.....	20
4.4 Off-Site Recycling.....	20
5.0 Wastewater & Sludge	21
5.1 Reduce the Amount of Wastewater Generated	21
5.2 Reduce Wastewater Toxicity	21
5.3 Discharge Wastewater for the Least Environmental Impact	22
5.4 Levels of Toxics in Sludge	23
6.0 Batteries	25
6.1 On-Site Battery Storage	25
6.2 Used Battery Recycling	25
7.0 Aerosol Cans/Empty Paint Containers	27

table of contents (continued)

8.0	Fluorescent Bulbs	29
9.0	Petroleum Product Storage	31
10.0	Pesticides	33
10.1	Labels	33
10.2	Storage	34
10.3	Spill Management.....	35
10.4	Disposal	36
10.5	Recordkeeping	37
10.6	Iowa Administrative Code – Summary on Certified Pesticide Application	38
10.7	Iowa Administrative Code – Summary on Iowa Pesticide Storage	40
11.0	Fertilizers	43
11.1	Storage	43
11.2	Spill Management.....	43
11.3	Disposal	43
12.0	Audubon International: Integrated Pest Management.....	45

Golf Course Maintenance Pollution Prevention

According to the Environmental Protection Agency (EPA), pollution prevention can be defined as: “The use of materials, processes, or practices that reduces or eliminates the creation of pollutants or wastes at the source.” Pollution prevention represents a shift away from the old school of thought, “pollution control,” in which waste was not dealt with until after it was generated. Through pollution prevention, we look at the processes that generate the waste to see if we can avoid creating a waste in the first place, or at least reduce the hazardous nature of the waste. When this is not possible, the next best solution to prevent wastes from having a negative impact on the environment is through careful management and recycling.

This manual will help golf course maintenance staff identify areas where pollution prevention techniques can be applied in a practical manner. Each section presents a waste type common to golf courses accompanied by pollution prevention recommendations.

Although the focus of this manual is on pollution prevention, regulatory information is given as necessary where it impacts pollution prevention practices and to illustrate how pollution prevention can help reduce regulatory requirements.



Elmcrest Country Club

1 Waste: Hazardous or Non-Hazardous?

Knowing what makes a waste hazardous is important in understanding why it should be reduced or eliminated and in choosing non-hazardous alternatives.

A material becomes a waste when it can no longer be used or reused in its existing form and requires disposal or treatment. In other words, if a material can be reused without being treated, then it is not considered a waste. Reusing materials on or off site can reduce waste generation. Examples of reuse can be as simple as reusing cardboard boxes for shipping or reusing dirty parts wash solvent for pre-cleaning parts to extend solvent life.

A waste is hazardous if it exhibits a specific characteristic, or if it is included in any of the four specifically listed categories of hazardous wastes.

1.1 ■ Characteristic Hazardous Wastes

There are four characteristics that can make a waste material a hazardous waste: ignitability, corrosivity, reactivity and toxicity¹.

IGNITABILITY:

A liquid waste is ignitable if its flashpoint is less than 140°F. A non-liquid waste is ignitable if it is capable of spontaneous combustion. Ignitable hazardous wastes have the EPA waste number D001. Examples of potentially ignitable wastes are:

- Petroleum parts wash solvents
- Solvent-based paint waste
- Waste kerosene or gasoline

CORROSIVITY:

A waste is corrosive if its pH is less than or equal to 2.0, or greater than or equal to 12.5. Corrosive hazardous wastes have the EPA waste number D002. Examples of potential corrosive wastes are:

- Acid or alkaline cleaning solutions
- Rust removers
- Battery acid
- Caustic hot tank waste

REACTIVITY:

A waste is reactive if it reacts violently with water, forms potentially explosive mixtures with water, generates toxic gases when mixed with water, contains cyanides or sulfides that are released when exposed to acid or alkaline materials, or is explosive. Reactive hazardous wastes have the waste number D003.

TOXICITY:

A waste is toxic if it fails the “Toxicity Characteristic Leaching Procedure” (TCLP) test for any one of 40 parameters. The TCLP parameters, regulatory levels, and waste number are listed in Table 1. If test results from a representative sample of waste meet or exceed any one of the listed regulatory levels, the waste is toxic. Examples of potential toxic wastes are:

- Painting wastes including used paint booth filters and floor sweepings, masking and paint contaminated rags
- Oily wastes such as used oil filters, shop rags, and oil absorbent
- Floor drain sump sludge

To determine toxicity according to the TCLP, use the following procedure:

1. Take a representative sample of the suspect waste. Representative means that the amount and type of waste in the sample to be tested reflect the actual composition of the waste that will require disposal.
2. Send the sample to a laboratory to be analyzed for the TCLP parameters that are potentially present in the waste. A list of analytical laboratories can be accessed via the IWRC's website, www.iwrc.org, click on 'Small Business Tools,' click on 'Vendor Database,' and choose 'Laboratories' from the drop down box. Laboratories can also provide clean sample containers and sampling instructions.
3. If the test results indicate that one or more of the TCLP parameters exceed regulatory levels found in Table 1, the waste is hazardous and must be stored and recycled/disposed of as such. A list of hazardous waste management companies can also be found on the IWRC website.
4. If the test results for all the parameters are below the regulatory levels, the waste is non-hazardous and may be managed as such (for example, disposed of in a landfill). Ensure that a Special Waste Authorization (SWA) has been obtained for waste being disposed of to the landfill as discussed in Section 1.4.

**Table 1:
Toxicity Characteristic Leaching Procedure (TCLP)**

Parameter	Regulatory Level	EPA Hazardous Waste #
Arsenic*	5.0 mg/l	D004
Barium*	100.0 mg/l	D005
Benzene**	0.5 mg/l	D018
Cadmium*	1.0 mg/l	D006
Carbon tetrachloride**	0.5 mg/l	D019
Chlordane	0.03 mg/l	D020
Chlorobenzene**	100.0 mg/l	D021
Chloroform**	6.0 mg/l	D022
Chromium*	5.0 mg/l	D007
m-Cresol	200.0 mg/l	D024
o-Cresol	200.0 mg/l	D023
p-Cresol	200.0 mg/l	D025
Cresols (total)	200.0 mg/l	D026
1,4-Dichlorobenzene	7.5 mg/l	D027
1,2-Dichloroethane**	0.5 mg/l	D028
1,1-Dichloroethylene**	0.7 mg/l	D029
2,4-Dinitrotoluene	0.13 mg/l	D030
Endrin	0.02 mg/l	D012
Heptachlor (and its epoxy)	0.008 mg/l	D031
Hexachlorobenzene	0.13 mg/l	D032
Hexachloro-1,3-butadiene	0.5 mg/l	D033
Hexachloroethane	3.0 mg/l	D034
Lead*	5.0 mg/l	D008
Lindane	0.4 mg/l	D013
Mercury*	0.2 mg/l	D009
Methoxychlor	10.0 mg/l	D014
Methyl ethyl ketone**	200.0 mg/l	D035
Nitrobenzene	2.0 mg/l	D036
Pentachlorophenol	100.0 mg/l	D037
Pyridine	5.0 mg/l	D038
Selenium*	1.0 mg/l	D010
Silver*	5.0 mg/l	D011
Tetrachloroethylene**	0.7 mg/l	D039
Toxaphene	0.5 mg/l	D015
Trichloroethylene**	0.5 mg/l	D040
Vinyl chloride**	0.2 mg/l	D043
2,4,-D	10.0 mg/l	D016
2,4,5-TP	1.0 mg/l	D017
2,4,5-Trichlorophenol	400.0 mg/l	D041
2,4,6-Trichlorophenol	2.0 mg/l	D042

*Heavy metals

**Volatile Organic Compounds (VOCs)

Thorough Knowledge

In some cases, a waste can be determined hazardous or non-hazardous without laboratory testing based on “thorough knowledge” of the contents of the waste and the processes generating it. Thorough knowledge is most accurate for wastes that are unused or have not been contaminated with other materials. Reviewing material safety data sheets (MSDS) will provide some information about the contents of a material. Since not all ingredients in a product are always listed on the MSDS, additional testing or information may be necessary to make a waste characterization. In addition, wastes will probably contain contaminants not addressed by the MSDS.

When the amount and type of contaminants in a waste are unknown, TCLP testing is normally recommended to make a hazardous/non-hazardous waste determination. In some cases, however, thorough knowledge might be used in place of testing a specific facility’s waste. If there is sufficient TCLP test data available indicating that a consistent waste stream from a specific industry is typically not hazardous, you may be able to apply the data to your facility. Your hazardous waste regulatory agency will decide if this is acceptable.

Remember that each facility is responsible for making an accurate hazardous/non-hazardous determination on all of its wastes. You must balance the cost of testing with the possible risk of liability and regulatory fines.

1.2 ■ Listed Hazardous Wastes

The federal Environmental Protection Agency (EPA) has designated specific materials as hazardous waste due to their consistent nature and widespread distribution². There are four “lists” of hazardous waste, known by the letter used in the hazardous waste number: “F”, “K”, “P”, and “U”. Each of these lists is explained briefly below:

F-Listed Wastes:

F-Listed wastes include a wide variety of commonly found wastes, ranging from solvents to wastewater treatment sludge’s to dioxin-contaminated materials.

K-Listed Wastes:

These are hazardous wastes from specific processes, many of which are chemical or pesticide manufacturing. An example is “wastewater treatment sludge from the production of toxaphene.”

P-Listed Wastes:

P-Listed wastes are acutely toxic chemicals in their unused form only. Examples include arsenic trioxide (gopher bait) and warfarin (rat poison).

U-Listed Wastes:

U-Listed wastes are toxic commercial chemicals, off-specification products, or manufacturing chemical intermediates, also only in the unused form. Examples include creosote, DDT and formaldehyde.

1.3 ■ Liability and Choosing a Waste Management Company

Each business has “cradle-to-grave” liability for all the waste it generates, both hazardous and non-hazardous. This means that responsibility for the waste continues even after the waste leaves the facility for transportation and disposal. Reducing waste is the best way to reduce liability. The pollution prevention practices in this guide will help to reduce liability by minimizing or eliminating wastes.

When you cannot avoid generating a waste, you should protect your business by dealing only with reliable waste management companies to recycle or dispose of your waste. Remember that no one can take away your liability once you have generated a waste, despite advertising claims. The following is a list of a few of the requirements that necessitate waste disposal:

1. Hazardous waste must be transported off site for treatment, recycling or disposal by an EPA/DOT-permitted hazardous waste transportation company
2. Hazardous waste manifests are required for all shipments of hazardous waste and are to be signed by the waste generator and the transporter when hazardous waste is picked up. The manifest is then signed and dated by the disposal or recycling facility upon receipt of the shipment. This copy is returned to the generator and should be kept on file to document compliance
3. Land Ban forms must accompany the manifest and be kept on file at the generator’s site. Land Ban regulations apply to wastes that are banned from land disposal, such as most petroleum-based solvents

For a list of hazardous waste management companies, check out our website at <http://www.iwrc.org>. Click on ‘Small Business Tools’, then click on ‘Vendor Database’, select ‘Hazardous Waste’, and finally, choose ‘Hazardous Waste Management Companies,’ from the subclass option.

1.4 ■ Non-Hazardous Wastes and Special Waste Authorizations

If your golf course generates **non-hazardous** process wastes, a Special Waste Authorization (SWA) issued by the Iowa Department of Natural Resources (IDNR) may be required if these wastes are to be landfilled in the state of Iowa. Common materials SWAs include sludge, used floor dry, and floor sweepings.

The applicability of a waste to SWA requirements is determined by the Iowa Department of Natural Resources and the applicable landfill³. Therefore, it is advisable to treat all non-hazardous process/production wastes as potential special wastes and follow the requirements in this summary. The IDNR can then determine if the waste requires a SWA and send back written notification either in the form of a SWA or an exemption letter.

General Requirements

- Commercial and industrial non-hazardous solid wastes require an SWA prior to disposal
- A Request for an SWA must be submitted to the IDNR
- Special wastes cannot contain free liquids
- SWAs are issued for a maximum of three years
- Waste disposal facilities/landfills are not required to accept special wastes, however, if they refuse acceptance they must identify alternative waste management options

Benefits - What are the benefits of disposing of waste with an SWA?

The SWA regulations reduce potential liability from disposal of commercial and industrial wastes in Iowa landfills. The rule requires testing to ensure wastes are non-hazardous and informs the landfill of the material disposed and the quantities involved. It also assists the landfill in determining if the material can be handled at the facility and if any special packaging/handling requirements will be necessary.

For additional information on disposal of non-hazardous wastes in the State of Iowa, a detailed summary on SWAs, and an SWA application, visit the IWRC's website, www.iwrc.org, click on 'Small Business Tools,' click on 'Regulatory Summaries,' and then click on 'Disposal of Special Wastes in Iowa.'

2 Parts Washing

Currently, petroleum-based solvents are widely used to remove grease and dirt from parts. These solvents are usually hazardous because of ignitability and/or toxicity. There are three basic approaches to pollution prevention in parts washing:

- Substitute non-hazardous cleaning methods
- Use less toxic solvents
- Maximize solvent life

2.1 ■ Substitute Non-Hazardous Cleaning Methods

Replacing hazardous parts wash solvent with non-hazardous substitutes is one pollution prevention alternative. There are many water-based degreasers and cleaning systems on the market today. If you are considering changing to a water-based cleaner, you should first test the product to determine its effectiveness for your application. Using a non-hazardous degreaser is only beneficial if it does the job.

Water-based parts washing alternatives include:

- Hot Soap or Jet-Spray Washers and
- Aqueous Cleaners (Alkaline and Microbial)



An alternative to water-based washing is this Jet-Spray washer unit

Hot Soap Washers

Hot soap or jet spray washers are like “dishwashers” for parts. They use non-toxic detergent and hot water to remove oil, grease, and dirt. Parts are placed inside the washer and the lid is closed during cleaning. Hot soap washers are available in varying sizes offering both high-pressure and low-pressure models. High-pressure models use strong jets of hot water and detergent to cut grease. Low-pressure models circulate the water around parts to loosen and remove dirt and grease.

The benefits of hot soap washers include:

- Reduced or eliminated employee exposure to hazardous solvents
- Less employee time spent parts washing
- Lower cost of cleaning materials
- No or less hazardous waste for disposal

Cost

The size of hot soap washer needed depends on the size of parts to be cleaned and the frequency of cleaning. Smaller hot soap washers (25 gallons) are available starting at roughly \$1900 to \$3000, depending on the model and manufacturer.

Maintenance

Sludge from oil, grease and other contaminants will accumulate in the washer. To extend the life of the detergent, this sludge should be cleaned out frequently. Prior to disposal, this sludge must have a hazardous/non-hazardous waste determination performed through TCLP testing for the heavy metal and VOC parameters listed in Table 1. Non-hazardous sludge can be dried and landfilled (accompanied by an SWA), or managed by a septic tank cleaning company. Land application of sludge is not recommended since even non-hazardous sludge may contain enough oil or heavy metals to contaminate soil or groundwater. If non-hazardous sludge is land applied, do so in accordance with applicable regulations.

Hazardous sludge should be stored in a sealed container labeled “**Hazardous Waste**,” included in the facility’s hazardous waste inventory, managed on site in compliance with the applicable hazardous waste regulations (i.e., CESQG or SQG), and disposed of off site by an EPA-permitted hazardous waste management company.

Some hot soap washers evaporate water so that more has to be added. Others generate wastewater that must be disposed of. Wastewater from hot soap washers may be discharged to the city sewer, provided approval is obtained from the local wastewater treatment authority (preferably in writing and kept on file for documentation). If wastewater pH is above local discharge limits, simple neutralization may be required. Prior to discharge, oil must be removed from the wastewater. Oil skimmers are available as an option on the washers, or can be purchased separately. The cost for small skimmers ranges from \$400 to \$800.

Disadvantages

Disadvantages of hot soap washer include the risk of parts rusting, and wastewater disposal problems for facilities not connected to the city sewer. Treatment with rust proofing chemicals after cleaning will help prevent rusting. Contact your vendor to obtain a rust proof package.

Hot soap washers may not be a good choice for facilities using septic tanks and leach fields. Hot soap washer wastewater should not be discharged to septic tanks because it may interfere with the bacterial function of the system and because it is in violation of IDNR policy. Contaminants in untreated wastewater can accumulate and cause environmental problems. If the wastewater is hazardous, discharge to a septic system would be illegal disposal.

The best solution for facilities connected to septic or direct discharge systems is to connect to the city sewer. If that is not possible, the water can be collected in a holding tank categorized as hazardous or non-hazardous and hauled to the nearest wastewater treatment plant if the water is non-hazardous. Other options for non-hazardous wastewater are to recycle or evaporate it on site, although this equipment is usually expensive. Wastewater determined to be hazardous must be collected in a sealed and labeled container, accounted for in a facility-wide hazardous waste inventory, managed on site in compliance with applicable hazardous waste regulations and disposed off site by an EPA-permitted hazardous waste management company.

Aqueous Cleaners

These cleaners are less toxic, water-based alternatives to petroleum-based solvents. They are composed of cleaning agents including detergents, alkaline chemicals, microbes, or a combination of these. For a current list of aqueous cleaners, visit the IWRC website at www.iwrc.org; click on Small Business Tools; click on Vendor database; choose ‘Solvent Parts Cleaning Alternatives.’

Benefits include:

- Less risk of hazardous material exposure to workers than traditional petroleum-based solvents
- Less risk of fire than from ignitable solvents
- Potentially decreased disposal costs since used aqueous cleaners may be eligible for discharge to the city sewer

Because spent aqueous cleaners are not ignitable, they may be discharged to the city sewer with prior approval from the wastewater treatment plant. Disposal of spent aqueous cleaners in a septic system is **not recommended** because the spent cleaners may contain ingredients that will interfere with the bacterial activity in the septic tank and because it violates IDNR policy. Spent aqueous cleaners may be hazardous because of toxicity content from contamination from heavy metals, grease and oils. If aqueous cleaners are disposed off site, a hazardous waste determination must be performed through TCLP testing of the heavy metals and VOC parameters listed in Table 1.

Grease and oil from parts will accumulate in the parts washer. This sludge should be managed as outlined in the maintenance section for hot soap washers.

a. Aqueous Alkaline Cleaners

Alkaline cleaners are those that have a high initial pH, usually between 10 and 12. For parts washing purposes, alkaline cleaners are routinely diluted in a ratio from one to three (1:3) to one to ten (1:10).

b. Aqueous Microbial Cleaners

Microbial cleaners contain soaps that loosen the grease from parts and microbes that reportedly decompose the grease, turning it into water and carbon dioxide. Microbial cleaners can be used for parts cleaning and for small spill cleanups. Microbial cleaners come packaged with a container of liquid emulsion containing a stable oxygen source and nutrients for the microbes, and a separate container of microbes. The mixed solution has a shelf life of about 60 days and must be kept within an optimal temperature range of approximately 75-95 for best functioning of the microbes. Spent microbial action solution can be discharged to the city sewer with prior approval and a hazardous/non-hazardous waste determination. Again, do not discharge this spent solution to a septic system.

Disadvantages

Drawbacks to aqueous cleaners include inadequate cleaning power for some purposes, the risk of parts rusting, and the need for final rinsing with water. To combat corrosion, rust inhibitors are often added to cleaners. Check to see whether a cleaner contains a rust inhibitor, or whether one needs to be added. To determine whether a cleaner will serve your specific needs, sample it prior to purchase. Disadvantages of microbial cleaners may include foul odors and/or limited solution life after mixing.

Cost

The cost of concentrated aqueous alkaline-type cleaners is approximately \$6 to \$10 per gallon. After dilution, the cost per gallon ranges from about \$0.60 to \$3.33. Microbial cleaners are priced at approximately \$20 per gallon in the concentrated form.

2.2 ■ Reduce Toxicity of Solvents

Petroleum-based solvents used in degreasing have varying degrees of toxicity. The following information will help in the choice of the least hazardous solvent that is effective in performing the desired task.

Highly Toxic Solvents to Avoid

Among the solvents to avoid are “halogenated” solvents, which are toxic to humans and may potentially damage the ozone layer. The most common “halogen” element in degreasing solvents is chlorine. An example of a halogenated, ozone-depleting solvent that has been used for degreasing is 1,1,1 trichloroethane, but is being phased out by federal regulations.

Also to be avoided are the solvents listed by the EPA as being hazardous due to their negative health and environmental effects.

Less Toxic Solvents

Non-halogenated Petroleum-based Solvents

If petroleum-based solvents are desired for the job, use those that are less toxic than the listed or halogenated solvents. These less toxic solvents include naphtha, mineral spirits and Stoddard solvent. These solvents are less toxic, but keep in mind that they can cause adverse health affects, such as skin irritation, and will be hazardous wastes upon disposal/recycling if the flashpoint is below 140°F or if TCLP parameters are present above the regulatory limits. The cost of mineral spirits is approximately \$4 per gallon.

Table 2 EPA-Listed Hazardous Solvents Commonly Used In Degreasing

Carbon tetrachloride*
methylene chloride*
Trichloroethylene*
1,1,1 trichloroethane*

Chlorinated fluorocarbons*
Methyl ethyl ketone
toluene

Chlorobenzene*
tetrachloroethylene (perc)*
Xylene

**Halogenated solvents*

Some newer petroleum-based solvents are formulated to have flashpoints above 140°F. While these solvents are not hazardous because of ignitability, they may acquire toxic amounts of heavy metals and VOCs from greasy parts. Both the spent cleaner and the sludge that accumulates in the parts washer should be determined hazardous or non-hazardous through appropriate TCLP testing (heavy metals and VOCs) prior to disposal. Petroleum-based products may not be discharged to the city sewer or a septic system.

Terpenes

Terpene solvents are hydrocarbons derived from wood or citrus fruits, and are used in degreasing. One of the most common terpenes used in parts washing is d-limonene, which is derived from lemon or orange peel oils. The **advantages** of terpenes are that they are:

- Not ozone depleting
- Derived from renewable resources (citrus fruit peels)

The **disadvantages** of terpenes include:

- High toxicity to aquatic life
- High cost

Terpenes are available alone or in mixtures with petroleum-based solvents. Used terpenes or terpene mixtures with a flashpoint below 140°F will be hazardous waste because of ignitability. Spent terpene solvents with a flashpoint above 140°F are not considered ignitable but a hazardous waste determination should be performed on the waste through appropriate TCLP testing (heavy metals and VOCs) prior to disposal. Spent terpenes should not be discharged outdoors or to the city sewer or septic system. They should be recycled (e.g., fuel blending) through a hazardous waste management company or used oil marketers (if the spent terpenes are non-hazardous). Contact your used oil marketer prior to adding terpenes to used oil.

Cost

Terpene solvents generally range in price from \$10 to \$18 per gallon, with some blends costing as much as \$35 per gallon.

At least one supplier provides a chemical additive that prolongs the life of the terpenes. The chemical is a clarifier that is added to the terpene mixture and causes most of the contaminants to settle out. After addition of the clarifier, the grease and dirt will settle to the bottom of the container, and the solvent mixture will be clear. The grease and dirt sludge should then be removed. A hazardous waste determination on the sludge through appropriate TCLP testing (heavy metals and VOCs) is necessary prior to disposal.

2.3 ■ Maximize Solvent Life

Good operating practices that increase efficiency in solvent use can maximize solvent life and reduce waste. Solvents should be used in parts washer with lids rather than open buckets or pans, which often results in unnecessary evaporation and spillage.

Parts washers pump solvent up from a reservoir through a spigot (often equipped with a brush) into a work basin. The solvent drains back into the reservoir through a screen in the bottom of the basin. Screens are typically made of reusable metal. Metal screens are preferred since disposable filters are potentially a hazardous waste stream. Another feature to consider is draining parts prior to removing them from the washer. Drain shelves either come standard with the parts washer or are available as an option.

Parts washers may be leased with a service agreement or purchased and serviced in house. When a service agreement exists, shops are cautioned to change the solvent only when necessary. Negotiate service agreements to avoid unnecessary disposal. When more than one parts washer is used, skip a servicing session for one of the washers, while replacing solvent for the remaining washers as usual. Designate the parts washer with contaminated solvent “for dirty parts only” and reserve parts washers with new solvent for final cleaning. This extends the life of the solvent. Remember, the more often your solvent is changed, the more waste you generate, and the more cost and liability you incur. A list of solvent waste management companies can be obtained from the IWRC’s website, www.iwrc.org, click on ‘Small Business Tools,’ click on ‘Vendor Database,’ and choose ‘hazardous waste’ from the drop down menu.

Costs

Parts washer costs vary greatly because of size, the type and quality of construction material, and added features such as parts baskets or drain shelves.

Some parts washers have filter units that extend the life of the solvent by filtering out contaminants. Dirty solvent passes through the filtering unit where contaminants are removed, and clean solvent goes back into the reservoir for reuse. Filter-type parts washers require less frequent servicing than traditional parts washers and will reduce the amount of waste solvent generated.

The type and location of the filters on the parts washer vary. Enclosed disposable fabric filter units mounted on the side of the washer remove primarily particulates. Clay-containing filter units that are placed in the solvent reservoir or in the parts wash-basin remove primarily oil and grease. Remember that a hazardous waste determination through appropriate TCLP testing (heavy metals and VOCs) should be performed on the used filters prior to disposal.

Units may be leased that use cyclonic action rather than an actual filter to remove solids. The solvent passes through a “filtering” unit where cyclone (centrifugal) action is initiated, causing the solids to settle out where they can be collected for disposal.

To extend the effective life of solvent in a parts washer:

- Keep parts washer lids closed and spray nozzles turned off when not in use
- Locate the units away from heat sources and drafts to minimize loss by evaporation
- Mechanically pre-clean parts by scraping or wire brushing
- Drain parts thoroughly prior to removing them from the parts washer to prevent dragout (loss of solvent adhering to parts)
- Install a shelf in the parts washer to facilitate draining. The shelf should not interfere with closing the lid
- Use only the size and number of parts washers necessary. Eliminate parts washers that are not used often
- Avoid unnecessary cleaning – determine what level of cleaning is required
- Replace solvent only when it is no longer usable. Extend service contract change-out schedule based on seasonal usage

2.4 ■ Solvent Distillation

If parts wash units are owned by the shop, on-site distillation (recycling) can reduce waste effectively. Used solvent is placed in the still, heated to the boiling point, and then the resulting vapors are cooled, producing nearly pure liquid solvent that can be reused.

Solvent stills are available in a range of sizes, depending on needs of different shops. Be aware that stills have different heat settings. Solvents with high boiling points may require a vacuum assist attachment. Table 3 gives average prices of solvent distillation equipment obtained from Midwestern vendors.

Table 3
Solvent Distillation Equipment Costs

Still Capacity	Cost	Vacuum Assist
2 gallons	\$2,100	\$1,400 extra
3.5 gallons	\$3,000	\$1,700 extra
5 gallons	\$4,000	\$2,000 extra
7.5 gallons	\$4,700	\$2,300 extra
15 gallons	\$8,500	\$4,500 extra

Be careful to keep solvents separate to ensure maximum purity after distillation. Contaminants in the solvent will form a residue after distillation called “still bottoms.” Heat resistant plastic bags can be purchased to place in the heating chamber to hold the still bottoms after distillation. The bags reduce the need to clean the inside of the still.

Costs

When estimating the cost savings from on-site solvent recycling, take into account the cost of new solvent and the cost of off-site disposal.

In general, shops that generate 50 gallons of waste solvent per month will obtain payback on a small still in just over one year.

Do not forget to use caution when operating a solvent still. Follow manufacturer’s instructions. Add only the amount and types of solvent recommended by the manufacturer. Stills will emit some solvent fumes during operations. Be sure to wear a respirator.

Solvent stored on site prior to recycling should be stored in labeled containers. The storage containers should be in good condition and located on an impermeable surface, away from drains and fire hazards. The storage area should have secondary containment to contain solvent in case of a spill or leak.

Solvent filtration units are also available to recycle solvent. The solvent is removed from the parts washers and placed in the filtration unit where a series of filters removes contaminants. The cost of a 30-gallon unit is approximately \$7,000.

Both filters and still bottoms will require hazardous waste determinations through appropriate TCLP testing (heavy metals and VOCs). However, due to the small quantity of filters and still bottoms likely to be generated at golf course maintenance shops, they may be considered hazardous waste to avoid TCLP testing fees.

3 Used Oil and Oily Wastes

The majority of used oil generated at golf courses is the result of normal vehicle and equipment maintenance operations. Oil-contaminated wastes include disposable shop rags and used oil absorbent materials.

The goals of pollution prevention for used oil and oil-contaminated waste for maintenance areas are:

- Minimize used oil-contaminated wastes,
- Recycle used oil properly, and
- Recycle used oil filters

3.1 ■ Road Oiling Ban

The application of used oil for dust suppression or weed killing on gravel roads, parking lots or elsewhere is illegal under federal law. Used oil readily contaminates soil and ground or surface waters. Even small amounts of oil produce a visible sheen that indicates problems.

3.2 ■ Minimize Used Oil-Contaminated Wastes

Shop Rags

Disposable shop rags used to wipe greasy parts are potentially hazardous because of oil and grease or solvent contamination, and must be determined hazardous or non-hazardous through TCLP testing (heavy metals and VOCs) prior to disposal. Note that disposable rags contaminated with a listed hazardous waste are hazardous by definition. Switching to launder service cloth rags will minimize this waste type and eliminate the need for testing the rags. Soiled cloth rags sent to a laundry facility are not considered a waste at the user's site since they are being reused. Wastewater from washing the rags is the responsibility of the laundry facility. Be aware that laundry facilities will not accept rags with excessive amounts of oil or solvent. Wring rags into the appropriate container (i.e. used oil into the used oil container) before sending them to the cleaner. Store dirty rags in a container that will not absorb oil or leak. Partially used rags can be stored separately and labeled for reuse prior to laundering.

If a laundry service is not feasible, minimize disposable shop rag waste. Use rags completely prior to discarding them. Cut over-sized rags in half or in quarters to reduce waste.

Oil Absorbent

Another source of oily waste is oil absorbent (clay or other disposable absorbent material) used to clean up spills and drips. The absorbed oil is lost and cannot be recycled or burned for energy recovery. In addition, used oil absorbent is potentially hazardous and must be determined hazardous or non-hazardous through TCLP testing (heavy metals and VOCs) prior to disposal. Used oil absorbent that tests hazardous must be disposed of by a hazardous waste management company. Non-hazardous used oil absorbent with no free liquids may be landfilled (subject to approval by the landfill, local regulations and accompanied by an SWA).

To avoid or minimize this unnecessary waste, catch drips before they end up on the floor using a drip pan underneath leaking vehicles/equipment when possible. Drips pans should have sufficient volume to capture the amount of oil that may leak, and should not be easily tipped over. Oil-laden parts that have been removed for repair or replacement should be placed on a drain pan rather than being allowed to drain onto the floor. Used oil in the drip pans should be drained into a used oil container,

and drip pans should be stored carefully to prevent spills. For example, store smaller drip pans over a larger drip pan to avoid contaminating the floor. Drip pans used for different fluids should be segregated. For example, do not use the oil drip pan to collect solvent.

When overhead work is being done, it may not be feasible to use drip pans on the floor. (Who wants to stand in one?!) When a drip pan cannot be used, absorbent pads or elevated drip pans may be used to keep leaks off the floor.

Absorbent pads last longer than traditional clay oil absorbent, but are disposable and must be determined hazardous or non-hazardous through TCLP testing (heavy metals and VOCs) prior to disposal.

Spill Cleanup

Some oil spills are bound to occur. The use of disposable oil absorbents should be minimized or eliminated completely. A good alternative for spill clean-up is to use launderable rags or a specially designated mop and bucket. Special oil-absorbing mops are available. The oil can be wrung into the used oil container and recycled. A list of reusable oil absorbent suppliers can be obtained from the IWRC's website, www.iwrc.org, click on 'Small Business Tools,' click on 'Vendor Database,' and choose 'Oil' from the drop down menu.

When purchasing oil absorbent materials, be sure to consider their reusability. Absorbent "socks" for example, may be reused about 10 times, but must then be determined hazardous or non-hazardous through TCLP testing (heavy metals and VOCs) prior to disposal. Roller-wringers are available to remove the maximum amount of oil from the socks. Be wary of oil absorbent products advertising "biodegradability" as they may have many of the same disposal concerns as non-biodegradable products.

Once the bulk of the spill is cleaned, a soap and water solution may be used to clean the residual oil sheen. This wastewater can be discharged to the local wastewater treatment plant. Do not discharge this water directly outdoors or to a septic system since even non-toxic soaps can pollute soil and streams and inhibit the functioning of a septic system.



A used oil storage container

On-Site Oil Storage

Maintain oil storage tanks or drums in good condition. Inspect all used oil storage areas regularly for leaks and spills. To prevent contamination from spills, locate used oil containers on an impermeable surface preferably with a containment system that can retain a volume of oil equal to the storage capacity of the largest container. If a container is leaking, fix it immediately or transfer all oil to another container. Storing drums on pallets facilitates leak detection. Any oil spills or ground contamination should be cleaned up immediately to prevent the spread of contamination. Protection from vandalism is also a consideration with outdoor storage. Store oil in a locked area if possible.

To help prevent spills, use large drum funnels to pour used oil into storage containers. After use, remove the funnel and close the drum to avoid contaminating the used oil. Store funnels over a drip pan to ensure that oil remaining on the surface of the funnel will be contained. Place this residual oil in the used oil storage container.

If economically feasible, purchase oil in bulk, instead of quart-sized containers. Purchasing in bulk is less expensive and minimizes waste. Bulk oil dispensers are available for easier and cleaner measuring.

3.3 ■ Recycle Used Oil

The best used oil management options for golf courses are to:

- Burn used oil on site for energy recovery in an approved used oil space heater, or
- Provide used oil to a used oil “marketer” or an approved collection center

Do not add hazardous solvents to used oil, because the resulting mixture may be a hazardous waste, or may be unsafe to burn. Adding refrigerant to oil is strongly discouraged because the chlorofluorocarbons contained in this oil will likely cause the used oil parameters to exceed burning specifications and cause the used oil marketer to reject it. Before adding non-hazardous fluid other than used oil, make sure that practice is acceptable by contacting the used oil space heater manufacturer or used oil marketer/collection center.

Used Oil Space Heaters

Shops may burn their own used oil and oil from do-it-yourselfers (private citizens and farmers generating fewer than 25 gallons per month) in specially designed used oil space heaters. Oil contaminated with hazardous waste should not be burned in space heaters.

According to used oil regulations, used oil space heaters must have a capacity of 500,000 BTU per hour or less, and be vented outside. These heaters are priced at about \$4,000 for the equipment and \$1,600 and up for installation. A list of current used space heater suppliers can be obtained from the IWRC’s website, www.iwrc.org, click on ‘Small Business Tools,’ click on ‘Vendor Database,’ then choose ‘Oil’ from the drop down box.

Benefits of on-site used oil space heaters include reduced liability since oil is not transported off-site and reduced energy costs for heating.

Used Oil Marketer/Recycler

A used oil marketer collects used oil and provides oil, as fuel, directly to a burner. Marketers are required to test the oil prior to burning to ensure that the oil meets EPA specifications. Used oil marketers generally offer transportation services. Depending on the marketer, the generator may be paid a small amount of money for the used oil, or they may have to pay the marketer. Since the generator is liable for contamination resulting from mismanaged used oil, marketers should be chosen carefully to ensure that the oil is recycled properly. A list of used oil marketers can be obtained from the IWRC’s website, www.iwrc.org, click on ‘Small Business Tools,’ click on ‘Vendor Database,’ then choose ‘Oil’ from the drop down box. Additionally, used oil in quantities less than 55 gallons may be self-transported to a state-recognized used oil collection center or Regional Collection Center (RCC) of household hazardous waste. The following link provides RCC locations and contact information: <http://www.state.ia.us/dnr/organiza/wmad/wmabureau/safesmartolutions/rccContactInfo.pdf>.

3.4 ■ Recycle Used Oil Filters

When removing an oil filter during an oil change, make sure to put a drip pan underneath the vehicle to catch any oil that spills during the operation. After the filter has been removed, the residual oil must be removed prior to disposal or metal recycling. Methods to remove oil from used filters include:

- Hot-draining (near engine operating temperature) for a minimum of 12 hours, after puncturing either the anti-drain back valve or the dome end of the filter
- Hot-draining and crushing
- Hot drain and dismantle

Hot draining and crushing is the preferred method since it removes considerably more oil than draining alone, and reduces the volume of the filter. Be sure to take spill prevention steps during crushing, including a drip pan or drum large enough to catch all oil from the filter. A list of oil filter crusher suppliers can be obtained from the IWRC's website, www.iwrc.org, click on 'Small Business Tools;' click on 'Vendor Database,' then choose 'Oil' from the drop down box. Crushed filters may be accepted by local scrap dealers for recycling.

When moving filters, avoid spills by putting the filters on a tray and storing them in a container that will not leak. Many shops use mobile oil filter-draining containers on wheels for easy and clean transporting. Remember to empty the mobile containers into the used oil storage container frequently enough to avoid overflowing.

While many states allow landfill disposal of properly drained oil filters, the casings are high quality metal and should be recycled. Although some metal recyclers do not accept used oil filters because of the possibility of contamination from residual oil in the filters, there are companies that specialize in oil filter recycling. Oil filter recyclers often provide a drum to collect the filters, and they usually either shred the filters or crush them together into large briquettes. The used oil is recovered and recycled and the metal is sent to a scrap dealer. This service costs about \$70.00 to \$90.00 per drum of uncrushed filters. Contact recyclers for more information. A list of oil filter recyclers can be obtained from the IWRC's website at www.iwrc.org, click on 'Small Business Tools,' click on 'Vendor Database,' then choose 'Oil' from the drop down box.

4 Used Antifreeze

Used antifreeze is generated from the servicing of vehicles, either expressly to replace the antifreeze, or indirectly when antifreeze is removed to service parts such as radiators, thermostats, or water pumps.

Antifreeze becomes less effective when the ingredients break down and contaminants accumulate. These contaminants include calcium, magnesium, chloride and sulfate from the make-up water, and dissolved and suspended metals from contact with cooling system parts. Ethylene glycol may degrade into acids, thus lowering the pH of the coolant, and increasing the likelihood of corroding metal parts. If dissolved metal levels, such as lead or chromium are high enough, used antifreeze may be a hazardous waste.

Antifreeze requires changing or treatment when its corrosion protection abilities decrease or it no longer provides adequate protection against freezing. Freeze point can be tested with hand-held testers that can be obtained from some antifreeze recycling equipment vendors and most auto parts stores. The pH can be checked using test paper or hand-held pH meters.

Propylene glycol has been introduced as “non-toxic antifreeze” because it is less toxic to humans and animals than ethylene glycol. Spent propylene glycol, however, is also potentially hazardous because of the same contaminants found in used ethylene glycol: fuel, solvents and heavy metals. Mixing propylene glycol and ethylene glycol may cause a problem in accurately reading the freeze point of the antifreeze.

Pollution prevention options for antifreeze are:

- Avoid improper disposal
- Minimize used antifreeze
- On-site recycling
- Off-site recycling

4.1 ■ Avoid Improper Disposal

Never dump antifreeze on the ground or discharge to a septic system. Ethylene glycol is toxic by ingestion and can cause coma and/or death in animals and children who are attracted to its sweet flavor. In addition, used antifreeze will likely contain some level of heavy metals from contact with engine parts. High heavy metal levels may make used antifreeze a hazardous waste.

Septic systems are not appropriate for antifreeze disposal because:

- Antifreeze may interfere with the bacterial functioning of the septic system
- If the antifreeze is hazardous, discharge into a septic system is contrary to IDNR policy and considered illegal disposal of a hazardous waste, subject to fines and clean-up costs

Some municipalities allow discharge of small amounts of non-hazardous used antifreeze to the city sanitary sewer with prior permission from the wastewater treatment plant.

4.2 ■ Minimize Spent Antifreeze

The amount of waste antifreeze can be minimized by replacing it only when necessary. Visually check antifreeze for contaminants, and test for freeze point and pH. Fresh ethylene glycol or corrosion inhibitors can be added to adjust these parameters without disposing of the antifreeze.

When good antifreeze must be removed for repairs only, save it in a clean container, and reuse it in the system after the repairs have been completed. This avoids unnecessary disposal of good antifreeze.

Segregate spent antifreeze from other wastes such as spent parts wash solvent or used oil. Mixing wastes will adversely affect their recyclability.

If antifreeze cannot be reused, recycling is the next preferred option. Recycling can be performed on site by purchasing recycling equipment, or off site through an antifreeze recycling company.

4.3 ■ On-Site Recycling

Antifreeze recycling equipment is available in models that operate either while hooked up to the vehicle (on-vehicle), or after the antifreeze has been removed from the vehicle (off-vehicle). In addition, antifreeze recyclers differ in the way they remove impurities. The most common types for use in vehicle repair shops are filtration and distillation units. Antifreeze filtration units are much less expensive to purchase and use.

Both used filtration filters and distillation still bottoms will require hazardous waste determinations through appropriate TCLP testing (heavy metals and VOCs). However, due to the small quantity of filters and still bottoms likely to be generated at golf course maintenance shops, they may be considered and managed as hazardous waste to avoid TCLP testing fees.

A list of antifreeze recycling equipment suppliers can be obtained from the IWRC's website at www.iwrc.org, click on 'Small Business Tools,' click on 'Vendor Database,' then choose 'Antifreeze' from the drop down box.

Check vehicle manufacturers' warranties prior to putting recycled antifreeze into any vehicle to ensure that the use of recycled antifreeze will not invalidate the warranty.

4.4 ■ Off-Site Recycling

Used antifreeze may also be stored on site, picked up by an antifreeze recycling company and transported off site for recycling. There is usually a minimum pickup quantity of 50 or 55 gallons. Some antifreeze recycling companies provide on-site antifreeze recovery services and leave the recycled antifreeze on site for reuse. For a list of antifreeze recyclers, visit www.iwrc.org, click on 'Small Business Tools,' click on 'Vendor Database,' then choose 'Antifreeze' from the drop down menu. Spent antifreeze should be determined hazardous or non-hazardous through TCLP testing (heavy metals and VOC's) prior to disposal. Antifreeze that is designated hazardous may only transported and treated off site by a hazardous waste management company.

Table 4
Antifreeze Recycling Service Costs

Status of Antifreeze Recycler	Cost per 55 gal
Permitted to Manage Hazardous Waste; Recycles off site; Keeps antifreeze	\$75 - \$120
Not Hazardous Waste-Permitted; Recycles off site; Keeps antifreeze	\$20 - \$30
Not Hazardous Waste-Permitted; Recycles on-site; Leaves antifreeze on site	\$100

5 Wastewater and Sludge

Wastewater at a golf course can be generated as a result from equipment washing, pesticide application equipment wash water, floor drains located in the maintenance shop, and rinseate from pesticide containers. Each of these methods of wastewater generation will require a proper method for disposal.

The goals of pollution prevention for wastewater are to:

- Reduce the amount of wastewater generated
- Reduce wastewater toxicity
- Discharge wastewater where it will have the least environmental impact
- Reduce the levels of toxics in the sludge that may accumulate in the floor drains or sumps

5.1 ■ Reduce the Amount of Wastewater Generated

Some suggestions for minimizing the amount of water used for equipment washing are:

- Use compressed air to blow off grass clippings
- Train employees to use water efficiently
- Save water in a holding tank and reuse it for preliminary cleaning.

Compressed air eliminates the need of using water to clean off equipment. Grass clippings may then be collected and used as compost.

When cleaning equipment, employees should be trained in the efficient use of water. Use only as much water as is absolutely necessary for cleaning. Shut the water supply off when it is not being used. Consider installing flow-restricting water-saving devices on faucets.

Pump water from the sump, after solids have settled out, to a holding tank where it can be reused for the preliminary cleaning of floors or equipment undercarriages. Sludge that collects in the holding tank should be managed as discussed in Section 5.4.

5.2 ■ Reduce Wastewater Toxicity

Wash water from pesticide application equipment will contain pesticide residues. Wash the equipment in a designated area. Use the least amount of water to wash the equipment. Sprayer equipment may be cleaned over turf areas where the wash water will take the place of or supplement normal applications. Be sure to avoid washing of pesticide application equipment where wells or surface water bodies are close by.



Golf Carts

In some cases, washing of equipment is done on a chemical mixing pad. Any wash water collected from the chemical mixing pad can be reused as a dilutant in the next application or may be applied to turf areas at or below application rate in accordance with label directions for use. This also applies to wash water from both the inside and outside of the application equipment.

Management of rinseate from washing pesticide containers is discussed in detail in the Pesticide Disposal Section 11.5.

Wastewater from maintenance equipment (i.e., lawn tractors, etc) washing also has the potential to be hazardous not only from possible pesticide contamination but also from contamination from oils, solvents, antifreeze, or other materials. To reduce the toxicity of the wastewater:

- Use only non-toxic soaps to clean equipment instead of hazardous solvents,
- Perform equipment maintenance work in areas with no floor drains, or seal off the drains during work to prevent spills from contaminating wastewater.
- Store hazardous wastes and hazardous materials, such as parts wash solvent, away from drains. If this is not possible, seal off drains where hazardous materials are stored.
- Prevent drips and spills from reaching the floor (this is discussed in detail in the Used Oil section),
- Clean spills immediately, preferably using a dedicated mop and bucket or launderable rags. Never clean spills by hosing them down with water.

5.3 ■ Discharge Wastewater for the Least Environmental Impact

All methods of industrial or commercial wastewater discharge are subject to some type of permit, approval or contaminant restriction. Septic systems are designed for domestic sewage only. Industrial discharges may kill necessary bacteria in the septic tank and/or cause overloading.

Facilities that discharge wastewater to a surface water must obtain a federal “National Pollutant Discharge Elimination System” (NPDES) permit. October 6, 1994, correspondence from the DNR states:

“First, it (wastewater) may not be discharged to a water of the state without or contrary the conditions of a NPDES permit. It is unlikely that the department (DNR) would issue a permit authorizing a discharge from facility floor drains or wash bay drains unless the facility could demonstrate that they were employing the best available treatment technology economically achievable for their wastewater.”

The correspondence goes on to state:

“...septic tanks may not be used for the disposal of chemical waste or grease in quantities which might be detrimental to the bacterial action in the tank or for the disposal of drainage from roof drains, foundation drains, or area drains. Motor oil, lubricants, antifreeze, gasoline, diesel fuel, pesticides, fertilizers, parts cleaning solutions and other chemicals associated with maintenance and repair of motor vehicles are all examples of chemical waste that, in sufficient quantity, might interfere with the bacterial action in a septic tank. Septic tanks are designed to treat domestic sewage not industrial waste and should not be used except for the treatment of sanitary sewage.”

Efforts to minimize wastewater contamination are advisable regardless of wastewater disposal means. Storing oil and chemical products away from floor drains or within dikes can minimize contamination. Washing oil contaminated or leaking equipment should be avoided if at all possible.

Discharging wastewater to the city sanitary sewer is generally the best option, provided the wastewater does not contain ignitable solvents, oils, or solids, and the wastewater treatment plant has given prior authorization. Prior authorization is important because you may be held responsible for any unauthorized discharge that causes costly damage to the wastewater treatment equipment, or interferes with the plant's ability to treat the wastewater. In the event of an accidental spill to the city sewer, immediately contact the wastewater treatment plant to minimize the risk of harm to treatment plant employees and damage to the system. Keep in mind that the wastewater treatment plant has the right to refuse any industrial wastewater discharge at any time.

Solids and oil must be removed from the wastewater prior to discharge to the city sewer. Solids generally settle out in the sump and oil floats to the surface where it can be removed. The settled solids form a sludge that must be cleaned out. Commercial oil skimmers are available that generally use an oleophilic (oil-attracting) material immersed in or run over the top of the water to absorb oil only. Once separated, the oil can be transferred to a used oil container. A list of oil skimmer suppliers can be obtained from the IWRC's website, www.iwrc.org, click on 'Small Business Tools,' click on 'Vendor Database,' then choose 'Oil' from the drop down menu.

Identify all drains in your maintenance shop to ensure that wastewater is not being discharged to a storm sewer. Storm sewers discharge untreated wastewater to a surface water. For shops serviced by the local wastewater treatment plant, all indoor drains should be plumbed to the city sanitary sewer or sealed. Drains not connected to the city sewer should be sealed.

For facilities that are not connected to the city sewer, disposal of waste wash water is problematic. Industrial wastewater (even equipment wash water) should not be discharged to storm drains or directly outdoors. Such discharges may cause environmental harm and be in violation of federal and state law. The best option is to connect to the city sewer, if possible. Alternatives to manage wash water in the absence of a city sewer connection are:

- Minimize the amount of wash-water generated and use only mild soaps for cleaning floors and vehicles
- Collect wastewater in a holding tank and reuse to its full extent
- Containerize and transport non-hazardous wastewater to the nearest wastewater treatment plant for disposal
- Treat water on site with a water-recycling unit
- Evaporate water on site using evaporating equipment if the water is non-hazardous. The resulting sludge will require a hazardous/non-hazardous waste determination

Visit the IWRC's website for a list of evaporating equipment suppliers and wastewater recycling equipment suppliers.

5.4 ■ Levels of Toxics in Sludge

In most maintenance shops, wastewater from floor drains drain into a sump, where dirt and grit settle out and accumulate at the bottom, forming sludge. Both the sludge and the wastewater can cause environmental damage if not managed properly.

Sludge removed from cleaning equipment maintenance sumps should be primarily dirt and grit, but may contain pesticides, oils, solvents and other materials. A TCLP laboratory test is often required to determine whether the sludge is hazardous or non-hazardous. When sludge contains pollutants at or above the regulatory level, it is hazardous and must be disposed of by a hazardous waste management company. In order to keep sludge non-hazardous, drains should be protected as noted in section 5.3. Spill management can help to keep sludge toxic levels low.

Non-hazardous sludge should be managed by a sump cleaning company, or dried until no free liquids remain and sent to a landfill (accompanied by an SWA). Non-hazardous sludge can be dried by spreading it on an impermeable surface, such as concrete, or by placing it in a drum and periodically mixing. Direct application of sump sludge on the ground (landspreading) should be avoided as it may cause environmental damage for which the waste generator would be liable for both contamination issues and regulatory compliance. In addition to a hazardous waste determination, local regulations may require other testing and monitoring. If a sump cleaning company is managing the sludge, ensure that they are managing it properly and in accordance with local and federal regulations.

6 Batteries

Lead acid batteries contain lead and corrosive acid. Both new and used batteries should be stored in a safe manner to prevent leaks and subsequent ground contamination. Pollution prevention in battery management involves:

- On-site battery storage
- Used battery recycling



Battery Storage

6.1 ■ On-Site Battery Storage

Indoor storage on an acid-resistant rack or tub is preferable. Batteries stored outdoors should be stored on an impermeable surface such as concrete with secondary containment, and sheltered from rain to prevent acid run off. Other pollution prevention recommendations are:

- Keep a neutralizing agent such as baking soda near in case of a spill
- Do not stack batteries since that may cause them to fall and crack
- Store batteries and battery acid away from flammable liquids, ignition sources and drains

6.2 ■ Used Battery Recycling

Used lead acid batteries are exempt from most hazardous waste regulation if they are recycled, but the waste generator is still responsible for contamination caused by batteries transported off site as well as stored on site⁴. Batteries should be stored safely, and only reputable recyclers should be used. Keep receipts for batteries that are exchanged, and be familiar with the final destination of the batteries to ensure recycling occurs through an EPA-permitted company.

7 Aerosol Cans/ Empty Paint Containers

The active ingredient or the propellant in an aerosol container may be hazardous. Cans that contain hazardous product or propellant are hazardous wastes if material is left in the can. Pressurized cans are also an explosion hazard.

If aerosol cans are used, utilize all of the material in the can, including the propellant. Cans that have been emptied until less than three percent by weight of the original product remains in the can, and the pressure inside the can is equal to that outside, are exempt from hazardous waste regulations. They should be recycled through a scrap metal dealer. Empty cans can be landfilled if recycling options do not exist in your area. Defective cans that still contain hazardous product or propellant should be returned to the manufacturer or disposed of as a hazardous waste.

Empty paint containers that contain less than three percent by weight of original product can be recycled as scrap metal or disposed of in a sanitary landfill. Unused paint can be taken to a DNR

Regional Collection Center (RCC) for recycling. RCC's are permanent facilities that provide hazardous waste education and on-going access to proper disposal of hazardous materials generated by businesses that are conditionally exempt small quantity generators (CESQG) and households. The following link provides RCC locations and contact information:

<http://www.state.ia.us/dnr/organiza/wmad/wmabureau/safesmartsolutions/rccContactInfo.pdf>.

Additionally, the Iowa Waste Exchange (IWE) can also offer supplementary recycle/reuse options for empty containers. IWE specialists access a central database of byproducts available and recipients' desired products. For assistance in contacting a local IWE Specialist, visit the website at

<http://www.iwrc.org/exchange/cfm/index.cfm>.



Aerosol cans and paint containers

8 Fluorescent Bulbs

Mercury-containing lamps requiring disposal are considered Universal Waste and, therefore, are exempt from the more stringent management standards for potentially hazardous waste under the Resource Conservation and Recovery Act (RCRA) but must be recycled rather than landfilled⁵. Mercury-containing lamps include fluorescent, high-pressure sodium, mercury vapor, and metal halide lamps.

Waste lamps that are managed under the Universal Waste Rule do not have to be included in the facility's determination of hazardous waste generator status (i.e., the facility's hazardous waste inventory) but are subject to streamlined standards for storing, labeling of waste containers, preparing and sending shipments of universal waste off site, employee training, and response to releases.

Store spent fluorescent bulbs in a sturdy container to prevent breakage of used bulbs during accumulation, storage, and transportation. Label the storage container "Used Lamps" and mark it with the date the first bulb was placed in the container to document the one-year time limitation. A list of fluorescent bulb recyclers can be obtained from the IWRC's website, www.iwrc.org, click on 'Small Business Tools,' click on 'Vendor Database,' then choose 'Universal Waste' from the drop down menu.

9 Petroleum Product Storage

Golf courses typically have aboveground and/or underground fuel storage tanks on site. Title 40, Section 112 of the Code of Federal Regulations (CFR) requires a Spill Prevention Control and Countermeasure (SPCC) plan for facilities with total aboveground petroleum product storage (i.e., new oil, used oil and fuel) capacity in excess of 1,320 gallons. SPCC plans are designed to minimize the potential for a petroleum release to occur and mitigate any environmental impacts in the event one does occur. The SPCC regulations generally require secondary containment for filling and dispensing operations. However, alternatives (i.e., contingency plans) are allowed if such containment is impractical. Contact the IWRC for assistance in obtaining an SPCC at 1-319-273-8905.



Fuel Storage Tanks

10 Pesticides

10.1 ■ Labels

Many pesticides create at least some risks to humans, animals, and the environment because of their intended use. The pesticide label tells you how to use certain pesticides safely and effectively. The label contains pertinent information that you should read and understand before you use a pesticide product. It is illegal to use a pesticide in a way contrary to its labeling. Any use not indicated on the label is prohibited. Each pesticide you buy has a label that gives you instructions on how to use the product.

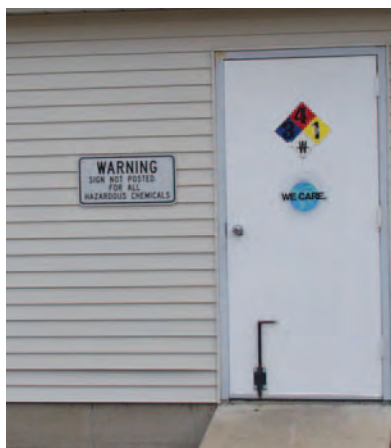
Directions for Use

Correct application of a pesticide product is accomplished by following the use instructions found on the label. The use instructions will indicate:

- The pests that the manufacturer claims the product will control
- The animal, or site the product is intended to protect
- In what form the product should be applied
- The proper equipment to be used
- How much to use
- Mixing directions
- Compatibility with other often-used products
- Phytotoxicity and other possible injury problems
- Where the material should be applied
- When it should be applied

What must be included on a pesticide label?

- **Product Name:** the name of the pesticide shows up plainly on the front of the label. The label will give the pesticides' common name and chemical name. Whether the pesticide is General or Restricted Use will also appear.
- **Directions for Use:** this section indicates what the pesticide controls, where, how and when to use the pesticide. If the intended use is not on the label, it should not be used. Recommended doses and application directions appear here also.
- **Precautionary Statements & Hazards:** describes potential hazards to humans or their pets and actions you can take to reduce those hazards. Types of protective clothing and equipment are also recommended on the label.
- **Environmental Hazards:** provides information on what to do to avoid environmental hazards.
- **Physical or Chemical Hazards:** notes hazards of the pesticide. For example: flammability.
- **Storage and Disposal:** indicates the best conditions for storing the pesticide and what to do with unused product and container.
- **First Aid:** indicates what to do first if the pesticide comes in contact and poses human harm. Route of Entry statements tell which areas of the body are most susceptible to pesticide dangers.
- **Active Ingredients:** identifies the active ingredients in a pesticide that control the pests. The label will usually state what other chemicals can be mixed with the pesticide.



Pesticide Storage Shed

- **Inert Ingredients:** states the percentage of other ingredients in the pesticide that are important in the pesticide mixture but do not directly affect the pest
- **Warranty Statement:** statement that limits a company's liability, a disclaimer, or serves as a warranty for the product
- **Manufacturers Address:** this includes the manufacturers or distributors name, address, and sometimes the phone number
- **Net Weight/Contents:** identifies the amount of pesticide in each container
- **EPA Registration Number:** all pesticides sold in the US must be EPA registered. The registration number is shown here
- **Establishment Number:** this number identifies the facility where the final production phase of a particular pesticide occurred

Signal Words

- "Keep out of reach of children," must appear on every pesticide label
- If highly toxic orally, dermally, through inhalation, or causes severe eye or skin burning, the label must read "DANGER and POISON", be in red print with the skull and crossbones symbol
- A pesticide that is moderately toxic orally, dermally, or through inhalation or causes moderate eye and skin irritation, will be labeled "WARNING". Slightly toxic pesticides will be labeled "CAUTION"

Environmental Statements

Also found on the label will be reminders of environmental precautions to follow to avoid contamination to the environment. If these precautions are not listed, it is still expected that they be followed. Examples are:

- Do not apply when runoff is likely to occur
- Do not apply when weather conditions favor drift from treated areas
- Do not contaminate water when cleaning equipment or disposing of wastes
- Keep out of any body of water
- Do not allow drift on desirable plants or trees
- Do not apply when bees are likely to be in the area
- Do not apply where the water table is close to the surface

Storage and Disposal

All pesticide labels contain general instructions for the appropriate storage and disposal of the pesticide and its container, including:

- Not for use or storage in or around the home
- Store away from fertilizers, insecticides, fungicides, and seeds
- Store at temperatures above 32°F (0°C)
- Do not reuse container or bag
- Do not contaminate water, food or feed by storage and disposal
- Open dumping or burning is prohibited
- Triple-rinse and offer container for recycling or reconditioning, or dispose in an approved landfill

10.2 ■ Storage

Most golf course superintendents use pesticides to control unwanted pests. Therefore, many superintendents choose to store pesticides on site. A properly stored pesticide is essential to reduce the chances of an accidental spill and the resulting expensive cleanup. The number one way to minimize storage concerns is to minimize the amount you store. Only purchase the amount intended for use on a particular day. Purchasing small amounts that you can use quickly is the best approach.

If pesticides do need to be stored, then they should be stored preferably in a lockable metal or concrete building. The pesticide storage area should be separate from other areas used to store

fertilizers and solvents. Labeling on exterior doors such as signs that say “Pesticide Storage” and “No Smoking” should be present.

Base walls for containment must be constructed of concrete, steel or other impervious materials and should maintain their integrity under fire conditions. The floors should be made of the same impervious material, and sloped to contain spills. It should have no drains or relief outlet, but may have a sump. If a drain is present in the storage area, seal it as soon as possible to prevent uncontrolled releases. Sloped ramps should be provided at the entrance to allow wheeled carts to move material in and out of the area safely.

Shelving should be made from plastic or metal. Wood shelving should not be used because it may absorb spilled pesticides. If wood shelving is present, paint it with a waterproof paint to minimize absorption. Pesticides should never be stored on the floor to avoid contact with other pesticides during spills or contamination with water. Only store them in their original containers or ensure that new containers are properly labeled. Dry pesticides should always be stored above liquid pesticides where applicable. Routine inspection of the storage area is encouraged to ensure against cracks in the wall and/or floor. Material Safety Data Sheets (MSDS) for all chemicals used should be stored in an easily accessible file, but not kept in the pesticide storage room itself. For more information, refer to Section 12.5, Iowa Pesticide Storage Summary.

A good storage building should have the following:

- Signage on outside door
- Securely locked to prevent unauthorized persons from entering
- Storage shelves made from plastic or metal
- Nonporous floors
- No drains or relief outlets
- Temperature control devices to prevent temperature extremes
- Adequate lighting and ventilation
- Materials available to contain and clean up spilled pesticides
- A written pesticide inventory and Material Safety Data Sheets (MSDS) kept close by but not in the pesticide storage room itself
- On the exterior door or walls, post warning signs labeled “DANGER - PESTICIDES - KEEP OUT.” Signs should be legible at least 50 feet from the building
- Personal Protective Equipment easily accessible but not contained within the storage building

10.3 ■ Spill Management

During the mixing and loading of pesticides, small spills may occur. Should an accidental spill occur, the spill(s) should be cleaned up as soon as possible. The sooner a spill is contained, the less chance there will be for harm to the environment. Always use the appropriate personal protective equipment as indicated by the MSDS or label direction for the chemical being cleaned up. Follow these steps to clean up small spills safely:



Pesticide storage spill kit

- 1) Control the spill by stopping the source such as setting the container upright, plugging leaks, or closing the valve.
- 2) Contain the spilled material before it spreads. Using barriers and absorbent materials are good measures to preventing the spill from spreading.
- 3) Collect the spilled material and any absorbents that may have been used to soak up the pesticide. Place all contaminated materials into a leak-proof container.
- 4) Dispose of all contaminated materials. Most contaminated materials will have to be properly disposed of as hazardous waste if the spilled material cannot be reapplied as a pesticide to a site. If the spilled pesticide can be reused or reapplied, do so to eliminate the need for costly hazardous waste disposal.

10.4 ■ Disposal

What is a pesticide waste?

A pesticide waste is any material that contains any concentration of pesticides that has been declared a waste. This includes: rinse material from containers and/or sprayers, left over spray solutions, expired or unwanted pesticides, or cancelled/suspended pesticides. Under the Resource Conservation and Recovery Act (RCRA) regulations, pesticides become “solid wastes” and potentially hazardous wastes at the point where the pesticide holder (i.e., end user, registrant, or distributor) decides to discard it. The holder who decides to discard, controls at what point the pesticide becomes a solid waste. If the pesticide is a hazardous waste (i.e., specifically listed or possess one or more of the following characteristics: ignitability, corrosivity, reactivity, or toxicity), RCRA regulations govern its transportation and storage from that point on. So, if an end user decides to dispose of the pesticide in his possession, the pesticide would be considered a solid hazardous waste and subject to RCRA regulations.

Disposal of Pesticides

If you have an excess pesticide, the best means of disposal will depend on the type of excess pesticide. If the excess is rinse material, it should be applied to a site at or below the application rate in accordance with label directions for use. Or in some cases, the rinse material may be reused as diluent for the next application.

Cancelled or suspended pesticides may be used at the user level until the stock is exhausted in most cases. To return cancelled or suspended pesticides in their still factory-sealed containers, contact the pesticide manufacturer. If this is unsuccessful, the cancelled or suspended pesticides will need to be disposed of as a hazardous waste through an EPA-licensed hazardous waste management company. For a list of hazardous waste management companies, visit the IWRC's website, www.iwrc.org, click on 'Small Business Tools', click on 'Vendor Database', then click on 'Hazardous Waste', and finally 'Hazardous Waste Management Companies.'

For unwanted pesticides, recycling may be achieved by exchanging the waste with potential users. Exchanging waste can be a cost-effective tool for both the generator and the recipient. The Iowa Waste Exchange (IWE) program facilitates the exchange of industrial by-products available and recipients' desired products. For assistance in contacting a local IWE Specialist, refer to the enclosed map and contact information or visit the website at <http://www.iwrc.org/exchange/cfm/index.cfm>.

Superintendents can easily minimize the amount of excess or unwanted pesticides on golf their golf courses by:

- Estimating needs and purchase only what is needed; do not stockpile pesticides
- Mixing only enough pesticide to complete the job
- Rotating pesticide stock; try to avoid carry over from one season to the next. Use up older pesticides first to avoid expiration, - first in, first out
- Triple rinsing empty containers, returning rinse material to the spray tank before the mixing and application of the pesticide

Disposal of Containers

Empty pesticide containers are not really “empty.” They still contain small amounts of pesticide residue even after they have been rinsed out properly. Empty pesticide containers should be triple rinsed or pressure rinsed prior to disposal. Use the following general recommendations in addition to following label instructions for proper rinsing and draining:

- 1) Empty the pesticide into spray solution and drain the container in a vertical position for 30-45 seconds
- 2) Refill the container one-fourth full with clean rinse water and secure the cap

- 3) Shake the container thoroughly, pour the rinseate into the spray mix and allow the container to drain in a vertical position for 30 seconds
- 4) Repeat steps 2 and 3 until the container has been rinsed three times. If the rinseate still appears cloudy, repeat the above steps until the water looks clear
- 5) Puncture or crush all plastic or metal containers to prevent them from being reused

It's important to remember to immediately rinse containers after emptying because some pesticide residues will dry and become difficult to remove. The rinse water should be reused as part of the makeup water or applied to the course at or below the application rate in accordance with label directions for use. Never reuse either rinsed or unrinsed empty containers. Once containers have been properly rinsed, store in a locked location until final disposal. Never allow empty pesticide containers to accumulate where children, pets, or livestock have access to them.

Properly rinsed containers may be recycled, or if a recycling facility is not available, empty containers may be disposed of in the local sanitary landfill after proper rinsing. Bags should be shaken clean so that all dust and material falls into the application equipment. Empty bags may be properly disposed of in the landfill. Never burn empty pesticide containers. Open burning of any solid waste is prohibited by Iowa DNR rules.

Table 5

Container Type	Disposal Statements
Metal Containers	Triple rinse. Then offer for recycling as scrap metal, or puncture and dispose of in a sanitary landfill.
Paper and Plastic Bags	Completely empty bag into application equipment. Then properly dispose of empty bag in the sanitary landfill.
Glass Containers	Triple rinse. Then dispose of in a sanitary landfill or in some cases, recycling options may be available.
Fiber Drums with Liners	Completely empty liner by shaking and loosening clinging particles. Dispose of the liner in a sanitary landfill. If the drum is contaminated and cannot be reused, dispose of in a sanitary landfill.
Plastic Containers	Triple rinse. Then offer for recycling or puncture or crush and dispose of in a sanitary landfill.

10.5 ■ Recordkeeping Requirements

The Federal Pesticide Record Keeping program requires all certified commercial and private applicators to keep records of their uses of federally restricted use pesticides for a period of two years. The federal regulations require pesticide applicators to record the following information within 14 days of application. There is no federal form layout requirement, so that record keepers can easily integrate these records into their already existing records keeping systems.

What should be included in each record?

- The brand/product/trademark name of the pesticide used
- The EPA registration number

- The total amount of the pesticide applied
- The date of application including month, day, year, and time
- The location of the application by one of the following:
 - The county, range, township, or section
 - By using the Identification Systems established by the USDA
 - The legal property description as described in the deed of trust or county/city records
 - An identification system created by the pesticide applicator(s)
- The size of the area being treated in the unit of measure expressed on the label
- The name of the applicator and their certification number
- Weather conditions at time of application
- Application equipment used
- Follow up to check the effectiveness of the application/pesticide
- Additional remarks

Why Keep Records?

- Proof of proper use
- Easy to find the cause of error, if an error is discovered
- Provides information to trace residue and/or damage problems
- Saves money
- Can compare the results obtained from different pesticides
- Improve pest control, practices, and efficiency
- Reduces pesticide misuse
- Provides a guide for buying only the amount of pesticides needed in the future

10.6 ■ Iowa Administrative Code – Summary on Certified Pesticide Application

Do these regulations apply to my operation?

Any person who applies pesticides as a commercial, non-commercial, or public pesticide applicator is required to have certification. This category includes commercial applicators directly or indirectly using restricted use pesticides to control pests in the following categories.

Categories

1. Agriculture Weed Control	12. Aquatic Pest Control
2. Agriculture Insect Control	13. Right-of Way Pest Control
3. Agriculture Crop Disease Control	14. General and Household Pest Control
4. Fruit and Vegetable Pest Control	15. Termite Control
5. Animal Pest Control	16. Fumigation
6. Forest Pest Control	17. Community Insect Control
7. Ornamental and Turf Pest Control	18. Wood Preservatives
8. Turf Pest Control	19. Public Health Pest Control
9. Ornamental Pest Control	20. Regulatory Pest Control
10. Greenhouse Pest Control	21. Demonstration and Research Pest Control
11. Seed Treatment	22. Aerial Application

General Requirements

- A person must be able to demonstrate a basic knowledge of minimum state and federal standards by passing an examination
- Written examinations are required for first-time applicators and also when applying for additional certification categories

Definitions

- **Certified Handler:** a person employed by a licensed commercial, noncommercial, or public applicator, or pesticide dealer who prepares or mixes pesticides for application by another person
- **Certified Applicator:** any individual who is certified to directly or indirectly use any restricted use pesticide. These pesticides are listed in the certification
- **Noncommercial Applicator:** any person who applies restricted use pesticides on property owned, rented or leased by the applicator or the applicator's employer
- **Commercial Applicator:** a certified applicator that directly or indirectly uses any restricted pesticide on any public property
- **Regulated Pest:** any living thing requiring regulations or control procedures to protect man or the environment
- **Restricted Use Pesticide:** pesticides that can only be used by a certificated pesticide applicator

What are the benefits of becoming a Certified Pesticide Applicator?

- Allows pesticides to be used safely and in known areas of infestation
- Assures that pesticides are used in a responsible, legal manner, and in a manner which will protect human health and the environment
- Helps to keep our homes and environment free from disease and provide us with more enjoyable landscapes
- Assures that the proper pesticides are used to control the right pests and are applied in the correct manner

What permits or registrations are required and how do I obtain them?

Before a license is issued, each applicator has to successfully complete the appropriate certification examinations. The examination will cover subjects relating to the safe handling, application and storage of pesticides, the correct calibration of equipment used, the effects of pesticides upon groundwater, and demonstrate knowledge of the minimum state and federal standards. A person who employs noncommercial applicators is also required to apply for a noncommercial applicator's license. However, these rules do not apply to non-commercial applicators that are full-time employees of a private establishment; don't advertise to be a commercial pesticide applicator; and apply pesticides on land other than the land owned by the business. To obtain a pesticide applicator-testing schedule, contact Chuck Eckerman of the Iowa Department of Agriculture and Land Stewardship at 515-281-8590 or visit www.agriculture.state.ia.us/pesticide_testing.htm.

When must I re-new my license?

Licenses expire annually on December 31, at the end of the 1st or 3rd year, depending on the duration of the applicant's license; either one or three years. The license can be renewed upon payment of the required license fee provided that all of the applicant's personnel who apply pesticides are certified in the appropriate classifications. You must pass an examination each third year following initial certification, or you may choose to attend two hours of approved continuing instructional courses each year during the renewal period. A 30-day grace period from the date of expiration will be allowed for the renewal of an applicator's certification.

10.7 ■ Iowa Administrative Code – Summary on Iowa Pesticide Storage

Do these regulations apply to my operation?

These regulations apply to your operation if all or any of the following describe your facility:

- Pesticides are being stored for more than 30 days per year and at which more than 300 gallons/pounds of liquid/dry pesticide are being mixed, repackaged or transferred from one container to another within a 30-day period
- Bulk pesticides are kept in individual containers in quantities of greater than 55 liquid gallons or 100 pounds net dry weight
- The site transfers a registered pesticide from one bulk container to another bulk container in preparation for sale or distribution to another person

Definitions

- **Pesticide:** any substance or mixture intended for preventing, destroying, or repelling any pest, or for use as a plant regulator or defoliant
- **Bulk Pesticide:** any registered pesticide that is transported or held in an individual container in quantities greater than 55 gallons or 100 pounds net dry weight
- **Permanent Pesticide Storage and Mixing Site:** Site of pesticide storage for more than 30 days per year and at which more than 300 gallons/pounds of wet/dry pesticide are being mixed, re-packaged or transferred from one container to another within a 30 day period

Requirements

Certification of Construction

Design plans and specifications for new facilities must be submitted to the Iowa department of Agriculture and Land Stewardship before the start of construction, along with certification from an Iowa registered professional engineer. The engineers certification must state that the proposed facility will comply with all rules and requirements. Upon completion of the construction of a new facility, certification by the owner must be made to the Iowa Department of Agriculture and Land Stewardship that the facilities were constructed in accordance of the following rules:

- 1) the new site must be protected from floods
- 2) be located at a minimum of 400 feet from public water supply wells and
- 3) be located at a minimum of 150 feet from private water supply wells

What are the requirements about Secondary Containment?

- All non-mobile bulk pesticide storage containers must be located within a watertight secondary containment facility
- All mixing, repackaging and transfer of pesticides from one container to another must be done within a containment area
- Containers used for pesticide storage and handling must be made of materials compatible with the pesticide and kept in a manner that reduces the possibility of a spill
- The designated site shall be paved with asphalt or concrete and curbed so as not to receive runoff from surrounding areas
- Cracks that occur in a secondary containment structure must be repaired with an acceptable sealant, and other repairs shall be made as needed to maintain the effectiveness of the containment facility

Storage in an exposed structure

- **Bulk liquid pesticides:** The secondary containment should be constructed to contain a

volume adequate to contain a minimum of 110% of the capacity of the largest single container, plus the space occupied by other tanks located within the secondary containment structure

- **Bulk dry pesticides:** The secondary containment should have at least a six-inch high curb surrounding the storage tank at minimum radius of three feet, the structure should be designed to contain any releases of the pesticide, and rainwater should not be allowed to accumulate in the containment structure

Storage in an enclosed structure

- **Bulk liquid pesticides:** The secondary containment should be constructed to contain a volume adequate to contain a minimum of 110% of the capacity of the largest single container, plus the space occupied by other tanks located within the secondary containment structure
- **Bulk dry pesticides:** The secondary containment should have at least a six-inch high curb surrounding the storage tank at minimum radius of three feet

What are the requirements for mixing, repackaging, and transportation of pesticides?

All mixing, repackaging and transfer of pesticides from one container to another performed at permanent pesticide storage and mixing site shall be done within a containment area. Pesticides should be mixed, repackaged and transferred in a manner that will prevent harm to humans or to the environment. Pesticides should be handled in a manner that minimizes the movement of pesticide dusts, aerosols and vapors from the pesticide storage and mixing site. Liquid and dry pesticides that are spilled must drain into a watertight catch basin or must be transferred into a curbed area, from which discharges can be recovered and properly disposed. Locking devices are required on bulk pesticide storage containers and all valves should be closed and locked when no workers are in the facility.

What are the labeling and record-keeping requirements?

The registered product label shall be affixed in an obvious location on the bulk pesticide storage container and should be designed to remain intact and legible throughout the active use of the container. The label shall contain the:

- Name
- Brand or trademark of the product
- Name and address of the manufacturer
- Registrant or person for whom manufactured
- Directions for use
- A statement of net content in terms of weight or measure
- An ingredient statement

The label of every pesticide must contain a warning or caution statement, in non-technical language based on its hazard. In addition, any pesticide highly toxic to humans shall be labeled with skull and crossbones and with the word “poison” written clearly visible in red. The first-aid procedure for poisoning instructions and for safe disposal of containers are also required on the label.

11 Fertilizers



Fertilizer storage

11.1 ■ Storage

Many fertilizers are oxidants, posing a fire hazard and as such, should be stored separately from solvents, fuels, and pesticides. Fertilizer should preferably be stored in a concrete building with a metal or other flame resistant roof.

Precaution should be exercised when storing fertilizer to prevent contamination of nearby ground and surface water. The fertilizer storage area should also be protected from rainfall (e.g., storage of dry bulk materials on a concrete or asphalt pad may be acceptable if the pad is adequately protected from rainfall and from water flowing across the pad).

11.2 ■ Spill Management

Protect the area where fertilizer is loaded into application equipment from rainfall. Clean up any spilled fertilizer immediately. Spilled and collected fertilizer can be applied to the golf course. Thorough cleaning done through dry collection methods such as sweeping, vacuuming, or washing down the loading area should be performed if rainfall protection is not available or practical for the loading area.

11.3 ■ Disposal

Bags containing fertilizers should be shaken clean so that all dust and material falls into the application equipment. Empty bags may be properly disposed of in the sanitary landfill. Never burn empty bags. Open burning of any solid waste is prohibited by Iowa DNR rules.

For unwanted fertilizers, recycling may be achieved by exchanging the waste with potential users. Exchanging waste can be a cost-effective tool for both the generator and the recipient. The Iowa Waste Exchange (IWE) program facilitates the exchange of industrial by-products available and recipients' desired products. For assistance in contacting a local IWE Specialist, refer to the enclosed map and contact information or visit the website at <http://www.iwrc.org/exchange/cfm/index.cfm>.

12 Audubon International: Integrated Pest Management

In addition to the pollution prevention topics discussed in this manual, the IWRC wants to encourage another facet of golf course management that pays special attention to environmental protection. The Audubon Cooperative Sanctuary Program (ACSP) for Golf Courses is an excellent and easy program to implement and obtain certification in. Currently, Iowa is the 11th most active state in terms of the percentage of existing ACSP members who have become certified. Approximately 2300 courses in all 50 states, Canada and, increasingly, around the world, are members of the ACSP.

The IWRC eagerly promotes this certification program through Audubon International and wishes to express its thanks to the following people for providing golf course site tours and discussing aspects of the ACSP certification process with the IWRC:

- Brett Hetland, Superintendent, Brooks Golf Club in Okoboji, Iowa and
- Rick Tegtmeier, Superintendent, Elmcrest Country Club in Cedar Rapids, Iowa.

The following is an excerpt from Kevin A. Fletcher, Director of Programs and Administration, for the ACSP describing the program and how to become a member.



Elmcrest Country Club

What is the ACSP for Golf Courses?

Kevin A. Fletcher

Director of Programs & Administration

What role does and should a golf course play in environmental stewardship-protecting our Nation's watersheds, promoting biodiversity, and managing our resources in a sustainable manner?

Audubon International is a not-for-profit, 501(c)(3), environmental education organization dedicated to improving the quality of life and the environment. Through our programs we focus on protecting watersheds, increasing biodiversity, managing resources in a sustainable manner, developing lands with nature in mind, and cultivating sustainable communities. We do this by promoting individuals to take environmentally responsible environmental actions on their properties.

The concept is simple: Give people the reasons for taking environmental stewardship seriously and the tools, information, guidance, and incentives for action, and they will embrace their responsibility to nature. All of our programs are a part of the Audubon Cooperative Sanctuary System (ACSS). Programs designed for golf courses, schools, businesses, backyards, and other property types provide conservation assistance specific to the unique location, resources, and needs of each site. This "system" of Audubon cooperative sites in 49 states and 25 countries is helping to protect water and wildlife one person, one place at a time.

Greening a Golf Course: What is Involved

The Audubon Cooperative Sanctuary Program for Golf was launched in 1991 in conjunction with the United States Golf Association. Today, there are over 2,000 golf courses enrolled in the program. Golf courses can offer a unique open space in the human landscape for wildlife to exist and thrive. Ongoing stewardship actions and education efforts lead to habitat protection, natural resource protection, as well as a reduction in the overall impact of golf management practices on the surrounding ecosystem.

Many golf courses, along with making environmental improvements through the ACSP for Business, can also look to improve the environmental performance of their golf course, and along the way, earn *Certified Audubon Cooperative Sanctuary* status.

What is Audubon certification? Certification is designed to recognize and support golf courses that have worked to ensure a high degree of environmental quality for both people and wildlife. Certification demonstrates a course's leadership, commitment, and high standards of environmental management. In order to become certified, a golf course must implement projects in six environmental quality areas and document their efforts. A "Certificate of Achievement" is granted upon completion of each category. When certification in all six categories is achieved, the course is designated as a *Certified Audubon Cooperative Sanctuary*.

A *Certification Handbook* provides the framework for assessing the site, developing an environmental plan, keeping records, and documenting stewardship efforts. There is no additional cost for certification. The cost is covered by the yearly membership, registration fee of \$150. Most courses can achieve certification within one to three years depending on how quickly they plan, organize, implement, and document projects in the six categories, including:

- **Environmental Planning:** The course begins with Environmental Planning. A Site Assessment and Environmental Plan form is provided to help course personnel evaluate their golf course and current management strategies, define goals and priorities, and outline objectives for achieving environmental quality in all areas. Once the Environmental Plan is complete and approved by Audubon, the course is eligible to apply for certification in the remaining five categories.



Bird House - Elmcrest Country Club

- **Wildlife & Habitat Management:** This category encompasses the management of non-play areas to provide habitat for wildlife on the golf course. The intent of this category is to maximize the use of the available space on the course to provide the best possible habitat given course location, size, layout, and type of property.
- **Chemical Use Reduction & Safety:** A comprehensive chemical use reduction and safety program includes employing proper cultural and pest management practices; educating workers and members about responsible plant management and safety; and keeping a clean and professional maintenance complex.
- **Water Conservation:** Water conservation is a key environmental concern for golf courses across the country. Conservation management includes maximizing irrigation efficiency; determining proper irrigation; reducing irrigated acreage; recapturing and re-using water; and incorporating drought-tolerant plant species.
- **Water Quality Management:** This category includes Best Management Practices to eliminate nutrient loading and minimize water quality problems; pond, stream and wetland management; proper equipment and chemical storage and handling; and water quality monitoring to ensure good water quality in surface and ground water.
- **Outreach & Education:** Designed to help course personnel gain recognition and support for environmental practices, and increase golfer and public understanding of wildlife and environmental quality on the golf course, this category includes both outreach and educational projects. A resource advisory group of people who help to plan and implement projects is formed to involve local experts, increase community support, and ensure the long-term success of environmental management practices.



Elmcrest Country Club

Golf courses enrolled in Audubon International's Cooperative Sanctuary System continue to improve their environmental performance, according to the Audubon International's *2001 Managed Lands Survey for Golf*. The survey of 470 of the over 2000 golf courses enrolled in the Audubon Cooperative Sanctuary Program (ACSP) for Golf Courses revealed the following:

- When examining Water Quality and Water Conservation efforts, 89% of courses that responded had improved their irrigation system or the way that water was applied to the site. As a result, these golf courses saved an estimated 1.9 million gallons of water per year per course since joining ACSP- totally over 500 million gallons per year. Likewise, 86% of golf course managers and superintendents have increased efforts to monitor water quality.
- In the area of Chemical Use Reduction and Safety, 82% of respondents reduced pesticide used while 75% reduced pesticide costs. Additionally, 92% of respondents used pesticides with lower toxicity levels.
- Finally, efforts to address Wildlife and Habitat Management have been equally effective, with 89% choosing native plants when landscaping, as compared to 49% before joining the program. Likewise, the average number of acres devoted to providing wildlife habitat increased by 50%, from 45 acres to 67 acres per course on average.

Likewise, more and more businesses have come to recognize the dollar value of environmental stewardship. Many businesses are taking voluntary steps that not only help the environment, but also make or save them money. Studies have shown, for instance, that for every dollar identified as an "environmentally-related cost" another two and a half dollars goes unnoticed by businesses. It seems clear that environmental stewardship and good business practice must go hand-in-hand (see sidebar: "Business Benefits of Environmental Stewardship").

For more information on Audubon International and the Audubon Cooperative Sanctuary System, please contact us at (518) 767-9051, by e-mail at acss@audubonintl.org, or visit our website at www.audubonintl.org.

Business Benefits of Environmental Stewardship

Customer Satisfaction – golfers have reported that playing quality has been maintained (50%) or even improved (49%) as a result of taking steps to manage the course's natural environment.

Worker Safety – A key component of environmental stewardship on a golf course is best practices when it comes to chemical management-this, of course, relates to worker safety, reducing exposure risk.

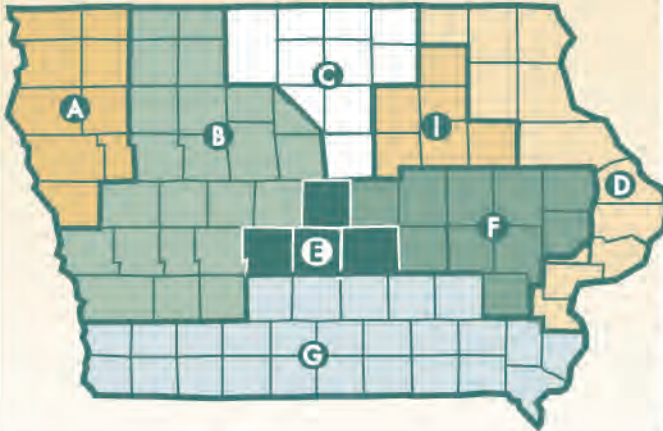
Job Satisfaction – Superintendents reported that their job satisfaction had been maintained (49%) or improved (49%) as a result of focusing on environmental stewardship.

Image and Reputation – By tapping into area scientists, naturalists and concerned citizens for ideas and volunteer assistance, many courses have effectively made stakeholder management a key part of their stewardship activities-resulting in better public relations.

Financial Performance – Reduced insurance premiums, reduced water costs, pesticide and fertilizer costs, reduced requirements for equipment maintenance, reduced energy costs result from an effective environmental management program on a golf course.

Source: Audubon International, *Environmental Improvement on Golf Courses: Audubon's Managed Lands Survey 2000-2001 and the 2003 Golf Course Survey*.

Iowa Waste Exchange Regions and Specialists



A: KEITH PRICE
Western Iowa
Community College
(712) 274-6400
Ext. 1809

B: FRED KESTEN
Region XII Council of
Governments
(712) 792-9914

C: SHELLY CODNER
Rural Iowa Waste
Management
Association
(319) 404-1942

D: JULIE PLUMMER
Eastern Iowa
Community College
District
(563) 336-3319

E: DENNIS HAYWORTH
DMACC - Business
Resources
(515) 964-6346

F: RICK MEYERS
(Linn County only)
and

JOHN KOCH
Kirkwood Training &
Outreach Services
(319) 398-5665,
(319) 398-4904

G: JIM REIMER
Indian Hills
Community College
(641) 683-5269

H: SARAH SMITH
Iowa Northland
Regional Council of
Governments
(319) 235-0311



Elmcrest Country Club



IOWA WASTE REDUCTION CENTER

University of Northern Iowa

