CANADIAN AGRICULTURAL PARTNERSHIP

Newfoundland and Labrador Environmental Farm Plan

Department of Fisheries, Forestry and Agriculture

Newfoundland Labrador

Canada

Newfoundland & Labrador
Environmental Farm Plan Workbook

2004

Compiled and edited by:

Eastern Canada Soil and Water Conservation Centre

Centre de conservation des sols et de l'eau de l'Est du Canada

Newfoundland and Labrador
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Foreword

Environmental farm planning has been recognized as an integral component of the Agricultural Policy Framework (APF) objective to confirm Canada's role as a world leader in environmentally responsible agriculture. Extensive consultations with provincial, territorial, and agri-food industry leaders have resulted in an agreement to promote a national approach for environmental farm planning (EFP) which addresses the 14 priority environmental concerns identified within the APF. The intent of the EFP process is to assist producers with environmental risk assessment and to develop an action plan that reflects their individual priorities. The EFP acts as a base for taking action through the adoption of Beneficial Management Practices (BMP's).

AAFC is pleased to have worked with the Eastern Canada Soil and Water Conservation Centre, the governments of New Brunswick, Newfoundland and Labrador, and Prince Edward Island, and with industry groups to develop this new workbook which addresses the APF priority environmental issues. The workbook builds on previous collaboration in the region to establish an Atlantic approach to environmental farm planning. The resulting workbook meets the regional needs, builds on success, and reflects the nationally agreed-upon principles of environmental farm planning under the APF.

I welcome this revised workbook as a vital tool which will help the agricultural industry meet the goals of the APF in the Atlantic Region.

Jim Tokarchuk
Manager, Stewardship Program
Agriculture and Agri-Food Canada

Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

Foreword

Producers in Newfoundland and Labrador have always been interested in minimizing the impact to the environment as a result of their farming. We are fortunate enough in this province to have vast pristine landscapes and are proud of the fact that we are envied by many others in Canada and abroad. Our agriculture industry, while small, is growing enormously and with this growth we must take an active role to continue to ensure our environmental footprint is not one that hampers that growth or damages our beautiful province.

People in this province expect food that is safe, nutritious and produced in a sound and responsible manner; completing and updating an Environmental Farm Plan is one way in which we can make sure we meet their expectations. With every action item that gets addressed we become better able to prove our responsibility and care as an industry. I would like to remind you that Environmental Farm Planning is an educational tool that does not end at the workshop or once you close the book, it is an ongoing process that evolves with your farm. It is something you, as a producer and as an industry, should be proud of.

I thank you for your active participation in this program and your commitment to sustainable agriculture in our province.

Jeff Whalen
Director, Natural Resources
Land Resource Stewardship Division

NEWFOUNDLAND & LABRADOR AGRICULTURE

Foreword

In 1993, the Atlantic Farmers Council (AFC) formed an Environmental Farm Plan (EFP) Steering Committee to adapt the Ontario EFP Workbook for use in the Atlantic provinces. The Eastern Canada Soil and Water Conservation Centre (ECSWCC) volunteered at the time to provide the technical expertise to adapt the workbook for the Atlantic region. The development of the EFP Workbook was carried out through consensus building between the ECSWCC, the AFC Workbook Committee, and the Ontario Farm Environmental Coalition.

Over the years, producers in the Atlantic region have recognized the value of the EFP process as a producer-driven, proactive, and voluntary environmental risk assessment. The workbook is also used as a planning tool to identify appropriate actions and Beneficial Management Practices on a whole farm basis.

Major revisions to the Atlantic EFP Workbook were recommended at a multi-stakeholder consultation workshop. At the meeting, the ECSWCC was mandated to initiate the revision of the Atlantic EFP Workbook with the participating provinces of Prince Edward Island, New Brunswick, and Newfoundland & Labrador. The ultimate goal of this initiative was to completely revise the EFP Workbook in order to address today's emerging environmental concerns and the environmental priorities within the Agricultural Policy Framework (APF).

Each of the main sections of the Atlantic EFP Workbook was individually reviewed by one of four Technical Advisory Teams (TAT) in a series of workshops. The TATs were composed of provincial government extension agrologists and specialists, agricultural producers, agri-environmental club coordinators, provincial EFP coordinators, provincial environment department specialists, and ENGOs from the three provinces and Agriculture and Agri-Food Canada representatives. After the TAT workshops, many TAT members were assigned an existing or new subsection of the workbook to revise or to identify gaps and make suggestions for improvements.

The ECSWCC was responsible for coordinating the workbook revision, developing the new format, researching the material, writing many of the initial drafts, and editing the final version based on comments received to ensure completeness and relevance. This revised edition is completely restructured with a new content and format. The revised workbook is intended to be more user friendly. It includes more information that will help producers gain insight into the relevance of different agri-environmental issues. Unlike the previous edition, this version includes a separate action plan booklet. We welcome any suggestions and comments you have about the workbook.

Thank you for taking the time to complete the workbook.

Jean-Louis Daigle
Executive Director
Eastern Canada Soil and Water Conservation Centre

Eastern Canada Soil and Water Conservation Centre

Centre de conservation des sols et de l'eau de l'Est du Canada

Acknowledgements

Funding to revise the Atlantic EFP Workbook was provided by the Government of Canada under the Agricultural Policy Framework in cooperation with the three provinces participating in the revision.

The considerable efforts of the Technical Advisory Team (TAT) members in preparing technical material or in revising material is greatly appreciated. The TAT members were:

Farmstead & Homestead Technical Advisory Team

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Karen Murchison, EFP Coordinator, PEI Environmental Farm Plan Steering Committee, PEI
Nicole Williams, Land Development Officer, Department of Agriculture, Fisheries and Aquaculture, NB
Malcolm Black, Regional Soil Conservationist, Agriculture and Agri-Food Canada, NS
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Lori Carter, Club coordinator, Central Soil & Crop Improvement Association, NB
Luc Sirois, Inspector, Department of Environment and Local Government, NB
Shauna Mellish, Club Coordinator, PEI West Agri-conservation club, PEI
Tara Neal, EFP coordinator, Newfoundland and Labrador Federation of Agriculture, NL
Vernon Taylor, Livestock Development Officer, Department of Agriculture, Fisheries and Aquaculture, NB

Soil & Crop Technical Advisory Team

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Barry Cudmore, Producer, PEI
Brent Stanley, Kennebecasis Watershed Restoration Committee, NB
Brian Brown, Private Forest Program Manager, Department of Agriculture, Fisheries, Aquaculture and Forestry, PEI
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Shauna Mellish, Club Coordinator, PEI West Agri-conservation club, PEI
Tom Byers, Land Development Officer, Department of Agriculture, Fisheries and Aquaculture, NB
Tom Duffy, Ducks Unlimited, PEI
Winston Jones, Producer, PEI

Acknowledgements *(cont'd)*

The efforts of all the collaborators and cooperators in the revision of the Atlantic Environmental Farm Plan workbook were essential. The workbook revision process required considerable effort, time, consensus building, coordination, and dedication.

Coordination, technical content editing, and layout of the revised Atlantic EFP Workbook were carried out by the staff at the ECSWCC. We wish to thank in particular Jérôme Damboise who coordinated the project for his professional commitment and dedication. Josée Rioux, Nicole McLaughlin, Lorraine Carroll, Gordon Fairchild, and Jean-Louis Daigle also contributed to the coordination, technical content writing, technical content editing, and formatting of the revised Atlantic EFP Workbook.

We would also like to acknowledge the contributions made to the process by staff from:

Agriculture and Agri-Food Canada, Prairie Farm Rehabilitation Administration

Agricultural Producers Association of New Brunswick, Environment Committee

Ducks Unlimited Canada

Faculté de Foresterie, Université de Moncton, campus d'Edmundston

Fédération des agriculteurs et agricultrices francophones du Nouveau-Brunswick

New Brunswick Department of Agriculture, Fisheries and Aquaculture

New Brunswick Department of Environment and Local Government

New Brunswick Department of Natural Resources

Newfoundland and Labrador Department of Environment and Conservation

Newfoundland and Labrador Department of Natural Resources

Newfoundland and Labrador Federation of Agriculture

Potatoes New Brunswick, Environment and On-Farm Food Safety Committee

Prince Edward Island Department of Agriculture, Fisheries, Aquaculture and Forestry

Prince Edward Island Environmental Farm Plan Steering Committee

Prince Edward Island Federation of Agriculture

Introduction
Your Guide to the Environmental Farm Plan

What is an Environmental Farm Plan workbook?

An Environmental Farm Plan (EFP) workbook is an awareness document to help producers assess environmental risks on their farm. It will help them highlight positive aspects and areas of concern on their farm through risk assessment questions, and help them set realistic goals to protect and enhance the environment on their farm.

What is the objective of the EFP?

The objective of the EFP is to help producers develop a practical plan for operating their farm in a way that is environmentally responsible, socially acceptable, and economically viable. By developing an EFP, producers are taking an important step to ensure the sustainability of their farm.

How to proceed?

You are encouraged to participate in an EFP workshop organized in your region to help guide you through the EFP process. At the workshop, you will assess the soils on your farm and their ability to influence potential risks to the environment. This workshop will prepare you to complete the **Farm Review** worksheets in this workbook.

Once you have completed your farm review, you will consider different solutions for potential problems you have identified. Following this assessment, you can develop your **Action Plan**. Several resources are available to help you in this process, such as:

- extension services (agriculture and forestry)
- agri-environmental clubs
- EFP coordinators
- farmers who have experienced similar situations or adopted innovative technologies
- private consultants
- documentation
- results from research/ demonstration projects
- departments of Agriculture, Environment, Forestry, and Natural Resources
- environmental non-governmental organizations
- suppliers

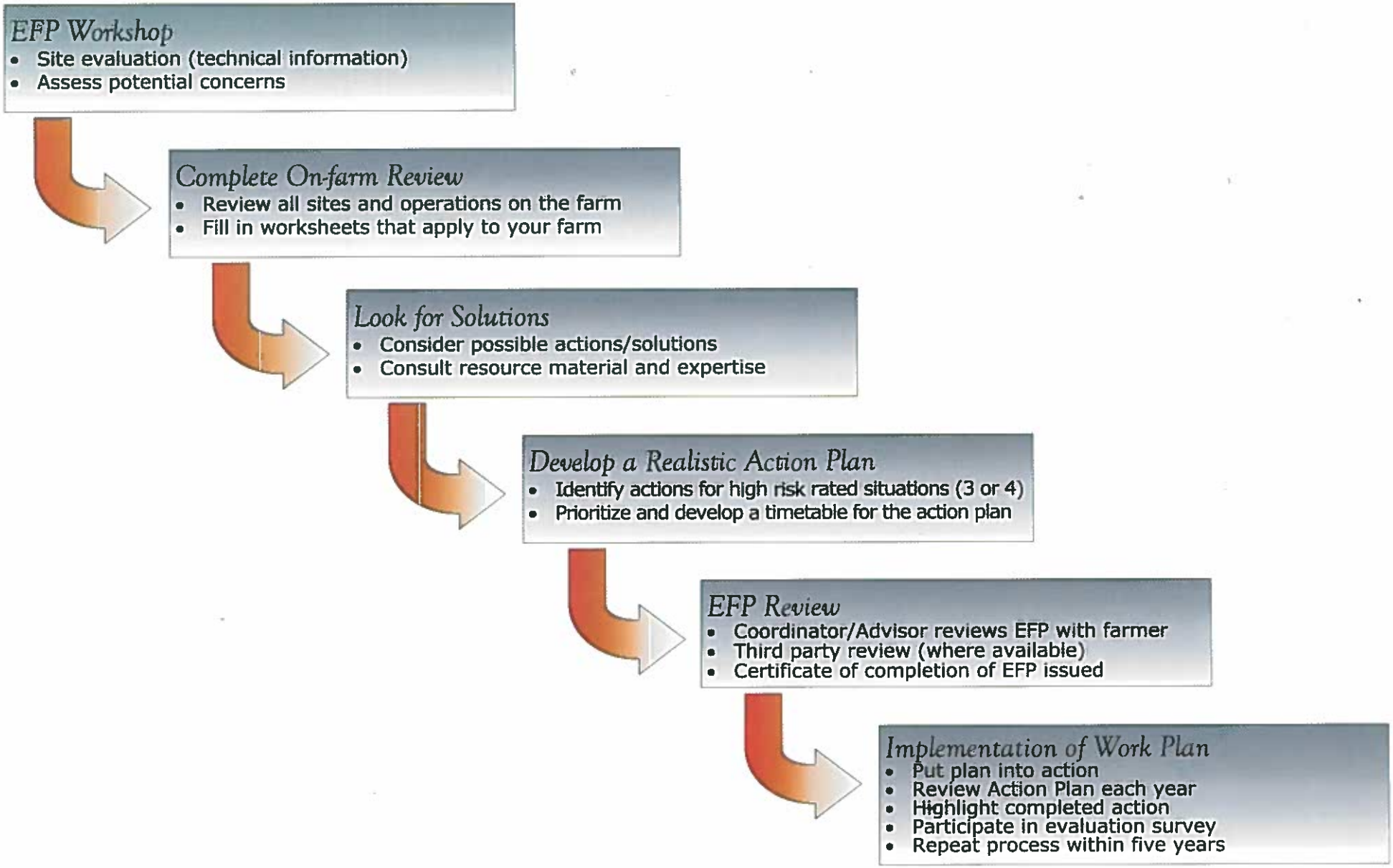
As you work on your Action Plan, you will have to decide whether potential problems result from natural risks on your farm (e.g. soil type or depth of the water table) or from the way you manage your farm operation. You will need to determine what you can do to solve these problems or reduce their impact, either immediately or over the following years.

Follow the plan to make changes in your farm operations according to the schedule you have set. Update your plan to integrate new developments or technologies, or to make adjustments as conditions change in your enterprise.

Remember that the Farm Review and Action Plan belong only to you. A certificate of completion will be issued once the workbook and action plan are completed. However, the procedure for obtaining the certificate can vary between provinces. You should call your provincial farm organization or commodity association and find out how to get the most benefit from the EFP program.

The following diagram summarizes all the steps in the Environmental Farm Plan process.

Environmental Farm Plan Process



A – Getting Ready

In order to answer the risk assessment questions in the workbook, some features on your farm need to be considered, which is the purpose of this section. In the following pages, you will find simple step-by-step instructions and information that will help you get started, which are identified as:

A – *Getting Ready*

B – *Understanding the Workbook Sections*

C – *Understanding the Workbook Subsections*

D – *Completing the Action Plan Booklet*

E – *Understanding Soil Maps*

F – *Understanding Soil Capabilities and Limitations*

G – *Understanding Topographic Maps*

H – *Understanding Hydrologic Soil Groups*

I – *Completing your Farmstead Map & Information Table*

J – *Completing your Field Map & Information Table*

Before you get started, whether you want to complete the EFP workbook on your own or participate in an EFP workshop, you will need some pieces of information that will help you complete your maps and tables and answer many of the risk assessment questions, such as:

1. Soil maps

Soil maps can be obtained from the Canadian Soil Information System (CanSIS) of Agriculture and Agri-Food Canada and/or from your provincial department of agriculture. Starting on page 10, you will find explanations on how to interpret a soil map. Soil maps can help you identify:

- physical properties and limitations of your soils
- potential for surface and ground water contamination
- slope gradients

It should be noted that the precision of the information on soil maps varies with the map scale.

2. Record keeping and Data collection

The following records or data could be useful in answering many of the risk assessment questions:

- field records
- crop production records
- soil test analyses
- crop rotation practices
- pesticide/fertilizer applications
- irrigation records
- livestock/animal health, animal ID, and movement records

3. Aerial photos

Aerial photos give a good overview of buildings, structures, watercourses, and fields on your farm. With these photos on hand, you do not need to draw your farm maps which will help you save some time. You might want to have more than one copy if you want to write on them. Most aerial photos can be obtained from your provincial government service centre in your region. For more details, you can also contact the department of Agriculture.

B – Understanding the Workbook Sections

The format of the EFP workbook

The EFP workbook is divided into seven sections identified with a large tab. The Action Plan is in a separate booklet.

Introduction

Farmstead & Homestead

Livestock Operations

Soil & Crop

Ecological Resources

Acts & Regulations

Conversion Tables & Glossary

Action Plan Booklet

Acts & Regulations

In this section, you will find a list of provincial and federal laws that apply to agricultural operations and also, an Environmental Regulation Handbook (if prepared) developed by the departments of Agriculture and Environment. Many risk ratings take into account these regulations; therefore, the legislation in your province should be consulted. As these vary between provinces, it was not always possible to totally reflect the regulations in the risk assessment questions. Furthermore, the ratings are based on Beneficial or Best Management Practices (BMP) and they often exceed regulations. In cases where the risk rating is below the regulated standard, the regulations apply. Producers need to refer to agricultural legislation and the Regulations Handbook of their province. Federal laws or municipal by-laws may also apply. Contact your local government office for more information.

Conversion Tables

The EFP workbook uses metric and imperial units. However, you may want to consult the **conversion tables** to convert imperial units into metric units or vice versa.

Glossary

You may want to consult the **glossary** to find the definition of a term used in this workbook.

C – Understanding the Workbook Subsections

The Farmstead and Homestead, Livestock Operations, Soil and Crop, and Ecological Resources sections are divided into subsections to facilitate the Farm Review process and for easy access. The subsections contain the Risk Assessment Questions that will help you evaluate and analyze your farm. The questions will make you think about your land, your farm buildings, the products you use, and so on. Through a rating system, you will be able to determine how each practice may affect the environment around your farm. The following information describes the content of each subsection.

1. What should you be aware of?

For each subsection, there is an introduction which is divided into five topics—when applicable—of which producers should be aware of: Soil Health, Water Quality, Air Quality, Biodiversity, and Profitability. Those topics are identified by an icon:

Soil Health

Soil health is one of the major requirements for sustainable agriculture. Soils must be in good condition to produce good quality crops; therefore, this topic will mainly discuss the chemical, biological, and physical properties of soil.

Water Quality

Good water quality is important for the health of our families, our livestock, and wildlife. Water must be protected in order to be safe to use. It must be free of pathogens, sediments, pesticides, excess nutrients; all of which can reach our surface and ground waters if proper measures are not taken. Water conservation on the farm will also be discussed.

Air Quality

Noise, odours, and particulates produced by farming practices are important issues and will be covered under this topic. Agricultural producers are becoming more aware of climate change and greenhouse gases. Agriculture contributes to greenhouse gas emissions but can play an important role in emission reduction and in carbon sequestration which will be discussed in this topic.

Biodiversity

Biodiversity is the variability among living organisms and their interrelationships, which includes diversity within species (genetic diversity), between species, and of ecosystems. It is very important to conserve and enhance the biodiversity on our farms because it is vital in maintaining a healthy environment that provides us with clean air, good quality water, and healthy soils, as well as a variety of resources essential to our well-being (raw materials, food, outdoor activities).

Profitability

Agricultural producers, like anyone else in business, must make a profit from their operation. This topic will address the economic benefits related to the adoption of Best or Beneficial Management Practices.

2. What can you do?

In this column, you will find a list of actions related to the subsection that might need to be undertaken in order to obtain a more sustainable farm. The list contains general information that can be of help in completing your Action Plan.

3. Resource List

A list of resource materials related specifically to the subsection is provided. The resource materials include production guides, factsheets, guidelines, and websites relevant to each subsection.

C – Understanding the Workbook Subsections (cont'd)

4. How do you rate?

The worksheets are divided into five columns. The first column includes the Risk Assessment Questions. Sometimes, questions in the same line of ideas are grouped under one topic. The other four columns represent the environmental Risk Ratings associated to each question. These can refer to either natural conditions or current situations. Each risk rating is explained in the table below:

1 *(low)*	2	3	4 *(high)*
Conditions that protect the environment, or have the lowest potential for environmental damage, or a BMP	Conditions that protect the environment or have a low potential for environmental risk	Conditions that have a potential to negatively affect the environment	Conditions that have the highest potential to negatively affect the environment

5. Answering the Risk Assessment Questions

The Risk Assessment Questions need to be answered directly in the Action Plan booklet. There are Action Plan sheets for every subsection, and they are presented in the same order as the subsections in the workbook. On the Action Plan sheets, you will find information presented in the following format:

Risk Assessment Question	*Sites*								*Timetable or Barrier to action*
1 Presence of windbreaks and living snow fences	*1*	*2*	*3*	*4*	*5*	*6*	*7*	...	
Reserved space to write potential action/solution; or Reserved space in grey, if no action needed for that question									

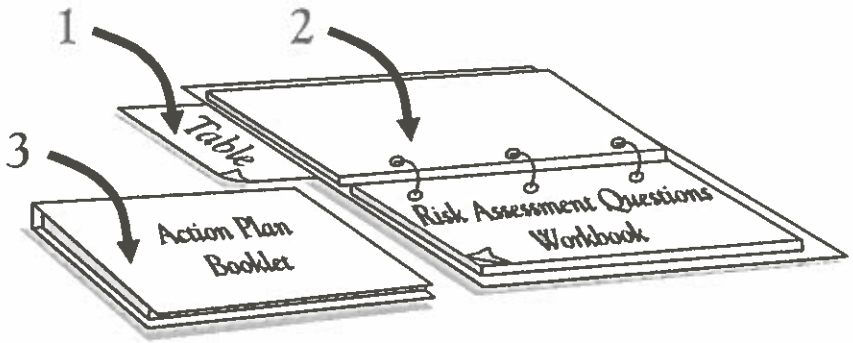
Some risk assessment questions may not apply to your farm. In this case, simply skip the question or indicate NA (not applicable). In other circumstances, a complete section may not apply to your farm operation. For example, if you are a commercial crop producer, you will not need to complete the Livestock Operations section. However, for all other sections and subsections, you need to at least answer the first question and according to your rating, you may need to skip part or the entire subsection.

Follow these steps to answer the Risk Assessment Questions:

1. Make sure that the side reference of the appropriate table is open in order to easily identify a site on your farm, which is explained later in this workbook. For the Farmstead and Homestead and Livestock Operations sections (except for the Pasture Management subsection), you will need to use your Farmstead Information Table (page 20) to answer the questions. For the Pasture Management subsection, the Soil and Crop section, and Ecological Resources section, you will need your Field Information Table (page 24) to answer the questions.

2. Read the Risk Assessment Questions in the workbook and the four Risk Ratings. Choose the risk rating that is the most appropriate for each site. If you hesitate between two ratings, choose the higher risk rated one or the one that best fit your farm conditions. If in a list of items, one of them is missing on your farm, choose the higher rating where it is found. You will sometimes notice that the rating 2 and/or 3 are empty. This does not mean that you can not choose that rating. It is possible that your rating is not exactly 1 or 4, but closer to one of them; therefore, choose one of the empty ratings that is closer to the condition of your site.

3. Write your answer (1, 2, 3, or 4) in the Action Plan booklet, in the box that corresponds with your site.



4. The next step consists of completing the Action Plan Booklet. In the following pages, you will find information that will help you with this task. It is strongly recommended that you read that information before starting your farm evaluation.

D – Completing the Action Plan Booklet

1. Introduction

In the Action Plan Booklet, you will need to indicate actions that you will implement on your farm to improve the environment. Each site rated 3 or 4 needs to be addressed, and the actions should improve the rating to a 2 or 1.

2. Indicate your actions

As you answer the risk assessment questions in the Action Plan Booklet, it will sometimes be very obvious which action will improve the rating 3 or 4. Therefore, it is suggested that you immediately write the proposed action in the reserved spaced.

For other risk assessment questions, you may need to do a little more research before indicating actions or solutions. Therefore, it is recommended to write the actions once the whole subsection is completed.

In other instances, you will notice that the space reserved for identifying actions is in grey. This means that the risk assessment question is a general evaluation of your sites; thus, no actions need to be undertaken in this case.

3. Hints for finding possible actions or solutions

There are many ways to help you identify possible actions or solutions to improve your high risk ratings, such as:

- Read the "What can you do?" at the beginning of each subsection.
- Consult your provincial department of Agriculture and/or Environment, your EFP coordinator, or other specialists.
- Consult the material in the Resource List of the subsection.
- Read the 1 and 2 risk ratings of the risk assessment question.
- Consult other agricultural producers.

4. Choose the right action

More than one action or solution can improve a risk rating. You should choose the one best suited to your farm operation by taking into consideration costs, technical feasibility, or long-term potential of the action. Then, you need to indicate the chosen option in the Action Plan Booklet.

5. Timetable for action

The year in which an action will or may be completed needs to be indicated in the *Timetable or Barrier to action* column from its debut to its completion (e.g. 2004-2006). Make a realistic estimate of what can be accomplished and prioritize your actions according to the following questions:

- Will the present situation cause any danger to the health or safety of your family and other people?
- Does the situation violate any current legislation?
- Will surface or ground waters be affected?
- Will wildlife be harmed?
- Can the situation be improved with a small change or is a larger change needed?
- How much will it cost to make the improvement?
- How long will it take to make the improvement?
- How will it affect other farm operations if this situation is changed?

D – Completing the Action Plan Booklet (cont'd)

6. Barriers to action

From time to time, it may not be possible to improve a high risk situation. The table below describes those reasons. You will need to indicate the barrier number in the *Timetable or Barrier to action* column.

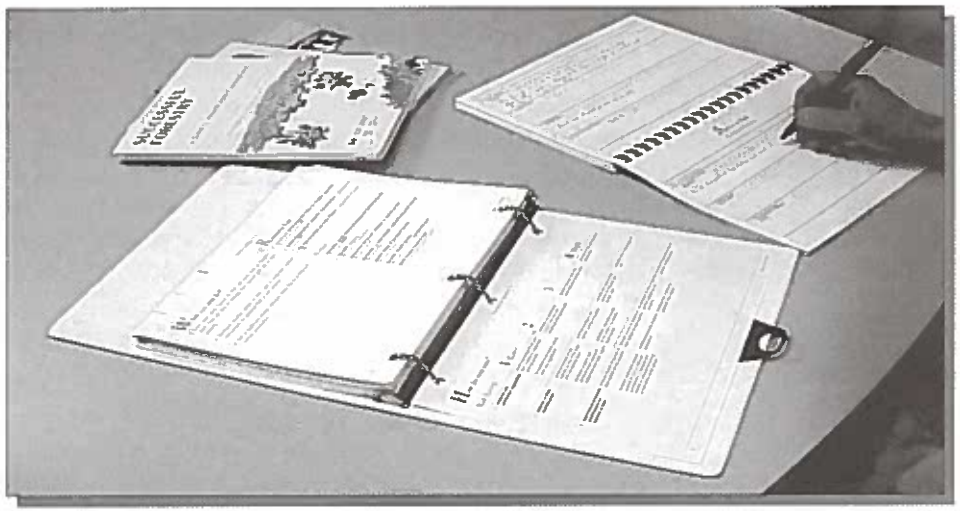
1	Legislation or by-laws prevent using the best solution	The best solution can not be used because it goes against provincial legislation or local by-laws
2	Expertise or information not available	The producer can not find any written information about how to solve the problem or technical specialists are not readily available
3	Materials or services not available	For example, trees for a windbreak not available or producer can not find erosion contractors to install the necessary erosion control structures
4	No proven solution; more research needed to find a solution	There is no proven acceptable solution. Research is necessary to find a suitable solution (e.g. treatment trench systems are not effective for milkhouse waste in clay soils)
5	Solution not realistic	For this farm, the commonly used solution is not realistic (e.g. no-till may not be feasible for some crops)
6	Cost is too high	The cost of the solution is too high compared to the benefit gained or a proposed solution would reduce the producer's income to an unacceptable level
7	Lack of finances	The producer does not have the money and/or can not get finances for the necessary changes
8	Other (specify)	Barriers not listed above, please specify

7. Submit your Action Plan

When all your actions are indicated, you are eligible to receive a certificate that confirms the Action Plan completion and in some provinces, you can have it reviewed by a Third Party. Your EFP coordinator can give you more details.

8. Action Plan Review

The Action Plan should be reviewed every year. You may want to identify the actions that have been applied and the ones that will need to be implemented in the year to follow. A more complete review of the EFP is recommended within five years.



D – Completing the Action Plan Booklet (cont'd)

Examples of actions or solutions for high risk ratings

The following are examples of actions that will improve a high risk rating to a lower risk rating.

Petroleum Storage Action Plan

Farmstead & Homestead

Risk Assessment Question	Sites										Timetable or Barrier to action
	1	2	3	4	5	6	7	8	9	...	
3 Type of petroleum storage tank				4						...	2004
ste 4: buy an ULC approved tank											

Pasture Management

Livestock Operations

Risk Assessment Question	Sites										Timetable or Barrier to action
	A	B	C	D	E	F	G	H	I	...	
10 Siting of water throughs	3	3	3							...	2005-2007
ste A, B, C: build a concrete platform to install nose pumps											

Soil Management Action Plan

Soil & Crop

Risk Assessment Question	Sites										Timetable or Barrier to action
	A	B	C	D	E	F	G	H	I	...	
17 Tillage depth	2	2	3	3	3	2	2	1	1	...	2004
stes C, D, E: till soil between 8 to 10 cm											

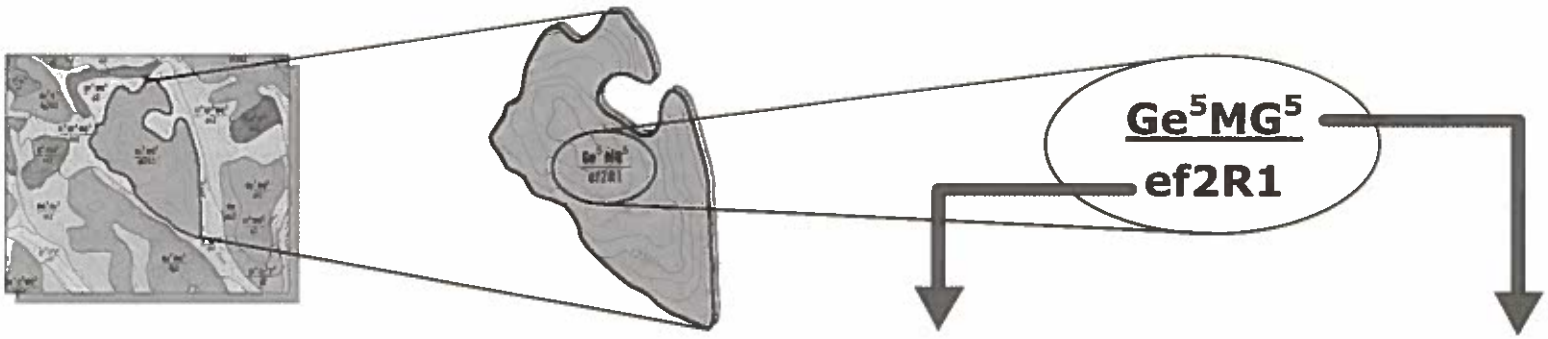
Wetlands Action Plan

Ecological Resources

Risk Assessment Question	Sites										Timetable or Barrier to action
	A	B	C	D	E	F	G	H	I	...	
3 Wood harvesting in/ near wetlands	1	1	1	3	1	1	1	1	1	...	2005
ste D: extract wood when soil is frozen											

E – Understanding Soil Maps

New Brunswick



The symbols in the denominator (bottom) indicate soil limitations (if any exist):

- **Letters** (ef) indicate the **slope** or **topographic classes**
- **Arabic number** (2) indicate the degree of **stoniness**
- **Last two symbols** (R1) or sometimes, **roman numerals** indicate outcrops of **bedrock**

ex: This map unit has both moderately rolling and strongly rolling areas, is moderately stony and has bedrock outcrops (2-10%) that interfere with tillage.

The symbols in the numerator (top) indicate the **soil series** present.

ex: This map unit is a complex of Glassville (Ge) and McGee (MG) soil series occurring in a ratio of 5:5 (50%:50%).

Topographic Classes

Single Slope	Multiple Slope	Slope %
A = depressional to level	a = nearly level	0 to 0.5
B = very gently sloping	b = gently undulating	0.5 to 2
C = gently sloping	c = undulating	2 to 5
D = moderately sloping	d = gently rolling	5 to 9
E = strongly sloping	e = moderately rolling	9 to 15
F = steeply sloping	f = strongly rolling	15 to 30
G = very steeply sloping	g = hilly	30 to 60
H = extremely sloping	h = very hilly	60

Stoniness

0 = Non-stony

1 = Slightly stony; slight to no hindrance to cultivation

2 = Moderately stony; some interference with cultivation

3 = Very stony; sufficient stones to constitute a serious handicap to cultivation

4 = Exceedingly stony; sufficient stones to prevent cultivation until considerable clearing is done

5 = Excessively stony; too stony to permit any cultivation (boulder or stone pavement)

Rockiness/Bedrock Outcrop

R1 = interferes with tillage (2-10%)

R2 = crop intertillage impractical (10-25%)

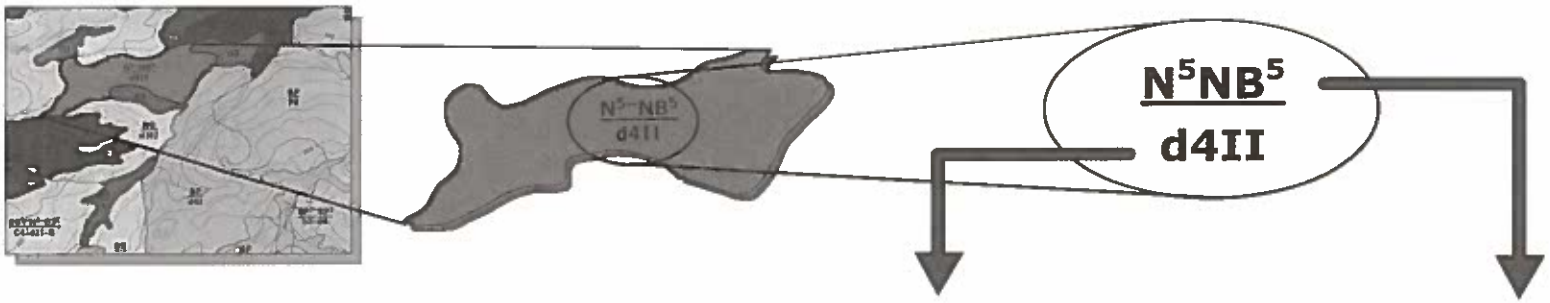
R3 = light machinery, pasture only (25-50%)

R4 = use of machinery impractical (50-90%)

R5 = over 90% of area is bedrock outcrop

E – Understanding Soil Maps

Newfoundland and Labrador



The symbols in the denominator (bottom) indicate soil limitations (if any exist):

- The first **letter** (d) indicates the **slope** or **topographic classes**
- The first **number** (4) indicates the degree of **stoniness**
- The **roman numerals** (II) indicate **rockiness**

ex: This map unit has gently sloping topography, is exceedingly stony and has a slightly rocky area.

The symbols in the numerator (top) indicate the **soil series** present.

ex: This map unit is a complex of North (N) and Ninth Brook (NB) soil series occurring in a ratio of 5:5 (50%:50%).

Slope Class

Simple	Complex	% Slope	
A	a	0-0.5	level
B	b	0.5-2.5	nearly level
C	c	2-5	very gently sloping
D	d	6-9	gently sloping
E	e	10-15	moderate slopes
F	f	16-30	strong slopes
G	g	31-45	very strong slopes
H	h	46-70	extreme slopes
I	i	71-100	steep slopes

Stoniness

0 = Non-stony (0-0.01%)

1 = Slightly stony (0.01-0.1%)

2 = Moderately stony (0.1-3%)

3 = Very stony (3-15%)

4 = Exceedingly stony (15-50%)

5 = Excessively stony (+50%)

Where not included, stoniness is understood to be 0

Rockiness

O = non rocky (2%)

I = slightly rocky (2-10%)

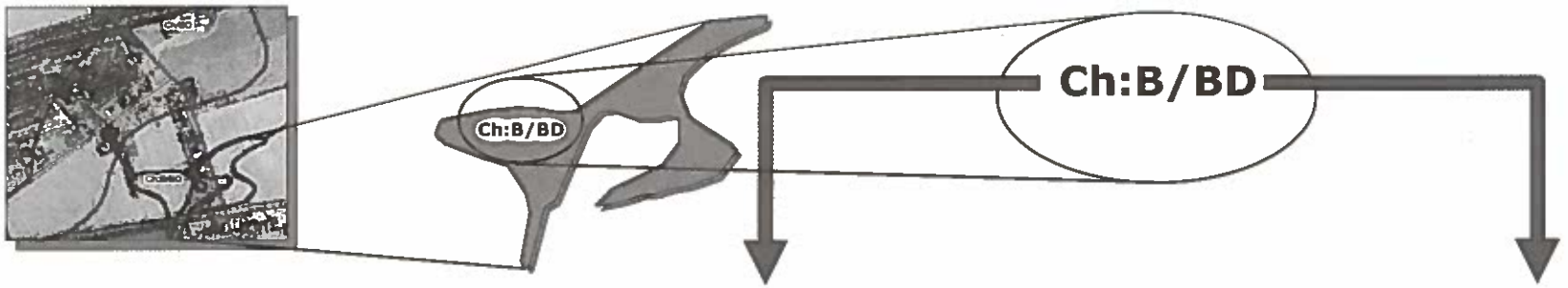
II = moderately rocky (10-25%)

III = very rocky (25-50%)

Where not included in soil map, rockiness is understood to be 0

E – Understanding Soil Maps

Prince Edward Island



The symbols in the numerator indicate :

- **First two letters** (Ch) indicate the **soil series** (refer to pages 13 and 14)
- **Third** (B) and **fourth letters** (if present) refer to the **soil phase**

ex: This map unit has a Charlottetown soil series and a moderately well drained phase.

The symbols in the denominator indicate :

- **First letter** (B) refers to the **slope phase**
- **Second letter** (D) refers to the **dominant surface texture**

ex: This map unit has a level to gently undulating slope and a fine sandy loam or very fine sandy loam texture.

Soil Phase

Phase	Description
A	stony surface phase
B	moderately well drained phase (class 3 drainage)
C	consolidated bedrock phase (50 to 100 cm depth)
D	unconsolidated bedrock phase (50 to 100 cm depth)
E	cobbly or stony subsoil phase
F	peaty surface phase

Slope Phase

Phase	Description	Slope %
B	level to gently undulating	0 to 2
C	undulating	2 to 5
D	gently rolling	5 to 9
E	moderately rolling	9 to 15
F	strongly rolling	15 to 30
G	hilly	30
I	DE complex	5 to 15
J	EF complex	9 to 30

Dominant surface texture

Phase	Description
A	sand or coarser
B	loamy sand or gravely loamy sand
C	sandy loam (< 8%)
D	fine sandy loam or very fine sandy loam
E	loam or silt loam
F	sandy clay or clay loam

E – Understanding Soil Maps

Prince Edward Island–Soil Information

Soil Name	Map Symbol	Soil Texture	Drainage Class	Hydrological Soil Group	Water Erosion Factor*	Soil Compaction Rating	Wind Erosion Rating
Alberry	Al	Loamy	Well	Mod.	3	Mod.	Low
Alberry	Ald	Loamy	Well	Slow	3	Mod.	Low
Baptist Point	Bp	Loamy	Poor	V. Slow	4	High	Low
Brackley	Br	Sandy	Imperfect	Slow	3	Mod.	Mod.
Bunbury	Bu	Sandy	Well	Fast	3	Low	Mod.
Charlottetown	Ch	Loamy	Well	Mod.	4	Mod.	Low
Charlottetown	Chd	Loamy	Well	Slow	4	Mod.	Low
Carey Point	Cp	Sandy	Imperfect	Slow	3	Mod.	Low
Crapaud	Cr	Loamy	Imperfect	Slow	4	Mod.	Mod.
Culloden	Cu	Sandy	Well	Fast	3	Low	Mod.
Culloden	Cud	Sandy	Well	Fast	3	Low	Mod.
Dunblane	Db	Loamy	Mod. well	Mod.	3	Mod.	Low
Dunstaffnage	Df	Sandy	Well	Fast	3	Low	Low
Duvar	Du	Loamy	Imperfect	Slow	4	Mod.	Low
Egmont	Eg	Clayey	Poor	V. Slow	3	High	Low
Emyvale	Em	Loamy	Well	Slow	3	Mod.	Low
Fifteen point	Fp	Loamy	Mod. well	Mod.	4	Mod.	Low
Gowanbrae	Go	Loamy	Well	Fast	3	Mod.	Low
Haliburton	Ha	Loamy	Well	Mod.	3	Mod.	Low
Haliburton	Hab	Loamy	Mod. well	Mod.	3	Mod.	Low

E – Understanding Soil Maps

Prince Edward Island–Soil Information

Soil Name	Map Symbol	Soil Texture	Drainage Class	Hydrological Soil Group	Water Erosion Factor*	Soil Compaction Rating	Wind Erosion Rating
Hebron	He	Loamy	Imperfect	Slow	4	Mod.	Low
Kildare	Ki	Sandy	Well	Mod.	3	Low	Low
Locke Road	Lr	Loamy	Poor	V. Slow	4	High	Low
Malpeque	Ma	Loamy	Imperfect	Slow	3	Mod.	Low
Margate	Mg	Loamy	Poor	Slow	4	High	Low
Mossy Point	Mp	Loamy	Poor	V. Slow	4	High	Low
Munn Road	Mr	Loamy	Imperfect	Slow	3	Mod.	Low
Newton	Ne	Sandy-Loam	Well	Mod.	4	Low	Low
O'Leary	Ol	Loamy	Mod. well	Mod.	3	Mod.	Low
Orwell	Or	Loamy	Poor	V. Slow	3	High	Low
Rocky Point	Rp	Sandy	Poor	V. Slow	3	Mod.	Mod.
Salt Grass Pt.	Sp	Loamy	Imperfect	Slow	3	Mod.	Low
Tignish	Ti	Loamy	well	Mod.	4	Mod.	Low
Urgg	Ui	Loamy	Imperfect	Slow	3	Mod.	Low
Wolfe Inlet	Wf	Clayey	Imperfect	Slow	4	High	Low
Wood Island	Wi	Loamy	Poor	V. Slow	3	High	Low
Winsloe	Wn	Loamy	Poor	V. Slow	4	High	Low
West Point	Wp	Loamy	Imperfect	Slow	3	Mod.	Low

* A Water Erosion Risk Factor of 1 indicates that the physical properties of the soil series and the climatic conditions of the map unit in which it is found are not conducive to soil erosion. A Factor of 4 indicates that soil climatic conditions can result in serious erosion.

F – Understanding Soil Capabilities and Limitations

The most accurate method to determine soil capabilities and limitations is through on-farm surveys. However, on your soil map, you will find a legend that provides various information for each soil type including the soil suitability and limitations. Some maps also provide the Canada Land Inventory class.

In this classification*, the mineral soils are grouped into seven classes based on soil survey information. Soils in classes 1, 2, 3, and 4 are considered capable of sustained use for cultivated field crops, those in classes 5 and 6 only for perennial forage, and those in class 7 are not suitable for agriculture.

The classification does not include capability of soils for trees, tree fruits, small fruits, ornamental plants, recreation, or wildlife.

Potential or limitations for agriculture:

Class 1: Soils in this class have no significant limitations in use for crops.
The soils are deep, are well to imperfectly drained, hold moisture well, and are naturally fertile. They can be managed and cropped without difficulty. Under good management, they are moderately high to high in productivity for a wide range of field crops.

Class 2: Soils in this class have moderate limitations that restrict the range of crops or require moderate conservation practices.
The soils are deep and hold moisture well. The limitations are moderate and soils can be managed and cropped with little difficulty. Under good management, they are moderately high to high in productivity for a fairly wide range of crops.

Class 3: Soils in this class have moderately severe limitations that restrict the range of crops or require special conservation practices.
The limitations are more severe than for Class 2 soils. They affect crop management options such as timing and ease of tillage, planting and harvesting, choice of crops, and methods of conservation. Under good management, they are fair to moderately high in productivity for a fair range of crops.

Class 4: Soils in this class have severe limitations that restrict the range of crops or require special conservation practices, or both.
The limitations seriously affect one or more of the following practices: timing and ease of tillage planting and harvesting, choice of crops, and methods of conservation. The soils are low to fair in productivity for a range of crops but may have high productivity for a specially adapted crop.

Class 5: Soils in this class have very severe limitations that restrict their capability to producing perennial forage crops, and improvement practices are feasible.
The limitations are so severe that the soils are of sustained production of annual field crops. The soils are capable of producing native or tame species of perennial forage plants, and may be improved for forage production by clearing of bush, cultivation, seeding, fertilizing, or drainage.

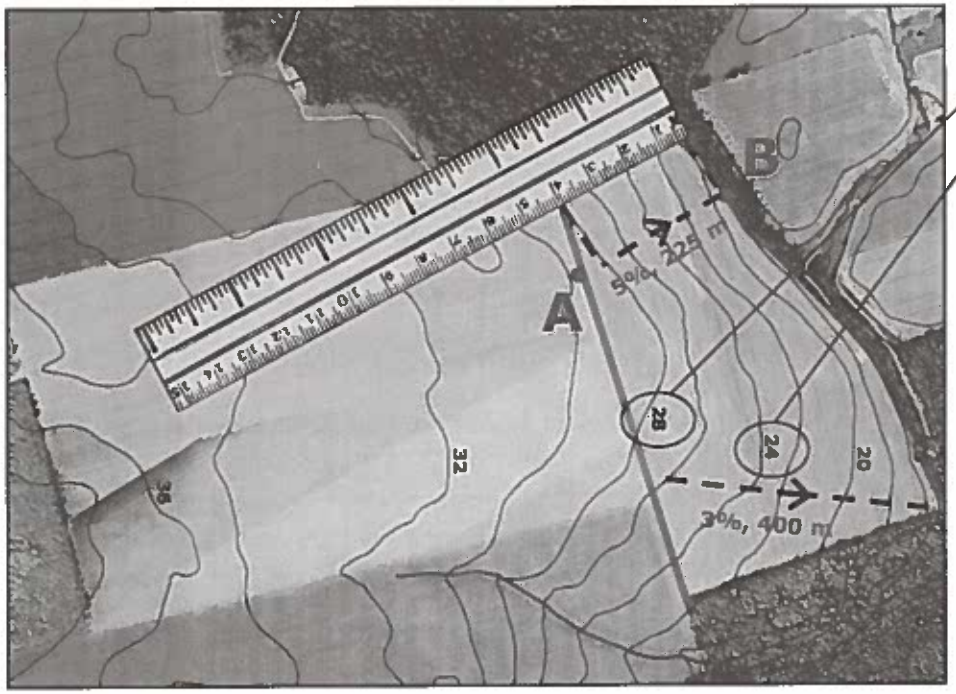
Class 6: Soils in this class are capable only of producing perennial forage crops, and improvement practices are not feasible.
The soils provide some sustained grazing for farm animals, but the limitations are so severe that improvement is not economical.

Class 7: Soils in this class have no capability for arable crops or permanent pasture.
This class also includes rockland, other non-soil areas, and bodies of water too small to show on the maps.

*Source: Soil Capability for Agriculture, Canada Land Inventory, ARDA.

G – Understanding Topographic Maps

The slope gradient and length can be determined directly in the field with the use of an inclinometer and a measuring tape. It can also be estimated with the use of a topographic map. It is better to use large scale maps, because they are more precise. In this example, the scale is 1:5 000 which means that 1 cm on the map is equivalent to 5 000 cm (or 50 m) in the field; therefore, the conversion factor is 50 m/cm.



slope gradient (%), slope length (m)

Scale 1:5,000
1 cm = 5 000 cm = 50 m

1. Slope gradient (%)

First, determine the **contour interval** of the map, that is the elevation between two adjacent contour lines. On most maps, the contour interval is already indicated in the legend. If not, find two different elevations indicated on the map contour lines and use the following formula to determine the contour interval:

Contour interval = Top elevation - Bottom elevation / # of contour intervals

28 m - 24 m / 2 = **2 m**

Then, determine the **slope direction** of the highlighted field on the map which needs to be somewhat perpendicular to the contour lines. Find the field's highest and lowest contour lines. With a ruler, measure the distance between these lines in the direction of the slope (dashed line). In this case, the distance is **4 cm**. Finally, determine the **slope gradient** by using this formula:

Slope gradient (%) = Contour interval x # of contour intervals / Distance between contour lines x conversion factor x 100

= 2 m x 5 / 4 cm x 50 m/cm x 100 = **5%**

2. Slope length

The **slope length** is measured between the edges of the field or between terraces. In this example, points A and B represent the slope length. With a ruler, measure the distance between those points. Again, the measured distance must be perpendicular with the contour lines of that field. Then, convert that distance according to the scale to determine the slope length. In this example, the slope length is 225 m (4.5 cm x 50 = 225 m).

H – Understanding Hydrologic Soil Groups

The rating for Hydrologic Soil Group (HSG) refers to the speed at which water moves into and down through the soil. Due to climatic conditions and land use patterns, a Fast rating does not necessarily mean the potential for runoff and surface water contamination is insignificant, and a slow rating does not necessarily mean the potential for leaching and ground water contamination is insignificant. The diagram below explains each Hydrologic Soil Group (Fast, Moderate, Slow, Very Slow) and will help you complete your field information table and answer the risk assessment questions.

Rapid Infiltration, Low Runoff Potential and Good Drainage

Fast (A)
Soils having high infiltration rates even when thoroughly wetted.

These consist chiefly of deep, well to excessively drained **sands or gravels**.
These soils have a high rate of water transmission in that water readily passes through them.

Moderate (B)
Soils having moderate infiltration rates when thoroughly wetted.

These consist of chiefly moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures (**loams to sands**). These soils have a moderate rate of water transmission.

Slow (C)
Soils having slow infiltration rates when thoroughly wetted.

These consist chiefly of soils with a layer that impedes downward movement of water or soils with moderately fine to fine texture (**clay loams to clays**). These soils have a slow rate of water transmission.

Very slow (D)
Soils having very slow infiltration rates when thoroughly wetted.

These consist chiefly of **clay soils** with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material.
These soils have a very slow rate of water transmission.

Slow Infiltration, High Runoff Potential and Poor Drainage

I – Completing your Farmstead Map & Information Table

To answer the risk assessment questions in the workbook, you need a Farmstead Map and Information Table. You can either use aerial photos or sketch your maps by using the grids provided. Different symbols on the map can be used to represent structures, buildings, neighbouring dwellings, and so on. These symbols can be described in the legend on the right. A space under the legend is reserved to write down soil characteristics of your farmstead. Once your map is completed, you need to fill the Information Table that gives more details about your sites.

1. Your Farmstead Map

➡ maps found in the Action Plan booklet

The Farmstead includes your homestead and any other structures associated with the farm operation excluding the fields. Usually, farms have one farmstead, but some farms may have buildings or structures on different sites which all need to be addressed. You should identify these structures if they are a part of your farm.

For your Farmstead, you should draw and/or identify:

- *Permanent structures/buildings and fixed sources of potential contamination*

e.g. septic system, equipment shed, manure storage, chemical storages, barn, feedlot, composting site, farmstead, and/or livestock windbreaks

- *Water sources*

e.g. well, neighbouring well, pond, stream, river, wetland

Choose one of these two methods of site identification:

- *One-by-one method*

Once your map is completed, identify up to 25 sites with **numbers** from 1 to 25. Only the *permanent structures/buildings and fixed sources of potential contamination* have to be identified with numbers.

- *Grouping method*

It is also possible to group structures and sites that form each homestead and farmstead under one **number**, but remember that your farm review may not be as accurate.

2. Your Farmstead Information Table

➡ table found in the Action Plan booklet

Follow these simple steps to complete the information table:

Site description

- *One-by-one method*

Use the *Site description* column to identify the permanent structure/building (*SB*) or fixed source of potential contamination. Make sure that the numbers of the SB column correspond with each number that was previously identified on your map.

- *Grouping method*

Write in the *FS* column the name of the first farmstead and/or homestead and its number previously identified on your map. Then, write in the *description* column, the permanent structures/buildings and fixed sources of potential contamination included in it. Continue doing so for all farmsteads and/or homesteads.

Information on Well at Risk

Write in the *Well* column which well is **at risk** in relation to each site in the *description* column. The well at risk may not necessarily be the nearest well and may not be on your farmstead, it could be your neighbour's. Then, identify the *type of well*, the *slope gradient* (if downslope), the separation *distance*, and *depth* of the well.

Information on Surface Water at Risk

Write in the *Surface Water* column which stream, lake, wetland, pond, etc. is **at risk** in relation to each site in the *description* column. Then, identify the *slope gradient* and the *distance* to the surface water in the next two columns.

Other information

In the last column, give any other information relevant to each site, such as the storage capacity and type and stocking rate.

On pages 20 and 21, you will find examples of a Farmstead Map and Table of a livestock farm.

I – Examples of a Farmstead Map & Information Table

Your Farmstead Sites (refer to page 18)

Site		Site Description	Information on Well at Risk					Information on Surface Water at Risk			Other information
FS	SB		Well	Type	Slope	Distance	Depth	Surface Water	Slope	Distance	
H-1	1	House	house	drilled	2-5%	10 m	100 m	Smith River	2-5%	140 m	
	2	Septic System	neighbour	drilled	2-5%	60 m	135 m	Wetland	2-5%	115 m	
Main F-2	3	Pesticide Storage	neighbour	drilled	2-5%	65 m	135 m	Wetland	2-5%	45 m	
	4	Fuel Storage	house	drilled	2-5%	50 m	100 m	Smith River	2-5%	60 m	2000 litre fuel storage (one tank)
	5	Machine Shed	house	drilled	2-5%	45 m	100 m	Smith River	2-5%	75 m	
	6	Milkhouse	house	drilled	2-5%	35 m	100 m	Smith River	2-5%	115 m	
	7	Silos	barn	drilled	2-5%	20 m	85 m	Smith River	2-5%	50 m	
	8	Barn	barn	drilled	2-5%	20 m	85 m	Smith River	2-5%	50 m	60 cow freestall barn, liquid manure mngt syst.
	9	Manure Storage	barn	dug	2-5%	50 m	85 m	Smith River	2-5%	60 m	above-ground 5000 m^3 concrete manure storage
	10	Feedlot	barn	dug	2-5%	65 m	85 m	Smith River	2-5%	105 m	
Hog-3	11	Hog Barn	hog barn	dug	< 2%	10 m	75 m	None	-	-	300 hogs
	12										
	13										
	14										
	15										
	16										
	17										
	18										
	19										
	20										
	21										
	22										
	23										
	24										
	25										

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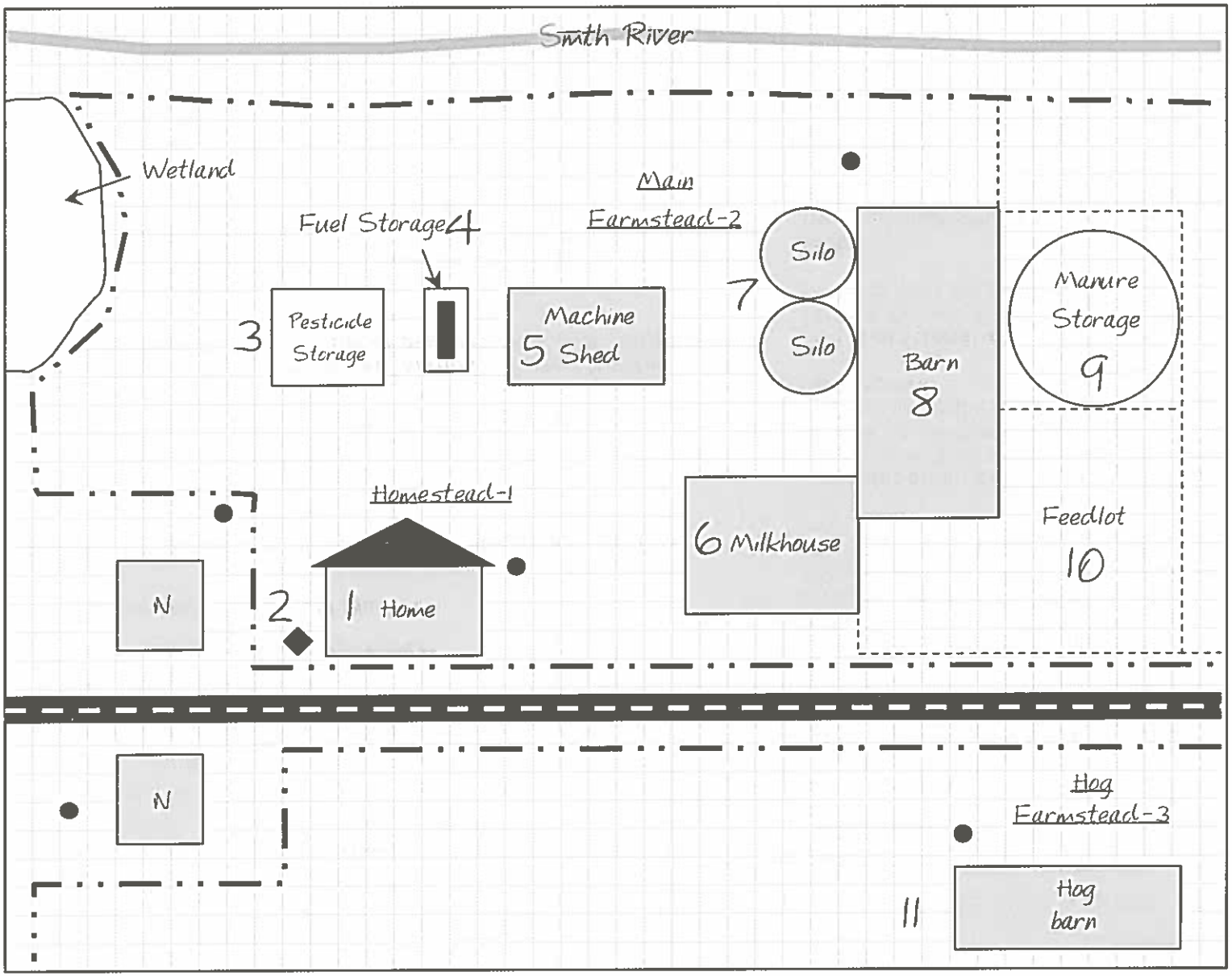
I – Farmstead Map Example of a Livestock Farm



Legend

- Property line
- N Neighbour
- Fenceline
- Well
- Road
- River
- Septic system

Soil Characteristics

Soil Series:
Kedgwick

Texture:
Clay-Loam

Drainage:
Good

Hydrologic Soil Group (HSG):
C-Slow

J – Completing your Field Map & Information Table

To answer the risk assessment questions in the workbook, you also need a Field Map and Information Table. You can use the grids provided to sketch your fields; however, we encourage you to use aerial photos, because it gives a more realistic view of your fields. You can use different symbols on the map to represent any major structures, field limits, and so on. These symbols can be described in the legend on the right. Once your map is completed, you need to fill the Information Table that gives more details about your fields.

1. Your Field Map

➡ maps found in the Action Plan booklet

On your Field Map, you should identify:

• *Sites*
e.g. fields, pastures, peatlands, dykelands, floodplains, and woodlots

• *Major structures on the sites*
e.g. ditches, terraces, waterways, windbreaks

• *Water sources*
e.g. wells, neighbouring wells, irrigation ponds, wetlands, streams, rivers

One or a combination of these two methods of site identification can be used to identify up to 25 sites or grouped sites with letters from A to Y :

• *One-by-one method* (recommended)
To use this method, you need to identify all your **sites** on the map with **letters** from A to Y. Remember that you can use more than one action plan booklet if you have more than 25 sites but wish to evaluate on a one-by-one basis.

• *Grouping method*
If some sites have similar soil characteristics (e.g. soil type and slope) and cropping system (e.g. row crops and rotation system), they could form one group. Keep in mind that your review may not be as accurate if the grouped sites are not similar or the sites with similar characteristics are separated by a great distance. To use this method, identify on your map, sites with similar characteristics with the same letter (A to Y).

2. Your Field Information Table

➡ information table found in the Action Plan booklet

Follow these simple steps to complete the information table:

Site description
Write in the second column, your own *identification number or name* of the fields, pastures, peatlands, dykelands, floodplains, and woodlots whether they are cultivated or not for each letter identified as a site or grouped site (e.g. E1, E2, E3 or old field 1 of M. Simon).

Information on Well at Risk
Write in the *Well* column which one well is **at risk** in relation to each site or grouped site in the *description* column. The well at risk may not be the nearest well and may not be on your farmstead, it could be your neighbour's. Then, identify the *distance* between the edge of the field and well.

Information on Surface Water at Risk
Write in the *Surface Water* column which stream, lake, wetland, pond, etc. **at risk** in relation to each site or grouped site in the description column. Then, indicate the *distance* between the edge of the field and the surface water source.

Soil characteristics
Identify the soil *series*, *drainage* class, *texture*, and hydrologic soil group (*HSG*) of each site (refer to page 17).

Slope
Using a topographic map or through site investigation, identify the average or range of the slope gradient (%) and slope *length* of each site.

Crop rotation
In the last column, identify the crops that are usually grown on each site. For woodlots, indicate the predominant tree species.

On pages 24 and 25, you will find examples of a Field Map and Table of a livestock farm.

J – Examples of a Field Map & Information Table

Your Field Sites (refer to page 22)

Site	Identification number/name	Info. on Well at Risk		Info. on Surface Water at Risk		Soil Characteristics				Slope		Crop Rotation
		Well	Distance	Surface Water	Distance	Series	Drainage	Texture	HSG	%	Length	
A	Pasture 1	barn	30 m	Smith River	30 m	Kedgwick	Good	sandy	C-slow	2-5%	110 m	permanent cover
B	Pasture 2	barn	205 m	Smith River	30 m	Kedgwick	Good	sandy	C-slow	2-5%	120 m	permanent cover
C	Pasture 3	barn	310 m	Smith River	25 m	Kedgwick	Good	sandy	C-slow	2-5%	115 m	permanent cover
D	Field 1	neighbour	40 m	-	-	Jardine	Good	sandy	C-slow	< 2%	70 m	forage
E	Field 2	-	-	-	-	Jardine	Good	sandy loam	B-moderate	2-5%	85 m	corn-forage
F	Field 3	hog barn	20 m	-	-	Jardine	Good	sandy	B-moderate	2-5%	145 m	forage
G	Field 4	hog barn	55 m	-	-	Jardine	Good	sandy	B-moderate	2-5%	145 m	forage
H	Field 5	hog barn	135 m	-	-	Jardine	Good	sandy	B-moderate	5-10%	65 m	corn-forage
I	Field 6	-	-	-	-	Jardine	Good	sandy loam	B-moderate	5-10%	70 m	corn-forage
J	Field 7	-	-	-	-	Jardine	Good	sandy loam	B-moderate	5-10%	70 m	corn-forage
K	Woodlot	-	-	-	-	Jardine	Good	-	B-moderate	-	-	pine and maple
L												
M												
N												
O												
P												
Q												
R												
S												
T												
U												
V												
W												
X												
Y												

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J – Field Map Example of a Livestock Farm

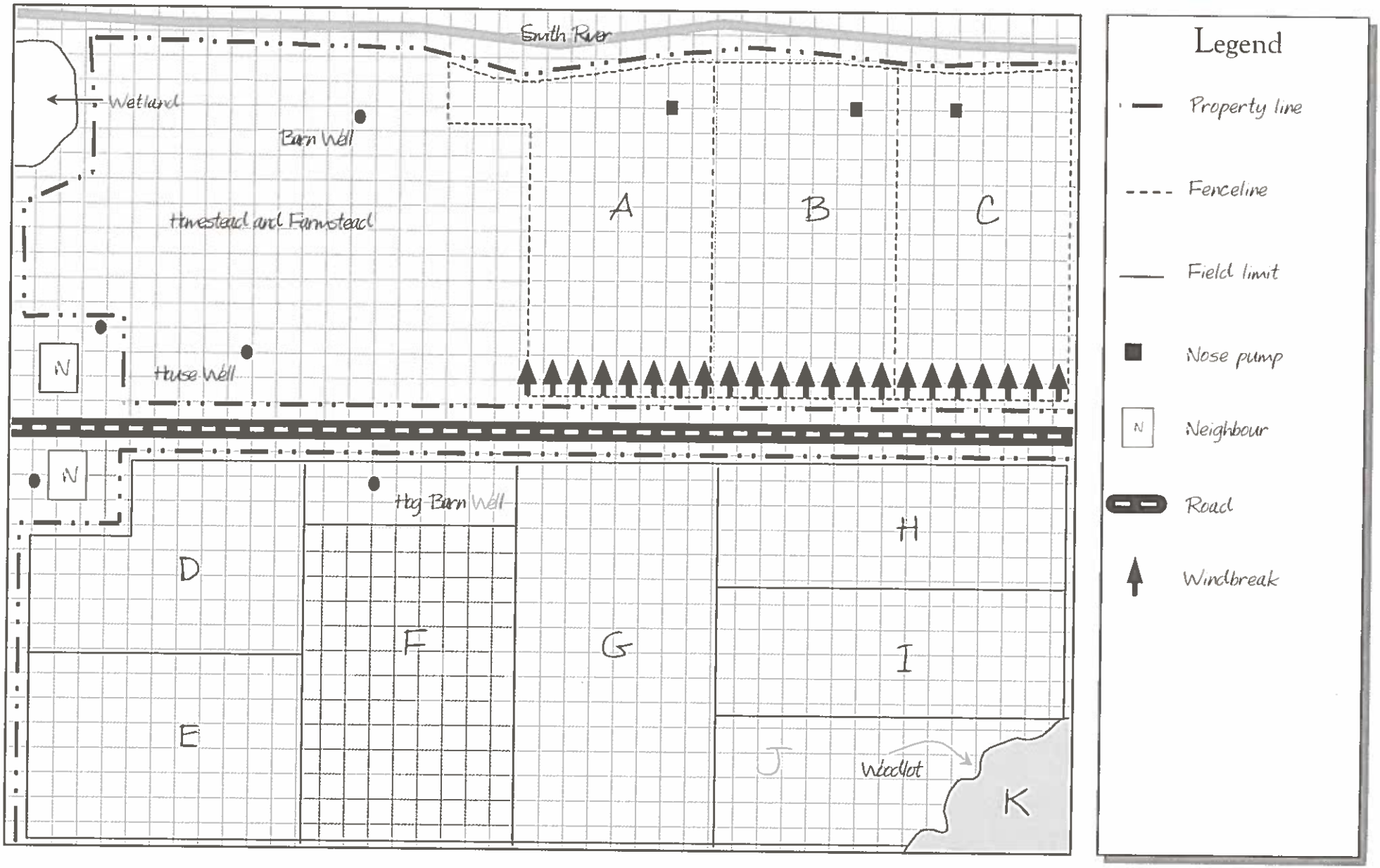


Table of Contents

Farmstead & Homestead

Farmstead Management

Most producers did not select the location of their farms; therefore, they did not have the opportunity to ensure that their operations met minimum separation distances from neighbours, water sources, public roads, or other public facilities.

Urban sprawl has also created conflicts in many farm communities. This could be viewed as a land use or land planning issue, but when a farm operation receives regular complaints from neighbours, the quality of life on the farm is greatly affected. Relocation is not a feasible alternative for most farms; however, there are management practices that can considerably reduce the risk of environmental contamination and reduce nuisance complaints.

This subsection will help producers assess the management and planning practices related to their farmstead and homestead. The goal is to provide an environmentally friendly, efficient, and safe farmstead and homestead.

What should you be aware of?

The impact of farmstead and homestead management practices on soil health is mostly related to chemical spills and to waste management practices. It is important to ensure that all chemicals on the farm are stored in facilities capable of retaining spills or leaks and to have an emergency plan prepared and followed in case of spills. Most organic waste produced on farms can be reused on the land as soil amendments which improve soil health; however, inorganic waste can be a source of soil contamination if not properly disposed of.

Maintaining a reliable source of good quality water is a primary concern for all producers as there are potential sources of water contamination on most farms. Keeping safe separation distances and locating the buildings and yards downslope from farm well(s) are some of the key precautionary measures that can be implemented. Containment and quick clean up of spills are also important practices. Runoff from surrounding land must be safely diverted away from the farmstead and homestead. Potentially contaminated effluents coming from the farm should be collected and safely disposed of.

Many farm operations seasonally emit different levels of dust and odours, and can sometimes be noisy. Most farms emit some odours, but more frequently, odours are emitted from livestock operations. Dust and noise emissions can vary with the size of the operation. There are many management practices that can mitigate these nuisances at minimal costs.

The proper use of trees, shrubs, and flower gardens on the farmstead will considerably enhance the aesthetic appearance of the farm. The diversity of birds at the farm can also be improved by planting various tree species that can provide food and nesting sites. The biodiversity on the farm is much improved if the landscaping efforts are integrated with surrounding landscape and ecosystems, such as by maintaining or providing travel corridors between the farmstead, woodlots, and other ecosystems.

Proper management and planning improve labour efficiency on the farm and reduce the risk of accidents, as well as the risk of water contamination. Most beneficial management practices adopted at the farmstead will have a positive impact on farm sustainability. Improving relationships with neighbours and acceptability of the farm operation to the general public will considerably enhance the quality of life on the farm, improve the market value of the farm, and/or encourage the next generation to stay on the farm.

How do you rate?

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Emergency Measures				
1 Emergency plan	Emergency plan developed and updated. Plan includes: • location and identification of buildings • location of hazardous materials and pressurized tanks • location of water sources • emergency numbers of different emergency agencies • anticipated flows in case of spills • contingency plan Emergency plan kept in emergency tube which is clearly posted All persons living and/or working on the farm trained in case of emergency	Emergency plan developed and updated. Plan includes: • location and identification of buildings • location of hazardous materials and pressurized tanks • location of water sources • emergency numbers of different emergency agencies Emergency plan kept in emergency tube which is clearly posted All persons living on the farm trained in case of emergency	Emergency plan developed and updated. Plan includes: • location and identification of buildings • location of hazardous materials and pressurized tanks Emergency plan located at the house or office	Emergency plan not developed or updated

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Farmyard Runoff				
2 Runoff control	Building located on elevated and well drained site Runoff from surrounding land naturally flow away from the building and yard Areas around building landscaped to divert roof water and any other clean rain water away from building	Building located on well drained site Runoff from surrounding land diverted away from the building and yard Areas around building landscaped to divert roof water and any other clean rain water away from building	Building located in a low lying area Runoff from surrounding land diverted away from the building and yard Tile drains placed around building to direct roof water and any other clean rain water into tile drainage system	Building located in a low lying area subject to flooding Runoff *not* diverted away from the building and yard Roof water and clean rain water not controlled and mixed with contaminated runoff
Nuisance Control (note to livestock producers: answer only the nuisance control questions in the Livestock Management subsection)				
3 Odour control	Culls and other crop waste material cleaned and properly disposed of *daily* (refer to farm waste subsection for more information)	Culls and other crop waste material cleaned and properly disposed of *weekly*	Culls and other crop waste material cleaned and properly disposed of *monthly*	Culls and other crop waste material cleaned less frequently than monthly
4 Noise control	*Most* of the following practices used to reduce noises at the farmstead: • ventilation fans enclosed and directed in opposite direction to neighbours • adequate mufflers on all tractors, vehicles, and engines • fans operated during daytime only or fans operated at low speed during the night • noise barriers (e.g. windbreak) in front of exhaust fans • downwind from neighbours	The following practices used to reduce noises at the farmstead: • ventilation fans enclosed and directed in opposite direction to neighbours • adequate mufflers on all tractors, vehicles, and engines • fans operated during daytime only or fans operated at low speed during the night	The following practices used to reduce noises at the farmstead: • ventilation fans enclosed and directed in opposite direction to neighbours • adequate mufflers on all tractors, vehicles, and engines	No particular practices to reduce noise at the farmstead

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Nuisance Control (cont'd)				
5 Dust control	The following practices used to reduce dust at the farmstead: • ventilation systems enclosed and kept clean • paved access road and yard • reduced traveling speed in access road and yard • turf seeded in non traveled areas of the farm • dust barriers around access road and yard (e.g. windbreaks) • downwind from neighbours	The following practices used to reduce dust at the farmstead: • ventilation systems kept clean • gravelled access road and yard • reduced traveling speed in access road and yard • turf seeded in non traveled areas of the farm	The following practices used to reduce dust at the farmstead: • ventilation systems kept clean • compacted access road and yard • reduced traveling speed in access road and yard	No particular practices used to reduce dust at the farmstead
6 Fly control	The following practices used to reduce flies at the farmstead: • no water ponding in yard or around building • waste and spills cleaned regularly • grass mowed regularly and kept short • building kept clean and dry	The following practices used to reduce flies at the farmstead: • no water ponding in yard or around building • waste and spills cleaned regularly • grass mowed regularly and kept short	The following practices used to reduce flies at the farmstead: • no water ponding in yard or around building • waste and spills cleaned regularly • insecticide sprayed when required	No particular practices to reduce flies at the farmstead; **or** Insecticide sprayed regularly

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Nuisance Control (cont'd)				
7 Rodent control	The following practices used to reduce rodents on the farmstead: • building kept clean and well maintained • cereal grains stored in steel tanks • grass mowed regularly and kept short • yard and building kept free of waste and debris • rodent traps in building • controlled number of cats on the farm	The following practices used to reduce rodents on the farmstead: • building kept clean; minor maintenance required • cereal grains stored in steel tanks • grass mowed regularly and kept short • yard and building kept free of waste and debris • rodent traps in building • pest exterminator hired	The following practices used to reduce rodents on the farmstead: • maintenance required but building structurally sound • cereal grains stored in steel tanks • yard and building kept free of waste and debris • uncontrolled number of cats on the farm	No particular practices used to control rodents

Water Wells

Water is essential to all farm operations. Farms require a large quantity of high quality water for human and livestock consumption, to manage crops, to clean buildings and equipment. Producers share water resources with their neighbours and wildlife; therefore, it is vital to conserve water and prevent its contamination. Careful planning and management minimize the risks related to agricultural activities.

What should you be aware of?

In order to ensure a continuous, dependable, and safe water supply, it is important to maintain a healthy soil. A soil that is not compacted, has good water infiltration, and is not contaminated will reduce the risks to water quality and quantity.

Nutrients, pathogens, pesticides, and petroleum products can contaminate the water. This can pose a serious threat to humans, livestock, aquatic ecosystems, and wildlife in general. For instance, babies and certain domestic animals are susceptible to methemoglobinemia (blue-baby syndrome) when there is excess nitrate in the water. Bacteria in the drinking water can cause gastrointestinal problems which can be life-threatening to certain age groups. Therefore, water should be tested regularly.

Provincial legislation exists to ensure the protection of drinking water sources. These regulations set minimum separation distances from potential contamination sources. Before drilling a new well, it is important to consider its distance from petroleum tanks, sewer pipes, septic systems, manure storages, etc.

Provincial guidelines must be followed to ensure that a well no longer in use is properly sealed. This will reduce risk of surface contaminants reaching the groundwater since wells provide a direct access point to groundwater.

It is also important to conserve water as excessive demands on a farm's water supply can lead to water shortages on the farm and for surrounding and downstream users. Water conservation may become increasingly important in the future as climatologists are predicting more frequent droughts.

Groundwater recharges many of the surface waters important to natural ecosystems such as wetlands, rivers, lakes, and streams. The management of well water affects the quality and quantity of these surface waters.

Providing clean, potable drinking water to livestock will maintain their productivity and reduce their risk of disease. Prevention of water contamination is much cheaper than water treatment, finding a new water source, or transporting clean, potable water from miles away. In addition, liabilities associated with impacts on water quality and the violation of acts, regulations, or by-laws can have serious financial repercussions for the agricultural industry.

How do you rate?

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Potential Well Water Contamination				
1 **Water quality**	Water tested at least once a year (more often if well is shallow) Test results recorded to monitor changes in water quality Meets higher standards than the *Canadian Drinking Water Guidelines*	Water tested once every two years Test results recorded to monitor changes in water quality Meet the *Canadian Drinking Water Guidelines*	Water tested less than once every two years; **or** Does not always meet the *Canadian Drinking Water Guidelines*	Water never tested; **or** Never meets the *Canadian Drinking Water Guidelines*
2 **Unused or abandoned well**	No unused or abandoned wells	*Unused* wells properly capped, protected, and maintained *Abandoned* wells properly filled in and plugged	Unused and abandoned wells properly capped	*Unused* wells not properly capped *Abandoned* wells improperly filled in and plugged
Well Water Source				
3 **Type of well**	Drilled in bedrock by licensed contractor All required permits obtained	Drilled in unconsolidated material (shale, gravel, etc.) by licensed contractor All required permits obtained	Sand point	Dug/bored well or spring; **or** Drilled without required permits

Risk Rating	1 (Low)	2	3	4 (High)
Well Water Source (cont'd)				
4 **Age of well**	Less than 30 years old	30 to 40 years old	40 to 60 years old	More than 60 years old
5 **Casing depth**	In bedrock: More than 15 m (50 ft) and firmly driven in bedrock In unconsolidated material: More than 45 m (150 ft) below ground level	In bedrock: Less than 15 m (50 ft) and firmly driven in bedrock In unconsolidated material: 30 to 45 m (100 to 150 ft) below ground level in loose soil	In bedrock: Less than 15 m (50 ft) and not firmly driven in bedrock In inconsolidated material: 15 to 30 m (50 to 100 ft) below ground level in loose soil	In bedrock: No casing In unconsolidated material: Less than 15 m (50 ft) below ground level
6 **Casing height above ground level**	30 cm (12 in) or more above normal ground level	Between 20 to 30 cm (8 to 12 in) above normal ground level	Less than 20 cm (8 in) above normal ground level	Below ground (e.g. in pit or basement)
7 **Condition of exposed casing, well cap, and vent**	Casing inspected annually and no defects visible Cap tightly secured and in good condition Vent is screened	Casing inspected every 2 years and in good condition Cap in good condition but loose Vent not screened	Casing inspected less frequently than every 2 years Cap loose and needs repair Vent not screened	Casing cracked or broken Cap badly damaged or missing No well vent
8 **Condition of material surrounding well casing**	No settling of surface material around well casing Mounded earth around well casing is grassed Space between well casing and surrounding material well sealed (e.g. grout, concrete) at a depth of 3 to 6 m (10 to 20 ft)	No settling of surface material around well casing Mounded earth around well casing Material surrounding casing *well compacted*; no visible space	No settling of surface material around well casing Area around well casing is level with surroundings Material surrounding casing *not compacted*; no visible space	Settling of surface material around well casing Settling or depression around well casing Visible space between well casing and surrounding material; surface water entering well

Risk Rating	1 (Low)	2	3	4 (High)
Water Management				
9 **Backflow prevention on water supply**	Anti-backflow devices (e.g. check valves) installed on hose connections	Anti-backflow devices installed on hose connections	No anti-backflow devices	No anti-backflow devices
	Air gap of at least 15 cm (6 in) maintained when using hoses	Air gap of at least 15 cm (6 in) maintained when using hoses	Air gap of at least 15 cm (6 in) maintained when using hoses	Air gap not maintained
	No cross-connections between water sources	Controlled cross-connections between water sources	Controlled cross-connections between water sources	Opened cross-connections between water sources
10 **Water use**	Water use monitored (metered and recorded) to identify potential problems or to measure impact of improvements	Water use not monitored	Water use not monitored	Water use not monitored
	Water supply adequate for intended use and well never runs out of water	Water supply not always adequate, well may run out of water if used excessively	Water supply not always adequate, well may run out of water if used excessively	Water supply not always adequate, well may run out of water in extended hot and dry period or freezes during winter
	Measures taken to conserve water (e.g. leaks repaired, water conserving fixtures used)	Measures taken to conserve water (e.g. leaks repaired, water conserving fixtures used)	Few measures taken to conserve water (e.g. leaks repaired)	No measures taken to conserve water

Petroleum Storage

Petroleum storage tanks are used on farms to store heating oil, gasoline, and diesel fuel. Petroleum leaks may lead to contamination of soils, surface, or ground waters. Petroleum contamination of soils can be very difficult and expensive to clean up. It may involve the removal of tonnes of contaminated soil around a contaminated site which then must be sent away for remediation. Petroleum storages should be properly sited, constructed, and maintained to prevent leaks and potential contamination.

What should you be aware of?

In petroleum contaminated soils, the microbial population and activities contributing to soil health and nutrient availability may be reduced. Some soil microbes have the ability to decompose petroleum contaminants in soil, but this process is often very slow. Ensuring that petroleum storages do not leak and preventing spills will protect soil health.

Spilled or leaked petroleum may slowly seep through the soil and eventually reach the groundwater. Contaminated groundwater can be very difficult or impossible to clean up. Once the groundwater is contaminated, another source of drinking water must be found for the farm. In addition, contaminated groundwater may spread throughout the aquifer to neighbouring wells or municipal drinking water supplies.

Runoff water may carry petroleum or soil sediments contaminated with petroleum into watercourses. Contaminated surface water is also difficult to clean and unfit for livestock watering, human consumption, recreational activities, and other uses.

The fumes from petroleum storages can be toxic and flammable. Care should be taken when refueling vehicles on the farm to limit exposure to petroleum fumes. If petroleum tanks are enclosed in a petroleum storage facility, that facility should be naturally well ventilated and the tanks should be vented outside. Storage tanks should also be located away from buildings, particularly dwellings and livestock barns to prevent long-term exposure to the fumes and prevent fires.

Petroleum contamination of surface waters will not only have a negative impact on the aquatic habitat but will also affect the whole food web relying on the watercourse. Various species of fish may be killed due to petroleum contamination as well as many species of birds that swim and feed in watercourses. Many other animals which depend on the watercourse for drinking will also be affected.

A single petroleum storage leakage event and the related clean up costs could jeopardize the survival of a farm operation. The costs of petroleum contamination cleanup can be very high. Insurance companies are becoming increasingly reluctant to cover large remediation expenses in their policies. Most insurance companies now demand that heating oil and other petroleum storage tanks have a secondary containment.

How do you rate?

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Fuel Use at the Farm				
1 **Fuelling of farm vehicles and equipment**	Fuelling done at service station; **or** Fuelling done at petroleum storage site and vehicle parked on *impermeable* pad (e.g. concrete apron) when refuelling Constant supervision Motor shut off while refuelling	Fuelling done at petroleum storage site and vehicle parked on *semi permeable* surface when refuelling; **or** Fuelling done in the field from approved containers (e.g. ULC, CSA) at least 75 m (245 ft) from watercourse Constant supervision Motor shut off while refuelling	Fuelling done at petroleum storage site and vehicle parked on *permeable* surface when refuelling; **or** Fuelling done in the field from approved containers (e.g. ULC, CSA) less than 75 m (245 ft) from watercourse Constant supervision Motor shut off while refuelling	Fuelling done from unapproved containers No supervision Motor left running while refuelling
2 **Amount of petroleum stored**	No petroleum or less than 70 l (15 gal) stored on the farm ⇩ Proceed to the Pesticide Storage & Handling subsection	Less than 2 000 l (440 gal) stored on the farm	Less than 4 500 l (1 000 gal) stored on the farm	More than 4 500 l (1 000 gal) stored on the farm

Risk Rating	1 (Low)	2	3	4 (High)
Type of Petroleum Storage Tank				
3 **Type of petroleum storage tank**	Aboveground storage tank: • approved (e.g. ULC, CSA) • double wall vacuum monitored steel tank • cathodic protective coating • installed in a secondary containment with a holding capacity of 110% • roof built over containment or rain flaps to prevent precipitation from entering secondary containment Exceeds ventilation requirements	Aboveground storage tank: • approved (e.g. ULC, CSA) • double wall vacuum monitored steel tank • cathodic protective coating • installed on concrete slab OR Above ground storage tank: • approved (e.g. ULC, CSA) • single wall steel tank • cathodic protective coating • installed in a secondary containment with a holding capacity of 110% • rain water regularly removed from spill containment Meets ventilation requirements	Aboveground storage tank: • approved (e.g. ULC, CSA) • single wall steel tank • cathodic protective coating • installed on concrete slab OR Above ground storage tank: • approved (e.g. ULC, CSA) • double wall vacuum monitored steel tank • cathodic protective coating • mounted on blocks or directly on the ground Not well ventilated OR Underground storage approved (e.g. ULC, CSA), less than 15 years old, and with anti-rust cathodic protective coating	Tank not approved OR Single wall above ground steel tank installed directly on the ground or raised on a stand No ventilation OR Underground storage more than 15 years old without cathodic protective coating

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Type of Petroleum Storage (cont'd)				
4 Installation	Tanks installed by a licensed contractor	Tank installation supervised by licensed contractor	Tank installation inspected by licensed contractor	Tank installation *not* inspected by licensed contractor; **or**
	Required permits obtained	Required permits obtained	Required permits obtained	Required permits *not* obtained; **or**
	Exceeds minimum separation distance to buildings, other tanks, and property lines	Meets minimum separation distance to buildings, other tanks, and property lines	Meets minimum separation distance to buildings, other tanks, and property lines	Does not meet minimum separation distance to buildings, other tanks, and property lines; **or**
	No combustible materials near tanks	No combustible materials near tanks	No combustible materials near tanks	Combustible materials near tanks
	No overhead electrical lines	No overhead electrical lines	No overhead electrical lines	
	All electrical connections in sparkproof fittings, installed by a licensed electrician and inspected by electrical inspector	All electrical connections in sparkproof fittings, installed by a licensed electrician and inspected by electrical inspector	All electrical connections in sparkproof fittings, installed by a licensed electrician	Electrical connections not sparkproofed or not installed by a licensed electrician
5 Dispenser (nozzle)	Approved (e.g. ULC, CSA)	Approved (e.g. ULC, CSA)	Approved (e.g. ULC, CSA)	Not approved; **or**
	Automatically shuts off or handle is released when tank is full	Certified latch-open device on nozzle; shuts off when tank is full or when nozzle falls out of filling neck or when pump is shut down; **or**	No automatic shutoff	Latch-open device on nozzle with no automatic shut off; **or**
	Constant hand pressure to operate	Hand pump used	Constant hand pressure to operate	Gravity fed

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Potential for Well Water Contamination (petroleum storage)				
6A Distance to well at risk	More than 200 m (655 ft)	Between 150 to 200 m (490 to 655 ft)	Between 100 to 150 m (330 to 490 ft)	Less than 100 m (330 ft)
6B Slope gradient toward well	Less than 2%; **or** Located downslope from well	Between 2 to 5%	Between 5 to 10%	More than 10%
6C Hydrologic soil group (water infiltration rate)	Very Slow	Slow	Moderate	Fast

6D Potential for well water contamination

If your answer is a fraction, round up to the next whole number to get your overall rating (i.e. 1.3 → 2)

$$\frac{\text{6A*} + \text{6B} + \text{6C}}{3} = \text{Overall Rating}$$

*if Risk Rating of question 6A equals 4 *(High)*, the Overall Rating equals 4

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Potential for Surface Water Contamination (petroleum storage)				
7A Distance to watercourse at risk	More than 200 m (655 ft)	Between 150 to 200 m (490 to 655 ft)	Between 100 to 150 m (330 to 490 ft)	Less than 100 m (300 ft)
7B Slope gradient toward watercourse	Less than 2%	Between 2 to 5%	Between 5 to 10%	More than 10%
7C Hydrologic soil group (water infiltration rate)	Fast	Moderate	Slow	Very slow

7D Potential for surface water contamination overall rating

If your answer is a fraction, round up to the next whole number to get your overall rating (i.e. 1.3 → 2)

$$\frac{7A^{*} + 7B + 7C}{3} = \text{Overall Rating}$$

*if Risk Rating of question 7A equals 4 *(High)*, the Overall Rating equals 4

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Spills and Other Safety Precautions				
8 Emergency plan	Petroleum storage and handling included in farmstead emergency plan Fire extinguisher available at storage site Spill clean up material at storage site All spills cleaned up immediately using proper procedures All leaks and major spills reported (70 l (15 gal) or more)	Petroleum storage and handling included in farmstead emergency plan Fire extinguisher available at the farm Spill clean up material at the farm Major spills cleaned up immediately using proper procedures All leaks and major spills reported (70 l (15 gal) or more)	Petroleum storage and handling included in farmstead emergency plan Spill clean up material at the farm Spills rarely cleaned up Major spills reported (70 l (15 gal) or more)	No emergency plan; **or** Spills never cleaned up; **or** Major spills not reported
9 Security measures (e.g. theft, vandalism, child safety)	Tanks fixed firmly in place and always locked	Tanks fixed firmly in place and locked when no one at the farm	Tanks fixed firmly in place and never locked	Tanks not firmly in place or locked
10 Monitoring	Weekly monitoring: • visual inspection for potential leaks and corrosion • inspection of secondary containment and/or vacuum gauge for any leak or spill • measurement of tank liquid level and verified with fuel use records to detect tank leaks	Monthly monitoring: • visual inspection for potential leaks and corrosion • inspection of secondary containment for any leak or spill • measurement of tank liquid level and verified with fuel use records to detect tank leaks	Monitoring: • regular visual inspection for leaks and corrosion	No monitoring; **or** Records not kept

Pesticide Storage & Handling

Pesticides are useful to help manage pests in agricultural production. They can increase yields, improve quality of produce, and are of relatively low cost. However, they can pose a threat to human health and to the environment if not handled and stored properly.

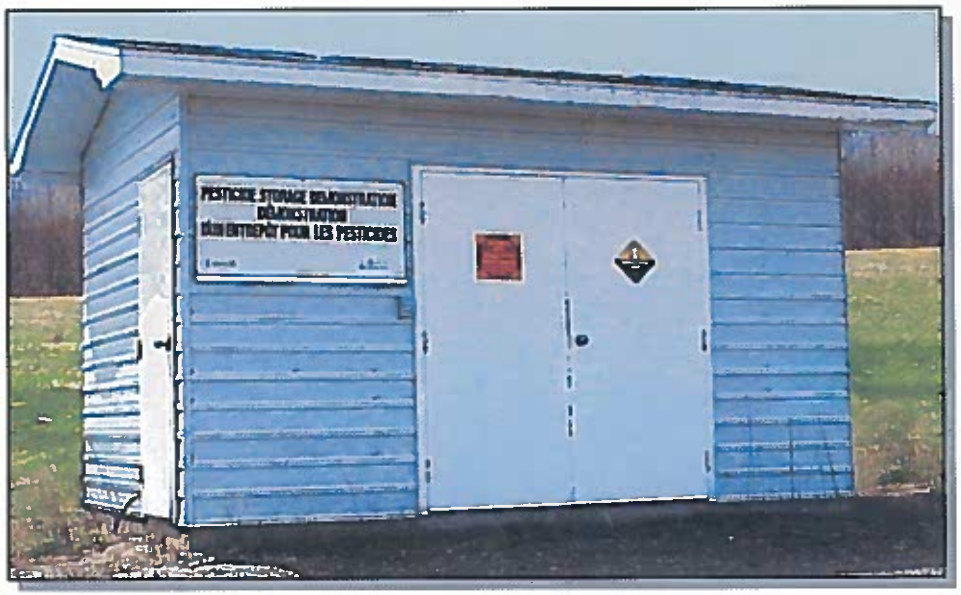
Agricultural pesticides are bought, stored, and handled in highly concentrated forms which are often very toxic to humans, animals, insects, plants, bacteria, and fungi. In fact, a minute amount of pesticides can render an entire aquifer undrinkable. Several pesticides can persist in the environment for many years and travel through organisms, air, soil, and water. Proper transport, storage, and handling of pesticides are necessary to prevent spills and accidental dermal or respiratory exposure to humans and livestock.

What should you be aware of?

Soil organisms (e.g. bacteria, earthworms) can be affected by pesticides, especially if pesticides are spilled or misused. Pesticides which persist in the soil may inhibit the activities of soil organisms. Therefore, the organisms are less capable to decompose humus and mineralize organic matter.

An obvious concern stemming from pesticide spills is the impact that it could have on water quality. Pesticides may leach into groundwater or reach surface water through runoff. Drinking contaminated water could pose serious threats to human and livestock health.

Pesticide fumes can be extremely hazardous if inhaled. An important aspect of occupational health and safety on the farmstead is ensuring that the pesticide storage is well ventilated. Also, to avoid inhaling pesticides, a respirator should be worn when handling them.



Any pesticide spill is harmful to the organisms that come in contact with it. The bigger the spill and the longer it takes to clean up, the larger the number of organisms affected. Proper pesticide storage lessens the risk of surface water contamination and the impact this may have on the aquatic habitat and wildlife. Chronic exposure of fish to non-lethal concentrations of pesticides has been linked to a decline of the reproductive capacity among different fish populations.

It is best to minimize the amount of pesticides on the farm. However, it is essential to have a safe place to store pesticides, even if only a small amount is used. A safe pesticide storage reduces the health risk for people living or working on the farm as well as the risk of spills. Spills are costly to clean up. Prevention of water contamination is much cheaper than water treatment or transporting clean water from miles away. A well organized storage means fewer mix-ups of chemicals, which can lead to crop loss, and helps keep a better inventory, which avoids purchasing excess pesticides.

How do you rate?

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Amount of Pesticide Stored on Farm				
1 **Amount of pesticide stored on farm**	No pesticides used on the farm ⇩ Proceed to the Fertilizer Storage & Handling subsection	Less than 25 l (5.5 gal) OR less than 25 kg (55 lbs) of total pesticides stored for more than 30 days from date received	Between 25 to 200 l (5.5 to 44 gal) OR 25 to 200 kg (55 to 440 lbs) of total pesticides stored for more than 30 days from date received	More than 200 l (44 gal) OR 200 kg (440 lbs) of total pesticides stored for more than 30 days from date received
Pesticide Storage				
2 **Pesticide storage**	Pesticides stored in a separate free standing building designed for pesticides; **or** Stored in a free standing insulated cabinet only used for pesticides More than 12 m (40 ft) or exceeds minimum separation distance from incompatible facilities (e.g. petroleum, fertilizer, or feed storage, residence, livestock barn)	Pesticides stored in a separate designated room within a building; **or** Stored in a cabinet located within a building; cabinet only used for pesticides *Not within* incompatible facilities (e.g. petroleum, fertilizer, or feed storage, residence, livestock barn)	Pesticides stored in a separate designated room within a building; **or** Stored in a cabinet located within a building; cabinet only used for pesticides *Within* incompatible facilities other than the residence (e.g. petroleum, fertilizer, or feed storage, livestock barn)	Pesticides stored in several places; **or** Stored in a residence

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Potential for Well Water Contamination (pesticide storage and/or permanent mixing/loading facilities)				
3A Distance to well at risk	More than 50 m (165 ft)	Between 40 to 50 m (130 to 165 ft)	Between 30 to 40 m (100 to 130 ft)	Less than 30 m (100 ft)
3B Slope gradient toward well	Less than 2%; **or** Located downslope from well	Between 2 to 5%	Between 5 to 10%	More than 10%
3C Hydrologic soil group (water infiltration rate)	Very slow	Slow	Moderate	Fast

3D Potential for well water contamination

If your answer is a fraction, round up to the next whole number to get your overall rating (i.e. 1.3 → 2)

$$\frac{\text{3A*} + \text{3B} + \text{3C}}{3} = \text{Overall Rating}$$

*if Risk Rating of question 3A equals 4 *(High)*, the Overall Rating equals 4

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Potential for Surface Water Contamination (pesticide storage and/or permanent mixing/loading facilities)				
4A Distance to water-course at risk	More than 150 m (450 ft)	Between 100 to 150 m (330 to 450 ft)	Between 75 to 100 m (250 to 330 ft)	Less than 75 m (250 ft)
4B Slope gradient to-ward watercourse	Less than 2%	Between 2 to 5%	Between 5 to 10%	More than 10%
4C Hydrologic soil group (water infiltration rate)	Fast	Moderate	Slow	Very slow

4D Potential for surface water contamination overall rating

If your answer is a fraction, round up to the next whole number to get your overall rating (i.e. 1.3 → 2)

$$\frac{4A^* + 4B + 4C}{3} = \text{Overall Rating}$$

*if Risk Rating of question 4A equals 4 *(High)*, the Overall Rating equals 4

Risk Rating	1 (Low)	2	3	4 (High)
Spill Containment				
5 **Spill containment in storage area**	Impermeable floor (e.g. sealed concrete)	Impermeable floor (e.g. sealed concrete)	Impermeable floor with cracks	Permeable floor (e.g. wooden, dirt, gravel)
	No floor drain	No floor drain	Floor drained to acceptable holding tank	
	Retaining walls high enough to provide a containment capacity of 110% of pesticides stored	Retaining walls high enough to retain 100% of stored pesticides	Floor does not have retaining walls	
6 **Spill containment in permanent mixing/ loading facilities**	Permanent roof	No roof	No roof	
	Impermeable floor (e.g. sealed concrete) with retaining walls	Impermeable floor (e.g. sealed concrete) with retaining walls	Temporary mixing/loading area with plastic lined berm	Mixing/loading area without containment to prevent contamination
	No floor drain	No floor drain		
	Constant supervision during filling and mixing	Constant supervision during filling and mixing	Frequent supervision during filling and mixing	Little or no supervision during filling and mixing
7 **Backflow prevention on water supply**	Separate water tank (nurse tank) used as a water supply	Anti-backflow device (check valve) installed to prevent contamination of water source (e.g. well, stream, pond)	Anti-backflow device (check valve) installed to prevent contamination of water source (e.g. well, stream, pond); **or**	No anti-backflow device
		Water pipe/hose permanently fixed at least 15 cm (6 in) above sprayer tank	Water pipe/hose hand held at least 15 cm (6 in) above sprayer tank	Water pipe/hose in sprayer tank

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Pesticide Storage and Handling Safety Measures				
8 Health and safety	These safety precautions are followed: • locked door–outdoor entrance only • mechanical ventilation • labels kept on all containers • switch for ventilation accessible from outside building • warning sign at entrance • respiratory equipment and protective clothing always worn Material Safety Data Sheets (MSDS) on file	These safety precautions are followed: • locked door • mechanical ventilation • labels kept on all containers • warning sign at entrance • labels kept on all containers • respiratory equipment and protective clothing always worn	These safety precautions are followed: • locked door • natural ventilation • labels kept on all containers • respiratory equipment and protective clothing sometimes worn	Any of the following: • no locked door • no ventilation • no labels on some or all containers • no respiratory equipment and protective clothing
9 Emergency plan and clean up materials for spills	Pesticide storage and handling included in farmstead emergency plan Fire extinguisher available at storage site Spill clean up materials in storage All spills reported and cleaned up immediately using proper procedures	Pesticide storage and handling included in farmstead emergency plan Fire extinguisher available at the farm Spill clean up materials at the farm Major spills reported and cleaned up immediately using proper procedures	Pesticide storage and handling included in farmstead emergency plan Spill clean up materials at the farm Spills rarely reported or cleaned	No emergency plan; **or** Spills not reported or cleaned

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Pesticide Waste				
10 Pesticides no longer registered for use and non usable leftovers	No leftover pesticide as only amount needed is purchased	Kept in original container with label intact Returned to place of purchase	Kept in original container with label intact Stored in pesticide storage until disposed of at an authorised disposal site	Still used; **or** Stored in unsafe area; **or** Sent to a landfill site
11 Pesticide containers	Pesticides purchased in bulk or in refillable containers Containers triple rinsed or pressure rinsed and stored *in pesticide storage* until taken to pesticide dealer	Containers, including plastic bags, triple rinsed or pressure rinsed, punctured, and stored until taken to pesticide dealer or to a recycling depot Paper bags with a plastic or foil liner single rinsed Paper bags and aerosol containers wrapped in an absorbent material and taken to a licensed waste disposal site	Containers improperly rinsed and taken to pesticide dealer or a recycling depot; **or** Containers triple rinsed and sent to a landfill site	Improperly rinsed containers sent to a landfill site; **or** Containers burned or buried on farm; **or** Reused for other purposes
Transportation of Pesticides				
12 Transportation	Pesticides delivered by agri-chemical dealer; **or** Producer transports less than 25 l (5.5 gal) or less than 25 kg (55 lbs) of pesticides at a time Pesticides secured during transportation Pesticides not transported in vehicle/equipment cab or with other items	Producer transports between 25 to 200 l (5.5 to 44 gal) or 25 to 200 kg (55 to 440 lbs) of pesticides at a time Pesticides secured during transportation Pesticides not transported in vehicle/equipment cab or with other items	Producer transports between 25 to 200 l (5.5 to 44 gal) or 25 to 200 kg (55 to 440 lbs) of pesticides at a time Pesticides secured during transportation Pesticides transported with non consumable items	Producer transports more than 200 l (44 gal) or 200 kg (440 lbs) of pesticides at a time Pesticides *not* secured during transportation Pesticides transported with consumable items

Fertilizer Storage & Handling

It is important to store and handle fertilizers carefully. The nutrients in fertilizer can be harmful to animals and humans if they reach ground or surface waters. Nitrate (a form of nitrogen) poses the greatest risk since it dissolves quickly in water and is easily lost from the soil through leaching. The effects of drinking water with high nitrate levels can be particularly devastating to babies and young cattle.

Livestock and children may also be tempted to ingest fertilizers (because of their salty taste) if they are accessible. Children may play with fertilizers which can burn their eyes and irritate their skin. Certain fertilizers are chemically unstable or explosive but are safe if stored and handled properly. Therefore, it is recommended to store fertilizers in a locked, dry, impermeable location and to minimize the amount of fertilizers stored on the farm.

What should you be aware of?

When selecting the fertilizer storage site, it is important to consider the soil texture of the area. The soil in the area should be heavy textured and have a low permeability (e.g. clay soil). This will prevent nutrients from leaching and contaminating the ground water. A high risk of spills exists where fertilizers are mixed and loaded. Therefore, the fertilizer storage should be located a safe distance away from watercourses and downslope from wells. Excess nitrate in drinking water can cause health problems to humans and animals.

When handling fertilizers, a respirator is recommended as air-borne particles may cause irritation of the nose and upper respiratory tract. Exposing fertilizers to air could cause some nutrients to be lost in a gaseous form such as nitrogen loss through ammonia. Also, fertilizers should not be exposed to humid air as they will absorb moisture, clump together, and be harder or impossible to use.

Good management of fertilizer storage and proper handling reduce the potential of surface water contamination. These practices will help maintain a healthy aquatic and wildlife habitat. Nitrogen and phosphorus can also cause excessive plant growth in surface water which in turn depletes the amount of oxygen for fish and aquatic life (eutrophication).

Minimizing the amount of fertilizer kept on the farm makes long-term storage unnecessary. However, in some remote areas, fertilizer storage is inevitable. Though building a fertilizer storage may be considered by some as a costly endeavor, it is far more expensive to try to clean a well or aquifer or to transport clean water from elsewhere after a spill. Having a fertilizer storage can also prevent other costly accidents such as livestock dying from ingesting fertilizers.

How do you rate?

Risk Rating	1 (Low)	2	3	4 (High)
Fertilizer Use at the Farm				
1 **Fertilizer transportation**	Delivered at the farm or field by fertilizer dealer	Transported in bulk fertilizer hopper or spreader; **or** Secured on truck if transported in bags Not transported with petroleum products	Transported in bulk hopper not designed for fertilizer transport; **or** Bagged fertilizer not secured on truck Not transported with petroleum products	Transported in bulk hopper not designed for fertilizer transport; **or** Bagged fertilizer not secured on truck Transported with petroleum products
2 **Amount of fertilizer stored**	No fertilizers used on the farm; **or** No fertilizer stored longer than immediate use period and no surplus fertilizer	Less than one tonne of granular fertilizers stored for longer than immediate use period Less than 200 l (53 gal) of liquid fertilizers stored for longer than immediate use period and kept in original container with label intact	One to 20 tonnes of granular fertilizer stored for longer than immediate use period; **or** 200 to 5 000 l (53 to 1 320 gal) of liquid fertilizer stored for longer than immediate use period and kept in original partly labelled container	More than 20 tonnes of granular fertilizer stored for longer than immediate use period; **or** More than 5 000 l (1 320 gal) of liquid fertilizer stored for longer than immediate use period and kept in unlabelled container

Proceed to the Farm Waste subsection

Risk Rating	1 (Low)	2	3	4 (High)
Storage of Fertilizer				
3 Type of storage	Building only used for fertilizer storage Impermeable floor (e.g. sealed concrete) Granular and liquid spills can be contained and collected	Temporarily stored in machinery shed Paved or concrete floor Granular spills can be contained and collected Most liquid fertilizer spills can be contained	Stored on compacted soil surface with a temporary cover (protected from rainfall and runoff) Granular spills can be contained and collected Liquid fertilizer spills can not be contained	Stored on soft soil (e.g. gravel) without cover Most granular spills can be contained but difficult to collect Liquid fertilizers spills can not be contained
Safety				
4 Health and safety	Following safety precautions are taken: • fertilizer not accessible to children and livestock • respirator and protective clothing worn when handling fertilizers • fertilizer storage well ventilated • fertilizers not stored with incompatible materials (e.g. pesticides, petroleum, feed)	Following safety precautions are taken: • fertilizer not accessible to children and livestock • dust mask always worn when handling fertilizers • fertilizers not stored with incompatible materials (e.g. pesticides, petroleum, feed)	Fertilizer not accessible to livestock Not stored with incompatible materials (e.g. pesticides, petroleum, feed)	Fertilizer accessible to livestock Stored with incompatible materials (e.g. pesticides, petroleum, feed)
5 Emergency plan	Fertilizer storage included in farmstead emergency plan Spill clean up materials available in storage Spills cleaned up immediately	Fertilizer storage included in farmstead emergency plan Spill clean up materials available at the farm Spills cleaned up within a day	Fertilizer storage included in farmstead emergency plan	No emergency plan

Risk Rating	1 *(Low)*	2	3	4 *(High)*

Potential for Well Water Contamination (fertilizer storage and/or permanent mixing/loading facilities)

6A Distance to well at risk	More than 50 m (165 ft)	Between 40 to 50 m (130 to 165 ft)	Between 30 to 40 m (100 to 130 ft)	Less than 30 m (100 ft)
6B Slope gradient toward well	Less than 2%; **or** Located downslope from well	Between 2 to 5%	Between 5 to 10%	More than 10%
6C Hydrologic soil group (water infiltration rate)	Very slow	Slow	Moderate	Fast

6D Potential for well water contamination

If your answer is a fraction, round up to the next whole number to get your overall rating (i.e. 1.3 → 2)

$$\frac{6A^{*} + 6B + 6C}{3} = \text{Overall Rating}$$

*if Risk Rating of question 6A equals 4 *(High)*, the Overall Rating equals 4

Risk Rating	1 *(Low)*	2	3	4 *(High)*

Potential for Surface Water Contamination (fertilizer storage and/or permanent mixing/loading facilities)

7A Distance to water-course at risk	More than 150 m (490 ft)	Between 100 to 150 m (330 to 490 ft)	Between 75 to 100 m (245 to 330 ft)	Less than 75 m (245 ft)
7B Slope gradient toward watercourse	Less than 2%	Between 2 to 5%	Between 5 to 10%	More than 10%
7C Hydrologic soil group (water infiltration rate)	Fast	Moderate	Slow	Very slow

7D Potential for surface water contamination overall rating

If your answer is a fraction, round up to the next whole number to get your overall rating (i.e. 1.3 → 2)

$$\frac{7A^{*} + 7B + 7C}{3} = \text{Overall Rating}$$

*if Risk Rating of question 7A equals 4 *(High)*, the Overall Rating equals 4

Farm Waste

Waste management is important for all enterprises. Farm activities may generate several different kinds of wastes such as used oil, organic wastes, washwater, old lumber, building materials, and old equipment. There are opportunities to save money while reducing the amount of waste produced and thus, decrease the possible impact to the environment.

One way to manage waste is to practice the 3 Rs: Reduce, Reuse, and Recycle. Most containers can be reused or recycled after they are carefully cleaned. The amount of waste can be reduced through a good maintenance program and by buying in bulk. Also, by turning by-products, such as vegetable culls, into compost, they become an economically valuable resource.

What should you be aware of?

Soil microorganisms and fauna affect soil biological processes and are part of a healthy soil. It is important to protect these organisms from toxins that can be released from various farm wastes to ensure they continue to transform nutrients and decompose residues. Having a dump on the farm increases the likelihood of heavy metals and other pollutants contaminating the soil. Even after the dump has been cleaned and all waste has been removed, contaminants may remain in the soil for years. This area may not be suitable for cropping as long as contaminants remain in the soil. Properly managing waste will reduce these risks.

On-farm dumps may be a source of contaminants such as heavy metals, pesticides, bacteria, and other toxins which may eventually seep into ground and surface waters. This could render these waters unusable for human and livestock consumption, irrigation, and other farm operations. Minimizing the amount of waste kept on the farm by reducing, reusing, and recycling can lower these risks. It is also a good idea to remove any existing on-farm dumps.

Ammonia, hydrogen sulphide, and greenhouse gases such as methane and nitrous oxide are naturally released during the biological decomposition of organic material. Spoiled hay and silage may contain spores that should not be inhaled, as they can affect human and animal health. Odours can be released from farm wastes, which may be intolerable to nearby neighbours. Most odour conflicts can be avoided by properly composting organic wastes.

Preventing pollutants from seeping into nearby ground and surface waters helps ensure that a healthy habitat for aquatic life will be maintained. Also, ensuring that old containers are recycled and old equipment does not end up in woodlots, riparian buffer zones, or other natural spaces will protect these habitats on the farm and prevent wildlife from harming themselves with these materials.

Reusing materials on the farm decreases total farm expenses. Reducing the amount of waste, recycling wastewater, and reducing spoilage can also lower the costs. Most crop residues normally considered waste products can be composted and commercialized. It is also important to ensure that all waste is disposed of properly to avoid any liability issues. In addition, keeping a tidy farm property helps increase farm value and the consumer's opinion of the operation. It may even increase farm sales.

How do you rate?

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Horticultural Waste				
1 **Fruit and vegetable waste** (vegetable and fruit culls, crop residues)	Composted; **or** Fed to livestock (directly or ensiled); **or** Sent to a waste processing plant (e.g. dehydration)	Spread evenly on land and incorporated; **or** Buried on farm in an appropriate and safe manner; necessary permits obtained	Spread evenly on land but not incorporated; **or** Sent to a licensed landfill site	Dumped on farm or on unapproved site
2 **Prunings from trees or shrubs**	Composted on farm; **or** Taken to a municipal solid waste composting site	Chipped for mulch or for use as a soil amendment	All sent to a licensed landfill site without exploring alternative uses	Burned
Greenhouse Waste				
3 **Organic growing media** (e.g. soil, peat)	Sterilized and reused to pot plants	Material reused for other purposes (e.g. soil amendment, landscaping)	All sent to a licensed landfill site without exploring alternative uses	Dumped on farm
4 **Synthetic growing media** (materials used in hydroponics)	Amount of growing media does not cause disposal problems (e.g. small pots used for starting plants)	Used for several years before disposal Reused for other purposes or added to the soil (e.g. used rockwool ground up and diced into heavy soils)	All sent to a licensed landfill site without exploring alternative uses	Dumped on farm
5 **Greenhouse plastic**	Plastic or poly material used for more than 3 years and sold for other use or recycled	Plastic or poly material used a minimum of 2 years and recycled if possible	Plastic or poly material used for one year then sent to a licensed landfill	Dumped or burned on farm

Risk Rating	1 (Low)	2	3	4 (High)
Machinery and Equipment				
6 **Inert old equipment** (machinery, equipment, vehicles)	Equipment traded in on new equipment; **or** Parts reused or recycled where possible. Remaining parts taken to scrap dealers	All equipment taken to scrap dealers	Equipment kept on the farm at one location	Old equipment scattered throughout the farm Recyclable and non recyclable liquids not removed, recycled or safely disposed of
7 **Tires**	Reused to hold plastic on horizontal silage systems and remainder returned to supplier or recycling depot	All returned to supplier or recycling depot	Reused for landscaping (e.g. retaining wall); **or** Sent to a licensed landfill site	Reused for streambank protection; **or** Dumped or burned on farm
Farm Structures				
8 **Old buildings**	Restored whenever feasible	Torn down before they become unstable and site restored	Torn down but waste not cleaned up	Left standing despite their instability; **or** Burned
9 **Old building materials**	Materials reused when possible Other materials sorted and sent to a licensed landfill site, recycling or hazardous waste depot, as appropriate	All materials disposed of at a licensed landfill site	All materials left in a pile or dumped on farm away from water sources	Dumped or burned on farm

Risk Rating	1 (Low)	2	3	4 (High)
Other Inorganic Wastes				
10 Packaging (e.g. paper, plastic, silage wrap, cardboard, horticultural containers, wood, bottles, twine, wire, bags, skids, plastic mulches)	Most packaging emptied, cleaned, and reused or recycled Efforts made to reduce the amount of packaging waste (e.g. only purchase materials that come in recyclable containers)	Some packaging emptied, cleaned, and reused or recycled Remainder emptied, cleaned, and sent to a licensed landfill site	Most packaging sent to a licensed landfill site without exploring alternative uses	Dumped or burned on farm
11 Hazardous solid waste (e.g. batteries, pressurized tanks, appliances)	Reused or recycled, where possible Remainder returned to supplier or to a hazardous waste depot	Stored on farm in an appropriate, safe storage for future disposal at supplier or returned to a hazardous waste depot	Sent to a licensed landfill site	Dumped on farm
12 Hazardous liquid waste (e.g. paints, stain, sealers, adhesives, cleaners)	Safely stored on farm and used up as needed, shared with a neighbour or taken to a recycling depot	Taken to hazardous waste depot	Sent to a licensed landfill site	Dumped or burned on farm
13 Petroleum products (antifreeze, brake and power steering fluids, engine oil, hydraulic fluid, lubricating oil, transmission fluid, refrigerants)	All products collected separately in easily identified containers Participate in petroleum product recovery program Use re-refined oil or synthetic and vegetable-based oil	Oil reused as lubricant on equipment making sure not to apply too much Combustible products reused on the farm as heating fuel in an approved used oil burner; heating system with flue gas pollution control Other products disposed through petroleum product recovery program	Combustible products reused on the farm as heating fuel in an approved used oil burner furnace Other products disposed of at a licensed landfill site	Dumped on farm Burned in unapproved burner

Risk Rating	1 (Low)	2	3	4 (High)
Septic System				
14 Septic system design	Septic system consists of a septic tank and drainage field to treat effluents System adequately sized for the present and future needs of the farm No signs of faulty system such as: • ground stays wet over drainage field • backed-up drains • wastewater appearing in low lying areas • vegetation flourishing around drainage field • foul odours in and around the home	Septic system consists of a septic tank and drainage field to treat effluents System adequately sized for the present and future needs of the farm Some signs of faulty system after heavy use such as: • ground stays wet over drainage field • backed-up drains • wastewater appearing in low lying areas • vegetation flourishing around drainage field • foul odours in and around the home	No drainage field System adequately sized for the present but not for future needs of the farm Often signs of faulty system after heavy use such as: • ground stays wet over drainage field • backed-up drains • wastewater appearing in low lying areas • vegetation flourishing around drainage field • foul odours in and around the home	No septic system Sewage dumped directly in drain tile or drain ditch
15 Septic tank	Septic tank is a water tight tank with two compartments or a baffle that allows the effluents to flow from the tank into the drainage field leaving the sludge and scum in the tank A replaceable effluent filter at outlet of septic tank Pumped out by a licensed contractor every 3 years or less	Septic tank is a water tight tank with two compartments or a baffle that allows the effluent to flow from the tank into the drainage field leaving the sludge and scum in the tank Pumped out by a licensed contractor every 4 years or less	Septic system consists of one compartment permeable tank (wood, perforated steel tank, etc.) Pumped out by a licensed contractor less often than every 4 years	Sewage drains directly into tile or surface drainage system; **or** Not pumped out by a licensed contractor

Risk Rating	1 (Low)	2	3	4 (High)
Septic System (cont'd)				
16 Drainage field site (leaching bed) selection	Located on well drained sandy loam soil at least 1 m (3 ft) above bedrock or high water table mark Drainage field no deeper than 0.5 m (1.5 ft) below surface Leveled or slightly sloped (less than 0.5%) Exceeds minimum separation distances from: • building (5 m/16 ft) • well (15 m/50 ft) • watercourse (15 m/50 ft) • property line (3 m/10 ft))	Located on low permeability soil less than 1 m (3 ft) above bedrock or high water table mark Constructed as a mound Leveled or slightly sloped (less than 1%) Meets minimum separation distances from: • building (5 m/16 ft) • well (15 m/50 ft) • watercourse (15 m/50 ft) • property line (3 m/10 ft)	Located on coarse sand or gravel Meets minimum separation distances from: • building (5 m/16 ft) • well (15 m/50 ft) • watercourse (15 m/50 ft) • property line (3 m/10 ft)	No drainage field; **or** Located on shallow soil on ledge or a high seasonal water table; **or** Does not meet minimum separation distances from: • building (5 m/16 ft) • well (15 m/50 ft) • watercourse (15 m/50 ft) • property line (3 m/10 ft)
17 Drainage field (leaching bed) site management	Roof and surface water do not drain towards drainage field Well grassed, no trees, shrubs, or garden on or near drainage field No vehicles permitted over leaching bed	Some roof and surface water drain towards drainage field Well grassed, no trees, shrubs, or garden on drainage field No vehicles permitted over leaching bed	Roof and surface water drain towards drainage field Not well grassed, shallow rooted trees and shrubs planted over drainage field Light vehicles permitted over leaching bed	Roof and surface water drain towards drainage field Not grassed, deep rooted trees, shrubs or garden planted over drainage field Vehicles permitted over leaching bed

On-farm Composting

On-farm composting can be a useful means of managing farm organic wastes such as potato culls or other vegetable wastes, manure, and animal carcasses. Properly composted, these wastes can be turned into soil amendments that will enhance soil organic matter, fertility, and productivity.

Composting farm wastes reduces the risk they present to the environment. In a well managed system, pathogens in the wastes are killed by the heat produced during the composting process. The nutrients in composted waste materials, particularly nitrogen and phosphorus, are in a more stable and slow-release organic form. Nitrogen and phosphorus are therefore less prone to leaching or runoff. Composting on-farm wastes also reduces the volume and weight of wastes to be handled. The composting process should be carefully managed to avoid odour, runoff, and leaching.

This subsection is intended for on-farm composting and use only. It is not intended for commercial composting operations or for compost sold off-farm.

What should you be aware of?

Compost amendments add organic matter and nutrients to the soil. The organic matter added to the soil will aid in developing strong stable soil aggregates that are required for good soil structure, drainage, aeration, and resistance to compaction and erosion. This improvement in soil health will lead to better crop root growth, yield, and quality.

The improvement of soil structure and organic matter will increase the soil's water holding capacity. This means that more water will be retained in the soil after a rainfall and the crop will be more tolerant to droughts. Compost amendments will also improve water infiltration which will reduce surface runoff.

Composting on-farm wastes can reduce odour produced on the farm. When well aerated, the composting process produces very few odours. Greenhouse gas emissions from the handling and spreading of composted materials, particularly manures, can be lower than from amendments of uncomposted materials. Also, composting manure can reduce ammonia emissions.

The biodiversity of microbes, worms, and insects in the soil is enhanced by increased availability of organic matter. The risks of soil erosion and runoff are reduced when soils are amended with compost. Compost also contains mainly slow-release organic forms of nutrients which are not as easily lost to the environment.

Composting adds value to on-farm waste materials and surplus manure, turning what may have been considered as "a waste disposal problem" into a valuable source of nutrients and organic matter. Compost generally has a nutrient value of around 1-1-1 or 2-2-2. Most importantly, compost has a long term impact on soil health.

How do you rate?

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Composting Site				
1 Composting site characteristics	No on-farm composting ⇩ Proceed to the Energy Efficiency subsection	Site has the following characteristics: • easily accessible throughout year • firm support for vehicles • not subject to flooding • at least 1 m (3 ft) above bedrock or high water table mark • slope 2 to 3% • good surface drainage • no incoming surface runoff • exceeds minimum separation distances from neighbours Required permits obtained	Site has the following characteristics: • not easily accessible in spring and winter • firm support for vehicles • not subject to flooding • less than 0.5 m (1.5 ft) over bedrock or high water table mark • slope 4 to 6% • good surface drainage • incoming surface runoff diverted away from site • meets minimum separation distances from neighbours Required permits obtained	Site has the following characteristics: • not easily accessible • subject to flooding • poor surface drainage • less than 0.5 m (1.5 ft) over bedrock or high water table mark • slope greater than 6% or less than 1% • incoming surface runoff not diverted • does not meet minimum separation distances from neighbours Permits not obtained

Risk Rating	1 *(Low)*	2	3	4 *(High)*

Potential for Well Water Contamination (composting site)

2A Distance to well at risk	Greater than 200 m (655 ft)	Between 150 to 200 m (490 to 655 ft)	Between 100 to 150 m (330 to 490 ft)	Less than 100 m (330 ft)
2B Slope gradient toward well	Less than 2%; **or** Located downslope from well	Between 2 to 5%	Between 5 to 10%	More than 10%
2C Hydrologic soil group (water infiltration rate)	Very Slow	Slow	Moderate	Fast

2D Potential for well water contamination overall rating

If your answer is a fraction, round up to the next whole number to get your overall rating (i.e. 1.3 → 2)

$$\frac{2A^* + 2B + 2C}{3} = \text{Overall Rating}$$

*if Risk Rating of question 2A equals 4 *(High)*, the Overall Rating equals 4

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Potential for Surface Water Contamination (composting site)				
3A Distance to watercourse at risk	Greater than 200 m (655 ft)	Between 150 to 200 m (490 to 655 ft)	Between 100 to 150 m (330 to 490 ft)	Less than 100 m (330 ft)
3B Slope gradient toward watercourse	Less than 2%	Between 2 to 5%	Between 5 to 10%	More than 10%
3C Hydrologic soil group (water infiltration rate)	Fast	Moderate	Slow	Very slow

3D Potential for surface water contamination overall rating

If your answer is a fraction, round up to the next whole number to get your overall rating (i.e. 1.3 → 2)

$$\frac{\text{3A*} \square + \text{3B} \square + \text{3C} \square}{3} = \text{Overall Rating} \square$$

*if Risk Rating of question 3A equals 4 *(High)*, the Overall Rating equals 4

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Composting Method				
4 **Composting method**	In-vessel composting	Turned frequently	Forced aeration	Insufficient turning or insufficient aeration
5 **Compost monitoring**	Moisture content and temperature of compost checked weekly in its initial composting phase	Temperature of compost checked weekly in its initial composting phase	Temperature of compost checked occasionally	Temperature of compost not checked
Feedstock Management				
6 **Odour control**	Feedstock handling and mixing in well ventilated building	Feedstock handling and mixing in well ventilated building, sometimes dusty	Feedstock handling and mixing in poorly ventilated building	Feedstock handling and mixing outdoors
	Feedstocks kept dry enough to prevent odour production (40 to 60% moisture)	Feedstocks kept dry enough to prevent odour production (40 to 60% moisture)	Feedstocks *not* kept dry enough to prevent odour production (more than 60% moisture)	Feedstocks *not* kept dry enough to prevent odour production (more than 60% moisture)
	Feedstock pile covered with a layer of finished compost to reduce odours	Feedstock pile covered with a layer of high carbon material (e.g. sawdust, straw) to reduce odours	Feedstock pile covered with a layer of high carbon material (e.g. sawdust, straw) to reduce odours	No measures taken to reduce odours

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Compost Management				
7 **Compost recipe**	Composting recipe based on feedstock moisture, lab analysis (C:N ratio), and on-farm experience	Composting recipe based on feedstock moisture and on-farm experience	Composting recipe based on book values	Compost all available materials without specific recipe
	Feedstock chopped to reduce particle size favourable for composting (1.5 cm (0.6 in) to 7.5 cm (3 in) pieces)	Feedstock chopped (1.5 cm (0.6 in) to 15 cm (6 in) pieces)	Feedstock chopped; contains some larger or smaller than desired pieces	Feedstock *not* chopped before composting and particle size too large for proper composting
8 **Leachate management**	Composting at controlled moisture content below 65%	Composting at controlled moisture content below 65%	Composting at controlled moisture content below 65%	Windrows and piles sometimes greater than 65% moisture
	Composting system and feedstock in roofed area on concrete impermeable pads	Composting system and feedstock on impermeable pads	Composted directly on compacted soil surface (e.g. clay)	Composting directly on porous soil surface (e.g. sand, gravel)
	Compost leachate captured and recycled into compost	Compost leachate diverted to a vegetative filter strip, then treated in constructed wetland	Compost leachate diverted and treated in a constructed wetland or vegetated area	Compost leachate lost and not controlled
9 **Water monitoring**	Monitoring well below composting site	Well most at risk used as test well	Homestead well used as test well	Well water not tested
	Well sampled every 6 months	Well sampled at least once a year	Well sampled occasionally	
	Log kept of water analysis	Log kept of water analysis		

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Compost Management (cont'd)				
10 Compost quality	Finished product is well cured and has most of the following characteristics: • earthy smell • free of pathogens • no viable weed seeds • moisture of less than 65% • consistent nutrient content • C:N ratio less than 25 • raw materials not distinguishable • no foreign objects • temperature does not increase when compost left in a pile	Finished product is cured and has most of the following characteristics: • earthy smell • free of pathogens • no viable weed seeds • moisture of less than 65% • consistent nutrient content • some raw materials with high C still distinguishable • some foreign materials (e.g. rocks) • temperature does not increase when compost left in a pile	Finished product is mature, but not cured and has the following characteristics: • musty odour • moisture of less than 65% • nutrient content is not consistent • particle size not uniform • some raw material with low C still distinguishable • some foreign materials • temperature does not increase when compost left in a pile	Finished product not matured and has the following characteristics: • offensive odour • very wet • much foreign material • raw material easily distinguishable
	Compost quality consistent throughout batch and between batches	Compost quality consistent throughout batch and between batches	Compost quality consistent throughout batch but not consistent between batches	Compost quality not consistent throughout batch or between batches

Energy Efficiency

Farms are dependent upon energy to complete many of their operations. Much of the energy is provided through non–renewable sources such as fossil fuels. Energy production can have significant environmental impacts, whether it be air pollution, flooding, and greenhouse gas emissions. Reducing energy consumption will help conserve resources for future generations, save money, and reduce the need for additional energy production. Efficient use of energy on the farm consists of eliminating unnecessary use, installing or implementing energy saving technologies, and converting to cleaner and more efficient fuels.

What should you be aware of?

Reducing the number of tillage passes and completing several operations in one pass reduce fuel consumption and soil compaction. Practices such as no-till have the potential to reduce the amount of fuel consumed while increasing soil organic matter, reducing soil erosion, and improving water infiltration.

Farms use a great deal of water, most of which requires energy for pumping. Therefore, it is important to keep the amount of water wasted to a minimum. Water conservation strategies decrease energy used for heating and pumping water while maintaining a reliable water supply.

Wood or oil burning appliances can produce particulates locally, while emissions can contribute regionally to smog, acid rain, and greenhouse gas emissions. Greenhouse gases such as carbon dioxide are released through fossil fuel combustion when using vehicles, tractors, and other farm equipment. In addition, reducing energy consumption may indirectly reduce noise since equipment use is kept to a minimum.

Greenhouse gas emissions produced through the combustion of fossil fuels contribute to climate change. Climate change may have an impact on wildlife as the changes in temperature, precipitation, and habitat occur more quickly than species are able to adapt. The destruction of habitat for the distribution of oil, gas, and electricity as well as for hydroelectric development projects puts species at risk.

Reducing energy consumption is very cost effective. Capital investment is required for some energy saving projects, but this is usually recuperated through energy cost savings in less than five years. Payback periods should be calculated to determine which projects should be initiated. Reducing the number of passes through the field will not only save on fuel consumption but will also save on wear and tear of machinery, time, and labour. Conservation tillage also requires lower investment in farm machinery.

How do you rate?

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Energy Efficiency Related to Crop Production				
1 **Fuel use efficiency**	The following practices are used to minimize fuel consumption during field operations: • tractor properly sized for implements • equipment well maintained • radial tires used and pressure adjusted to tractor axle loading to minimize slippage • zero tillage (no-till) • several operations done in one pass • records of fuel use per operation	The following practices are used to minimize fuel consumption during field operations: • tractor properly sized for implements • equipment well maintained • radial tires used and pressure adjusted for heaviest axle loading • reduced or conservation tillage	The following practices are used to minimize fuel consumption during field operations: • tractor properly sized for implements • limited equipment maintenance • bias ply conventional tires used and pressure adjusted for heaviest axle loading	Tractor over- or under- sized for implements Equipment not well maintained Uneven tire pressure
2 **Crop drying method**	Crop dried in field	Low temperature drying; **or** Natural air drying	Recirculating batch bin dryer; **or** Continuous-flow dryer	Non recirculating batch dryer bin; **or** Non recirculating batch dryer

Risk Rating	1 (Low)	2	3	4 (High)
Energy Efficiency Measures in Building and Yard				
3 Lighting	The following practices are used: • energy saving lights only • dimmers and timers • well located fixtures • only required light bulbs wattage used • lights on only when needed • motion sensor security lights	The following practices are used: • mostly energy saving lights • dimmers and timers • only required wattage used • lights on only when needed • minimal security lights left on during the night	The following practices are used: • some energy saving lights • wattage of lights not considered when replaced • lights occasionally left on	No particular practices to reduce energy requirements for lighting: • mostly incandescent lights • lights left on needlessly
4 Energy conservation measures in heated or cooled buildings	The following practices are used: • excellent level of insulation (above R30 for walls and R40 for ceilings) • vapour barrier • controlled level of humidity • air exchanger • no draft through doors, windows, electrical outlets, or cracks • well maintained and highly efficient heating or cooling system • electronic controls for heating, cooling, and ventilation	The following practices are used: • good level of insulation • (above R20 for walls and R30 for ceilings) • no vapour barrier • controlled level of humidity • no draft through doors, windows, electrical outlets, or cracks • well maintained and highly efficient heating or cooling system • thermostat controls	The following practices are used: • low level of insulation (above R12 for walls and R20 for ceilings) • no vapour barrier • level of humidity not controlled • draft through doors, windows, electrical outlets, or cracks • low efficiency heating or cooling system • simultaneous heating and cooling (controls not integrated)	The following characteristics can be found in building: • very low level of insulation (below R12 for walls and R20 for ceilings) • no vapour barrier • level of humidity not controlled • draft through doors, windows, electrical outlets, or cracks • obsolete low efficiency heating or cooling system • no thermostat controls
5 Hot water use	Hot water used judiciously Pipes and heater insulated Water heater close to point of use and appropriately sized	Pipes and heater insulated	Must run hot water for a long time before it becomes hot	Needless hot water use Leaky hot water taps

Farmstead Windbreaks

Windbreaks around the farmstead are designed to reduce energy loss from buildings and/or to act as a living snow fence to trap snow away from the homestead, working area, and roads. Living snow fences have a long life span, compared to conventional snow fences, and provide more snow control and greater storage. When established around a livestock yard, they protect the livestock from heat in the summer and from cold winds in the winter. This protection reduces the impact of climatic extremes on livestock thus improving their health and productivity. Trees and shrubs should be resistant to stem and branch breakage, tolerant to pests and pesticides, and should have a low to moderate root and crown spread if near utility lines or a sewage system. Trees selected for livestock windbreaks should have some tolerance to high nitrogen and phosphorus concentrations.

What should you be aware of?

Windbreaks can filter part of the surface and ground waters that will flow through them at the surface or through their root zone. The filtration effectiveness will vary with species, windbreak width, and volume of water flowing through them. It is a good practice to establish a grassed buffer strip and/or waterway between windbreaks and adjacent fields to filter and/or divert runoff water.

Farmstead windbreaks improve air quality by screening dust, noise, and odours. Windbreaks can considerably reduce greenhouse gas emissions by decreasing the amount of energy required to heat the buildings in the winter, reducing the energy required for snow removal, and sequestering carbon. Windbreaks established around a livestock yard can reduce greenhouse gas emissions by improving weight gain per unit of feed consumed.


Source: AAFC

Windbreaks and living snow fences can provide food and nesting sites for various species of birds. The diversity of birds in the windbreaks is dependent on the width and diversity of shrubs, trees, and ground cover. Multi-row windbreaks and snow fences with multiple species of trees and shrubs provide added benefits such as reducing the risk of losing the windbreaks due to a pest infestation. Multi-row windbreaks also enhance wildlife habitat and biodiversity.

The utilization of windbreaks for the protection of the farmstead and for energy saving is well documented. The protected area provides a more comfortable living environment while saving considerable energy both in the winter and summer. Energy savings of 10 to 40% can be obtained depending on the climate and wind conditions as well as building and windbreak designs. An effective living snow fence decreases snow removal costs. A windbreak which protects livestock from cold and wind in the winter and heat in the summer, can reduce animal stress, improve animal health, and enhance feed utilization and weight gain. Windbreaks are also beneficial to the landscape contributing to the beauty and diversity of the countryside thus increasing the value of the farm. The incorporation of agroforestry species such as fruit or nut bearing shrubs or trees in the windbreaks may also provide added revenue.

How do you rate?

Risk Rating	1 *(Low)*	2	3	4 *(High)*
1 **Presence of windbreaks and living snow fences**	Area needing protection (e.g. building, working area, road, farmyard, barnyard, feedlot) is sheltered with windbreaks or living snow fences			No windbreaks or living snow fences ⇩ Complete the Action Plan for this question and proceed to the next section
2 **Location**	Located 30 to 60 m (100 to 200 ft) from area needing protection	Located 60 to 100 m (200 to 330 ft) from area needing protection	Located further than 100 m (330 ft) from area needing protection	Located less than 30 m (100 ft) from area needing protection
3 **Orientation**	Windbreaks located on the north and west side of area needing protection or at a 90° angle to prevailing winds	Windbreaks oriented between 45° and 90° angle to prevailing winds; density reduced accordingly	Windbreaks oriented between 45° and 90° angle to prevailing winds; density *not* reduced	Windbreaks oriented at an angle too sharp to provide any wind protection

Risk Rating	1 *(Low)*	2	3	4 *(High)*
4 Density and uniformity	Density is 60 to 80% year round and uniform across length and height of *windbreaks*	Overall density is 60 to 80% but not uniform across length and height of windbreaks and living snow fences	Overall density is less than 60% and not uniform across length and height of windbreaks and living snow fences	Windbreaks and snow fences too thin with too many gaps
	Density is 80 to 100% and uniform across length and height of *living snow fences*	Snow distribution not uniform and accumulation occurs in areas along windbreaks but no sign of turbulence or drifting near buildings or farm yard	Snow drifting and accumulation near buildings and area needing protection	Turbulence or snow drifting and accumulation in areas needing protection
	Shrubs provide a uniform density at the bottom of windbreaks			
	No gaps in windbreak(s)			
	Windbreak(s) extends at least 15 m (50 ft) beyond each side of area needing protection or extends into an L shape			
5 Wildlife protection and biodiversity	Windbreaks consist of at least 3 rows of trees and shrubs of deciduous and coniferous species of various ages and structure	Windbreaks consist of at least 2 rows of trees and shrubs of deciduous and coniferous species	Windbreaks consist of 1 row of trees and shrubs of mixed species	Windbreaks consist of 1 row of one species
	Groundcover at the bottom of windbreaks			

Livestock Operations

Livestock Facilities

Livestock producers are increasingly concerned about the public perception of their operations. In most areas, livestock producers represent a small minority of the population. The number of livestock farms, like any other farms, is decreasing while the size of the operations is constantly increasing in order to be economically viable. Potential for nuisance and conflict is more pronounced near municipalities especially where the urban population is expanding into rural areas. Other issues facing livestock farms are food safety, biosecurity, animal welfare, and other environmental concerns such as potential for surface and ground water contamination. This subsection will address most environmental issues related to livestock farm operations.

What should you be aware of?

Livestock operations may have an indirect negative or positive impact on soil health. If effluents, runoff, and other wastes from livestock farms are not well contained and disposed of, there is potential to contaminate surrounding soils with excess nutrients. When properly managed, most organic wastes produced on livestock farms can be reused as valuable soil amendments to increase soil organic matter and soil fertility.

Livestock require unlimited access to good quality water to maintain good health and productivity. It is important for livestock producers to prevent the contamination of their surface and ground water sources. It is not an easy task as there are many potential sources of water contamination on livestock farms. Runoff from surrounding areas must be safely diverted away from the operation while runoff and effluents coming from the farm yard must be contained and properly disposed of.

In-barn air quality may affect the health of livestock and farm workers. Odours are an unavoidable consequence of livestock farming and often the cause of conflict with neighbours. Although odours on livestock farms can not be completely eliminated, there are means of mitigation. Dust and noise are also two nuisances associated with most farms. About 50% of agricultural greenhouse gas emissions come from livestock operation. Methane is the most important GHG emitted on livestock farms; however, nitrous oxide and carbon dioxide are also emitted as well as other gases such as ammonia.

The intensification of livestock operations and the retention of the most productive breeds of livestock have considerably reduced the biodiversity of livestock production at the farm and at the regional, national, and international levels. Although many breeds of livestock have almost disappeared, the largest threat facing intensive livestock regions is the impact on biosecurity.

The introduction of exotic or domesticated wildlife species on livestock farms can be a threat to wildlife if they escape. These species should be kept in isolation from other domestic or wild species to prevent risk of disease and other pest infection.

Most management practices adopted on livestock farms to protect the environment have a positive impact on the long term financial sustainability of the operation. Any environmental improvement activities will also favour the social acceptance of livestock operations and reduce complaints from neighbours. Although the cost of many improvements can be high, several of those are related to a change in management practices which will either reduce operational costs or improve the health and productivity of the livestock.

How do you rate?

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Potential for Well Water Contamination (livestock facilities)				
1A Distance to well at risk	More than 200 m (655 ft)	Between 150 to 200 m (490 to 655 ft)	Between 100 to 150 m (330 to 490 ft)	Less than 100 m (330 ft)
1B Slope gradient toward well	Less than 2%; **or** Located downslope from well	Between 2 to 5%	Between 5 to 10%	More than 10%
1C Hydrologic soil group (water infiltration rate)	Very slow	Slow	Moderate	Fast

1D Potential for well water contamination

If your answer is a fraction, round up to the next whole number to get your overall rating (i.e. 1.3 → 2)

$$\frac{1A^* + 1B + 1C}{3} = \text{Overall Rating}$$

*if Risk Rating of question 1A equals 4 *(High)*, the Overall Rating equals 4

Risk Rating	1 *(Low)*	2	3	4 *(High)*

Potential for Surface Water Contamination (livestock facilities)

2A Distance to watercourse at risk	More than 200 m (655 ft)	Between 150 to 200 m (490 to 655 ft)	Between 100 to 150 m (330 to 490 ft)	Less than 100 m (330 ft)
2B Slope gradient toward watercourse	Less than 2%	Between 2 to 5%	Between 5 to 10%	More than 10%
2C Hydrologic soil group (water infiltration rate)	Fast	Moderate	Slow	Very slow

2D Potential for surface water contamination overall rating

If your answer is a fraction, round up to the next whole number to get your overall rating (i.e. 1.3 → 2)

$$\frac{\text{2A*} \square + \text{2B} \square + \text{2C} \square}{3} = \text{Overall Rating} \square$$

*if Risk Rating of question 2A equals 4 *(High)*, the Overall Rating equals 4

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Livestock Buildings and Site Characteristics				
3 **Livestock density in housing facility**	Animal density well below recommendation for the building	Animal density meets recommendation for the building	Animal density slightly exceeds recommendation for the building	Excessive animal density for the building
4 **Runoff control**	No incoming field runoff flowing towards building	Field runoff safely diverted away from building	Field runoff not safely diverted away from building but does not enter building	Field runoff not diverted away from building
	Barnyard runoff collected in a separate storage and spread on the fields or treated in a constructed wetland or vegetated filter strip	Barnyard runoff collected in liquid manure storage	Barnyard runoff directed toward surrounding field	Barnyard runoff not collected or controlled
Biosecurity				
5 **Access to livestock housing facility**	Only farm workers allowed in building	Only authorized persons allowed in building	Only authorized persons allowed in building	Anyone allowed in building
	Building locked at all times	Log of visitors kept	No log of visitors	No log of visitors
6 **Sanitation**	Boots disinfected with a recommended disinfectant when entering and leaving building	Boots disinfected with a recommended disinfectant when entering	Non recommended disinfectant available at the door	No disinfectant available at the door
	Separate coverall clothing worn in each barn	Coverall clothing worn and kept at the farm	Coverall clothing worn on and off farm	Coverall clothing not worn
	Barn thoroughly cleaned and disinfected between successive groups of livestock (where applicable)	Barn thoroughly cleaned between successive groups of livestock (where applicable)	Barn thoroughly cleaned between successive groups of livestock (where applicable)	Barn not cleaned between successive groups of livestock

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Biosecurity (cont'd)				
7 **Livestock isolation**	Newly purchased livestock kept in isolation for at least *30* days	Newly purchased livestock kept in isolation for at least *14* days	Newly purchased livestock kept in isolation for *7* days	Newly purchased livestock not kept in isolation
8 **Exotic livestock**	Exotic livestock not kept on the farm	Exotic livestock kept in separate building and isolated from domestic livestock	Exotic livestock kept in same building but isolated from domestic livestock	Exotic livestock not isolated from domestic livestock
9 **Purchased feed and supplement**	Only approved, inspected, and analyzed feed and supplement used	Only approved analyzed feed and supplement used	Only approved feed and supplement used	Any type of feed used
	Records kept of all produced or imported feeds and supplements	Records kept of all imported feeds and supplements	Keeps invoices or receipts of feed purchased	No records
10 **Traceability**	Participating in a recognized livestock traceability program	All livestock tagged and traceable on paper	Most livestock tagged	Livestock not tagged
	Computerized record keeping of livestock purchased, sold, and/or disposed of as well as health care products used	Record keeping of livestock purchase, sold, and/or disposed of as well as health care products used	Record keeping of livestock purchased and sold	No record keeping

Risk Rating	1 (Low)	2	3	4 (High)
Livestock Yard and/or Feedlot				
11 Type of livestock yard or feedlot	Livestock confined to a roofed area and animal density meets recommendation Paved or concrete surface Manure removed every week and stored in manure storage or spread onto fields when suitable	Yard used as an exercise area and animal density meets recommendation Compacted earthen surface on fine texture soil Manure removed regularly and stored in manure storage or spread onto fields when suitable **OR** Livestock confined to a roofed area and animal density meets recommendation Solid packed manure with plenty of bedding	Livestock confined to a limited area year round Non compacted soil surface Manure removed once a year	Livestock raised year round in an unconfined area Non compacted soil surface Yard rarely cleaned
12 Effluent and runoff from yard or feedlot	No incoming runoff flowing towards yard or feedlot Effluents and runoff from yard collected and stored in separate storage or in manure storage built to retain liquids Concrete slab in area around water trough and feed bunk	Incoming runoff diverted away from yard or feedlot Bedding used to soak up most effluents and runoff; excess runoff and effluent diverted towards a constructed wetland or a vegetated filter strip Area around water trough and feed bunk compacted and scraped regularly	Most incoming runoff diverted away from yard or feedlot Bedding used to soak up effluents and runoff in heavily used portion of yard or feedlot Area around water trough compacted and scraped regularly; feed bunk moved regularly	Incoming runoff not diverted away from yard or feedlot Effluents and runoff not controlled Area around water trough and feed bunk always wet and muddy

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Livestock Watering				
13 Water quality	Water tested every year Meets higher standards than the *Canadian Water Quality Guidelines* for Livestock Watering	Water tested every 2 years Meets the *Canadian Water Quality Guidelines* for Livestock Watering	Water tested every 3 years Does not meet some of the *Canadian Water Quality Guidelines* for Livestock Watering	Water not tested; **or** Poor water quality
14 Water quantity	Water source satisfies daily water requirements in any season or weather conditions	Water source satisfies daily water requirements in most seasons and weather conditions Alternate water source readily available in case of failure or water shortage	Water source satisfies daily water requirements in most seasons and weather conditions Alternate water source not readily available	Water source not reliable during an extended hot and dry period or freezes during winter Livestock often run out of water
15 Water conservation	Water troughs, automatic shutoff valve, and pipes well maintained to prevent overflows and leaks Watering device designed to reduce spills and water waste Water use minimized when cleaning the barn through proper selection of water pressure	Water troughs, automatic shutoff valve, and pipes well maintained to prevent overflows and leaks High pressure used when cleaning the barn and efforts made to reduce water use	Water troughs often overflow; leaks repaired Low pressure used when cleaning; excessive water used	Water troughs often leak or overflow No effort to control amount of washwater; high pressure and excessive water used when cleaning

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Moisture and Air Quality in Building				
16 Type of ventilation system	Automated natural ventilation system (where applicable); **or**	Manual natural ventilation system (where applicable); **or**		No ventilation system; **or**
	Automated forced air system with adequate capacity to maintain maximum seasonal air flow through building	Forced air system with adequate capacity to maintain maximum seasonal air flow through building except for the hottest days of summer	Forced air system with adequate capacity to maintain minimum seasonal air flow through building	Forced air system without enough capacity for most months
	Ventilation system: • removes dust, gases, and odours from building • controls temperature and humidity in building • exceeds requirements for animal density	Ventilation system: • removes gases and odours from building • controls temperature and humidity in building • meets requirements for animal density	Wet conditions in building during winter months but minimal odours Excessive heat in hot summer days Ventilation do not meet requirements for animal density	Wet conditions and odours in building during most months Ventilation well below requirements for animal density
17 Manure cleaning	Manure cleaned and transferred from the barn to storage on a *daily* basis	Manure cleaned and transferred from the barn to storage *within a week*; **or**	Manure cleaned and transferred from the barn to storage on an *irregular basis* (often exceeds a week); **or**	Manure cleaned *once a year*
		Solid packed with plenty of bedding	Solid packed with minimal bedding	Solid packed with bedding of poor material (e.g. feed waste)
	Avoid accumulation of manure or ponding of manure effluents in the barn	Avoid accumulation of manure or ponding of manure effluents in the barn	Accumulation of manure and effluents in some areas of the barn	Accumulation of manure and effluents in many areas of the barn
	Barnyard kept cleaned of manure effluent and solids	Barnyard kept cleaned of manure effluent and solids		

Risk Rating	1 (Low)	2	3	4 (High)
Livestock Feed Storage and Handling				
18 Type of silage system to minimize silage loss and plastic waste	Air tight or conventional tower silo	Horizontal silo; **or** Heap silo; **or** Round bale silage wrap individually; **or** Round bale silage wrap in a tube; **or** Ag Bag system	Round bale placed in a plastic tube	Round bale silage in individual bags
19 Tower silo	Silo structurally sound; no cracks Forages ensiled at 50 to 60% moisture No sign of seepage	Some cracks, but still structurally sound Forages ensiled at 60 to 65% moisture Very few signs of seepage	Some cracks and stains but may be structurally sound Forages ensiled at moisture greater than 65% Visible signs of seepage Seepage diverted toward vegetated area	Cracks and holes and may not be structurally sound Forages ensiled at moisture greater than 70% Seepage throughout the entire length of silo Seepage not contained

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Livestock Feed Storage and Handling (cont'd)				
20 Horizontal silo	Concrete floor and walls with seepage or runoff collection	Concrete or paved floor and lined wooden walls with seepage or runoff collection	Paved or earthen packed surface on fine texture soil with surface runoff control	Earthen unpacked floor or packed surface with no seepage or runoff control
	Roof present and silage gas warning signs at entrance	No roof	No roof	No roof
	Silage properly packed and sealed with plastic cover	Silage properly packed and sealed with plastic cover	Silage properly packed and/or sealed with plastic cover	Silage not properly sealed
	Forages ensiled at 60 to 65% moisture	Forages ensiled at 65 to 70% moisture	Forages ensiled at moisture greater than 70%	Forages ensiled at moisture greater than 70%
	No sign of seepage	Seepage and runoff collected and spread on the field or stored in liquid manure storage	Surface runoff diverted toward vegetated area	Seepage and runoff not contained
21 Bale silage	Bales stored on paved surface	Bales stored on elevated well drained earthen surface; no rocks on surface	Bales stored on flat earthen surface	Bales stored in low or wet area
		Site kept clean of vegetation or mowed	Vegetation not mowed or controlled	Vegetation not mowed or controlled
	Site readily accessible year round	Site accessible year round	Site may not be accessible during spring thaw	Site not accessible during fall and spring
	No incoming runoff flowing towards site	Surface runoff diverted away from site	Surface runoff not diverted away from site	Surface runoff not diverted away from site
	Livestock fenced away from site	Livestock fenced away from site	Livestock fenced away from site	Livestock have access to site
	Forages ensiled at 45 to 50% moisture	Forages ensiled at 50 to 60% moisture	Forages ensiled at 60 to 70% moisture	Forages ensiled at moisture greater than 70%

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Livestock Feed Storage and Handling (cont'd)				
22 Dry hay	Bales stored in hay barn equipped with a hay drying system	Bales stored in a hay barn; **or**		Bales left in the field until needed; **or**
		Stored on paved or packed earthen surface	Stored outside on dry earthen surface	Stored in low or wet area
		Bales covered with plastic cover	Not covered	Not covered
		No incoming runoff	Runoff diverted away from site	Runoff not diverted away from site
23 Health and safety near feed storages	All workers aware of silo hazards	All workers aware of silo hazards	Most workers aware of silo hazards	Not aware of silo hazards
	Warning signs placed on enclosed silos to warn of low oxygen or silage gas	Warning signs placed on enclosed silos to warn of low oxygen or silage gas	Warning signs placed on silage silos to warn of silage gas	No warning signs
	Silos well ventilated before entry	Silos well ventilated before entry	Silos not well ventilated before entry	Silos not ventilated before entry
	Always a second person near by when entering silo	Always a second person near by when entering silo		
	Respirator mask and safety rope worn when entering silos	Respirator mask and safety rope worn when entering silos	Respirator mask and safety rope available	No safety equipment available
	Forage and grain silo equipped with outside and inside safety ladders	Forage and grain silo equipped with outside safety ladders	Forage and grain silo equipped with outside attached ladders	Portable ladder used
	Silos doors kept locked at all times or outside ladder mounted 2.5 m (8 ft) from the ground	Outside ladder mounted 2 m (6 ft) from the ground	Outside ladder mounted 1 m (3 ft) from the ground	

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Livestock Feeding				
24 Feed formulation or ration	Ration or formulation based on forage and feed analysis and on individual livestock performance, development stage, sex, etc. (where applicable); **or** Group ration or formulation based on forage and feed analysis and on livestock group performance, development stage, sex, etc. Feed supplements used to reduce nitrogen and phosphorus content of manure and/or to reduce greenhouse gas emission	Group ration or formulation based on forage and/or feed analysis and on livestock group performance	Group ration or formulation based on book nutrition value of forage and feed and on average group performance	All livestock of the same species fed the same ration
25 Forage waste management	Livestock fed in feeding-trough, slant bar, or tombstone feeders	Livestock fed in feeding-trough, slant bar, or tombstone feeders	Livestock fed without using feeding-trough, slant bar, or tombstone feeders	Unmonitored open access feeding
	Forage waste in the barn and at storage site cleaned up regularly	Forage waste cleaned regularly in the barn but accumulates at storage site	Forage waste cleaned regularly in the barn but accumulates at storage site	Forage waste not cleaned regularly in the barn or at storage site
	Waste composted or fed to less demanding animals	Waste incorporated in manure storage system	Waste reused as bedding or stockpiled on the farm and eventually spread on the fields	Waste dumped or burned on farm
	Waste kept to a minimum (less than 20%) through proper harvesting, storage, and feeding techniques	Between 20 and 30% waste forages	More than 30% waste forages	More than 40% waste forages

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Livestock Feeding (cont'd)				
26 Surplus forage	Sold off farm; **or** Used the following year to feed less demanding livestock	Used as bedding, mulch, and/or soil amendment	Inappropriately stored outside and eventually used as feed or bedding	Dumped, burned, or left to rot
27 Other feed waste and spills (e.g. processed feed, grains, supplements)	Feed waste and spills cleaned up regularly and fed to less demanding animals Feed waste kept to a minimum	Cleaned up regularly and incorporated into manure	Cleaned up irregularly (accumulates around feeder/silo) and disposed of in the manure storage system	Accumulates around feeder or silo
Mortalities and Abattoir Waste				
28 Deadstock and abattoir waste	Picked up by a rendering service soon after death or placed in cold storage until arrival of rendering service; **or** Composted in a well designed deadstock composter (where permitted by jurisdiction)	Composted in conventional composting system (small animals and abattoir waste only) where permitted by jurisdiction; **or** Incinerated in an approved on-farm incinerator operating under government approval and away from neighbours; **or** Buried on farm where permitted by jurisdiction: • at least 300 m (985 ft) from a well and 100 m (330 ft) from a watercourse • under 0.6 m (2 ft) of earth • at least 0.6 m (2 ft) above bedrock and/or water table • within 24 hours of death	Incinerated in an approved on-farm incinerator and away from neighbours; **or** Buried on farm where permitted by jurisdiction: • at least 150 m (490 ft) from a well or 60 m (195 ft) from a watercourse • under 0.6 m (2 ft) of earth • at least 0.6 m (2 ft) above bedrock and/or water table • within 24 hours of death	Composted in conventional composting system without approval; **or** Dumped on farm or in manure storage; **or** Burned in an unapproved on-farm incinerator; **or** Buried on farm without consideration for: • distance to well or watercourse • depth of burial and depth to bedrock or water table

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Livestock Health and Health Care Products				
29 Animal health	Routine preventive livestock health program implemented Appropriate record keeping system in place	Occasionally use veterinary service for preventive health measures or for emergencies Appropriate record keeping system in place	Veterinary services for emergencies No record keeping	Never use veterinary services
30 Storage of medication and semen	Medication stored in their original labelled containers in a locked insulated room within livestock building Semen container kept locked and stored in medication storage Perishable products kept refrigerated Inventory of all products stored kept up to date	Medication stored in their original labelled containers in a locked insulated cabinet or refrigerator within livestock building Semen container not locked but stored in medication storage Perishable products kept refrigerated Inventory of all products stored kept up to date	Medication stored in their original labelled containers in a locked storage room or cabinet within the house Semen container not locked Perishable products not refrigerated No inventory of products	Medication improperly stored in house or in barn; readily accessible to anyone
31 Products no longer registered for use and non-usable leftovers (e.g. past "best before date", contaminated, no animals that can use it)	Returned to place of purchase	Stored in appropriate area for storage until disposed of at hazardous waste depot or licensed landfill site (consult supplier or veterinarian)	Stored indefinitely in an appropriate storage on the farm	Still used; **or** Stored in an inappropriate area on the farm; **or** Dumped on farm

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Milkhouse Washwater				
32 Milking centre cleanup	All manure, excess feed, and other solids always removed from parlour or milkhouse centre floor before wash down	Most manure, excess feed, and other solids usually removed from parlour or milkhouse centre floor before wash down	Some manure, excess feed, and other solids removed from floor before wash down; some washed down milkhouse's drain	Manure, excess feed, and other solids often washed down milkhouse's drain
33 Water used in milking centre	Use appropriate water pressure and nozzle selection when cleaning to minimize manure splashing and water use	Use high pressure when cleaning. Avoid manure splashing on the walls	Low pressure used when cleaning. No splashing but use excess water	High pressure and excessive water used when cleaning
34 Use of chemicals	Water tested once a year to balance use of cleaning products and disinfectants	Water tested for hardness every couple of years	Water tested for hardness only in first year	Water never tested for hardness
	Cleaning cycle adjusted as required	Cleaning cycle follows manufacturer's directions	Cleaning cycle seldom checked or adjusted	Cleaning cycle rarely adjusted
35 Method of storage and disposal of milkhouse effluents	All first rinse water collected and fed to animals Other rinses stored with liquid manure; **or**	Liquid and solid separation in a flocculator; solids stored in manure storage while liquids directed to septic system or tile drain	All first rinse water collected and fed to animals	Dumped on soil surface; **or**
	Storage and disposal system approved by regulatory agency		Disposed in a septic system	Disposed in drainage tile, ditch, stream, or river

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Nuisance Control for Livestock Facilities				
36 Odour control	The following practices are used: • Exceeds minimum separation distance from neighbours and residential, recreational, and commercial areas • Building kept clean, well ventilated, and dry but not dusty • Covered manure storage or manure treated • Ventilation fans enclosed and directed in opposite direction to neighbours • Manure, feed spills, and other waste cleaned *daily* (where applicable) • Manure and silage effluents collected regularly • Mortalities quickly and properly disposed of • Odour barriers around building and feedlot • Downwind from neighbours	The following practices are used: • Meets minimum separation distance from neighbours and residential, recreational, and commercial areas • Building kept clean, well ventilated, and dry • Solid manure system or synthetic floating cover placed on liquid manure storage • Ventilation exhaust enclosed or directed in opposite direction to neighbours • Manure, feed spills, and other waste cleaned *weekly* or more frequently • Manure and silage effluents collected regularly • Mortalities quickly and properly disposed of	The following practices are used: • Building kept well ventilated and dry • Solid manure system or mulch cover on liquid manure storage • Ventilation exhaust directed in opposite direction to neighbours • Manure, feed spills, and other waste cleaned *monthly* • Manure and silage effluents not collected regularly • Mortalities quickly and properly disposed of	No particular practices to reduce odours at the farm

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Nuisance Control for Livestock Facilities (cont'd)				
37 Noise control	The following practices are used: • Exceeds minimum separation distance from neighbours and residential, recreational, and commercial areas • Ventilation fans enclosed and directed in opposite direction to neighbours; fan not operated during the night • Crop drying fans operated during daytime only • Livestock have unlimited access to water and fed at least 3 times daily • Noise barriers (e.g. windbreak) around building and feedlot • Downwind from neighbours • Adequate mufflers on all tractors, vehicles, and engines	The following practices are used: • Meets minimum separation distance from neighbours and residential, recreational, and commercial areas • Ventilation fans enclosed or directed in opposite direction to neighbours • Crop drying fans operated during daytime only • Livestock have unlimited access to water and fed at least 3 times daily • Adequate mufflers on all tractors, vehicles, and engines	The following practices are used: • Ventilation fans directed in opposite direction to neighbours • Crop drying fans operated during daytime only • Livestock have unlimited access to water and fed at least twice daily	No particular practices to reduce noises at the farm

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Nuisance Control for Livestock Facilities (cont'd)				
38 Dust control	Most of the following practices are used: • Exceeds minimum separation distance from neighbours and residential, recreational, and commercial areas • Paved access road and barnyard • Turf seeded in non traveled areas of the farm • Building kept clean and dry but not over ventilated • Ventilation system enclosed and kept clean • Feed waste cleaned regularly • Dust barriers (e.g. windbreak) around building • Downwind from neighbours	Most of the following practices are used: • Meets minimum separation distance from neighbours and residential, recreational, and commercial areas • Gravelled access road and barnyard • Turf seeded in non traveled areas of the farm • Building kept clean and dry but not over ventilated • Ventilation system kept clean • Feed waste cleaned regularly	Most of the following practices are used: • Compacted access road and barnyard • Building kept dry but not over ventilated • Ventilation system kept clean • Feed waste cleaned regularly	No particular practices to reduce dust at the farm
39 Rodent control	The following practices are used: • Building kept clean and well maintained • Manure and feed spills cleaned regularly • Feed stored in steel tanks • Grass mowed regularly and kept short and yard kept tidy • Mortalities quickly and properly disposed of • Rodent traps in buildings • Pest exterminator hired	The following practices are used: • Building kept clean; minor maintenance required • Manure and feed spills cleaned regularly • Feed stored in steel tanks • Grass mowed regularly and kept short and yard kept tidy • Mortalities quickly and properly disposed of • Rodent traps in buildings • Controlled number of cats on the farm	The following practices are used: • Maintenance required but building structurally sound • Manure and feed spills cleaned regularly • Feed stored in stand alone grain storage • Mortalities quickly and properly disposed of • Rodent traps in buildings	No particular practices to control rodents

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Nuisance Control for Livestock Facilities (cont'd)				
40 Fly control	The following practices are used: • Building kept clean and dry • Covered manure storage • Manure and feed spills cleaned regularly • Manure and silage effluents collected regularly • Feedlot kept dry and cleaned regularly • Mortalities quickly and properly disposed of • No water ponding in yard, around and in buildings • Grass mowed regularly and kept short • Fly traps in buildings • Pest exterminator hired when required	The following practices are used: • Building kept clean and dry • Solid manure system or synthetic floating covered placed on liquid manure storage • Manure and feed spills cleaned regularly • Manure and silage effluents collected regularly • Feedlot kept dry • Mortalities quickly and properly disposed of • No water ponding in yard or around buildings • Grass mowed regularly and kept short • Fly traps in buildings • Approved insecticides used when required	The following practices are used: • Building kept dry • Solid manure system or mulch cover on liquid manure storage • Manure and feed spills cleaned regularly • Manure and silage effluents collected regularly • Feedlot kept dry • Mortalities quickly and properly disposed of • Approved insecticides used regularly	No particular practices to reduce fly populations on the farm

Manure Storage & Handling

Livestock manure is a valuable resource because it contains large amounts of nutrients and adds organic matter to the soil. However, it also contains pathogens and can be a source of offensive odours.

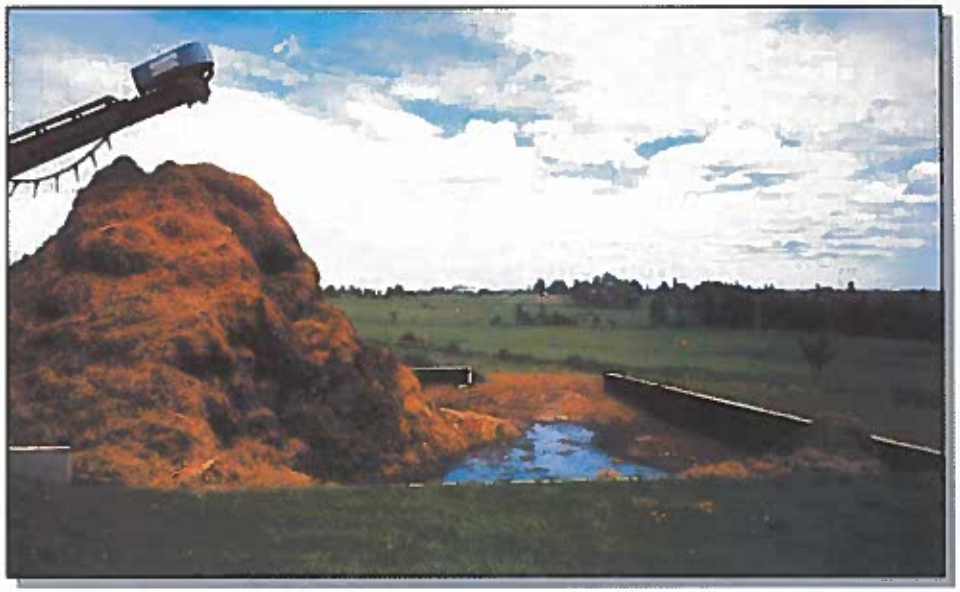
Improper manure storage can result in nutrients and bacteria contaminating nearby watercourses. This can have an impact on aquatic habitat and on the quality of drinking water. Odours from manures can cause some complaints from nearby neighbours. In order to prevent any negative impact of manure on the environment, it is important to store and handle it properly.

What should you be aware of?

Organic matter contained in manure increases biological activity in the soil and improves soil structure, which in turn enhances aeration, root development, and erosion resistance. Manure is an excellent source of macronutrients (e.g. nitrogen, phosphorus, potassium) and micronutrients (e.g. boron).

Nitrates entering drinking water supplies can cause blue-baby syndrome (methemoglobinemia). Manure pathogens, such as *E. coli*, can cause sickness in humans and livestock. Ammonia contained in manure can be lethal to fish if it reaches a watercourse. Manure nutrients can cause algal blooms in watercourses. The decaying of these algae can result in the eutrophication of watercourses.

Manure odours are considered a nuisance to many people. Ammonia and hydrogen sulphide are the two principal gases responsible for manure odours. Decomposition of solid manure releases carbon dioxide while decomposition of liquid manure releases nitrous oxide and methane–three potent greenhouse gases.



Nutrients and organic matter entering watercourses reduce oxygen levels in water thus endangering aquatic species. In constructed wetlands, limited amounts of nutrients can stimulate the growth of vegetation in wetlands. This, in turn, provides habitat for wetland species. When added to the soil, the organic matter and nutrients from manure increase soil biological activities.

Manure is a valuable source of nutrients and can reduce the need for chemical fertilizer. Adequate manure storage volume will permit spreading to take place when climate and soil conditions are favourable or when the crop can most efficiently use the nutrients. Covering the manure storage prevents dilution and reduces the volume of manure to be spread and associated costs.

How do you rate?

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Potential for Well Water Contamination (manure storage)				
1A Distance to well at risk	More than 200 m (655 ft)	Between 150 to 200 m (490 to 655 ft)	Between 100 to 150 m (330 to 490 ft)	Less than 100 m (330 ft)
1B Slope gradient toward well	Less than 2%; **or** Located downslope from well	Between 2 to 5%	Between 5 to 10%	More than 10%
1C Hydrologic soil group (water infiltration rate)	Very slow	Slow	Moderate	Fast

1D Potential for well water contamination

If your answer is a fraction, round up to the next whole number to get your overall rating (i.e. 1.3 → 2)

$$\frac{1A^* + 1B + 1C}{3} = \text{Overall Rating}$$

*if Risk Rating of question 1A equals 4 *(High)*, the Overall Rating equals 4

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Potential for Surface Water Contamination (manure storage)				
2A Distance to watercourse at risk	More than 200 m (655 ft)	Between 150 to 200 m (490 to 655 ft)	Between 100 to 150 m (330 to 490 ft)	Less than 100 m (330 ft)
2B Slope gradient toward watercourse	Less than 2%	Between 2 to 5%	Between 5 to 10%	More than 10%
2C Hydrologic soil group (water infiltration rate)	Fast	Moderate	Slow	Very slow

2D Potential for surface water contamination overall rating

If your answer is a fraction, round up to the next whole number to get your overall rating (i.e. 1.3 → 2)

$$\frac{\text{2A*} + \text{2B} + \text{2C}}{3} = \text{Overall Rating}$$

*if Risk Rating of question 2A equals 4 *(High)*, the Overall Rating equals 4

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Type of Storage				
3 **Liquid or semi-solid manure storage**	Well ventilated, under barn storage system; **or** Permanently covered concrete or glass lined steel tank; **or** Synthetic floating cover over concrete or glass lined steel tank	Concrete or glass lined steel tank; **or** Earthen storage with membrane	Earthen storage	Not properly constructed earthen storage
4 **Solid manure storage system**	Dried and stored in an enclosed solid manure storage; **or** Stored in a covered or enclosed in a well ventilated, solid manure storage; **or** Composted in an enclosed composter	Stored in a concrete storage or on a concrete pad with retaining wall; **or** Solid packed in barn with adequate bedding	Stored on concrete pad without retaining wall; **or** Solid packed with no or minimal bedding	Stacked on soil
5 **Concrete or steel tank or under barn storage**	Designed and constructed according to engineering standards and specifications or approved by regulatory agency Plans on file No sign of leaks, cracks, or other structural problems Regular monitoring of seal	Designed and constructed according to standards in use at the time of construction (e.g. factsheets or provincial programs) Plans on file No sign of leaks, cracks, or other structural problems	Design method not known No evidence of leaks, cracks, or other structural problems	Design method not known Evidence of leaks, cracks, or other structural problems

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Type of Storage (cont'd)				
6 Earthen storage	Designed and constructed according to engineering and hydrogeological standards and approved by regulatory agency Plans and soil tests on file Constructed on soils with more than 20% clay and lined with a synthetic liner; bottom of storage more than 1 m (3 ft) above bedrock or normal water table No evidence of leaks, cracks, or other structural problems Regular monitoring of seal	Designed and constructed according to standards in use at the time of construction (e.g. fact sheets or provincial programs) Plans and soil tests on file Constructed on soils between 15 to 20% clay and lined with bentonite clay or a synthetic liner; bottom of storage more than 1 m (3 ft) above bedrock or normal water table No evidence of leaks, cracks, or other structural problems	Design and construction method not kept on file Installed on soils with less than 15% clay No evidence of leaks, cracks, or other structural problems	Not designed or constructed according to standards; **or** Installed on soils with less than 15% clay; **or** Storage bottom closer than 1 m (3 ft) to normal water table or bedrock without an appropriate liner; **or** Evidence of leaks, cracks, or other structural problems
7 Stacked manure	Stacked on concrete pad with retaining walls No liquid runoff; **or** All liquid runoff properly handled in a separate system as liquid waste or in a properly designed constructed wetland	Stacked on concrete pad All liquid runoff contained or filtered through a properly designed filter strip system	Stacked on asphalt or other semi-impermeable base Portion of liquid runoff contained	Stacked on soil base and liquid runoff not contained; **or** Livestock raised year round in a confined lot

Risk Rating	1 (Low)	2	3	4 (High)
Type of Storage (cont'd)				
8 **Manure stacked in the field**	Never stacked in field (no stacking allowed in a designated watershed area)	Stacked for a period of 30 days or less on medium to fine textured soils	Stacked for less than 90 days on medium to fine textured soils	Stacked for more than 90 days
		Upslope surface water diverted away from pile	Upslope surface water diverted away from pile	Upslope surface water not diverted away from pile
		New location for pile each time	New location for pile each time	Location of pile never changes
		Never stacked over drain tiles	Sometimes stacked near drain tiles	Often stacked over drain tiles
		Stacked at least 150 m (490 ft) from surface water and public roads	Stacked at least 100 m (330 ft) from surface water and public roads	No consideration for separation distances
		Stacked at least 200 m (655 ft) from wells	Stacked at least 150 m (490 ft) from wells	
		Stacked at least 30 m (100 ft) from surface drainage ditch	Stacked at least 15 m (50 ft) from surface drainage ditch	
Storage Volume				
9 **Storage capacity of manure storage** (including bedding, milkhouse washwater, rainwater, etc.)	Storage has capacity for one full year	Storage has capacity for at least 250 days	Storage has capacity for at least 210 days	Storage has capacity of less than 210 days
10 **Surface runoff**	No incoming surface runoff flowing towards storage and roof water diverted away from manure storage	Surface runoff (from fields or yard) and roof water diverted away from manure storage	Field runoff diverted away from manure storage	Runoff and roof water flow freely through or into manure storage

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Manure Treatment and Nuisance				
11 Prevention of nuisance	No close neighbours or storage located downwind and more than 1000 m (3280 ft) from neighbours Manure storage covered or surrounded by trees or a windbreak Manure storage not visible from public roads	Storage located downwind and more than 500 m (1640 ft) from neighbours Manure storage surrounded by a windbreak Manure storage visible but far from public roads	Storage located downwind and more than 200 m (655 ft) from neighbours Manure storage visible from public road	Storage less than 200 m (655 ft) from neighbours Manure storage between barn and road
12 Manure treatment (e.g. solid/liquid separation, filtration, aeration, anaerobic digestion)	Manure treated mainly to reduce odours and volume, to create energy, or to increase nutrient management options Complies with all applicable environmental legislation **OR** Manure treatment not required for the farm operation	Manure treated mainly to provide options to export manure and to reduce odours Complies with all applicable environmental legislation	Manure treated mainly to reduce odour complaints Complies with applicable environmental legislation	Manure not treated despite a surplus of manure or receives several nuisance complaints; **or** Unaware or does not comply with all applicable environmental legislation concerning manure treatment

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Health and Safety				
13 Safety and emergency	Fence or wall of *at least* 1.5 m (5 ft) surrounds storage	Fence or wall of *at least* 1.5 m (5 ft) surrounds storage	Fence or wall of *less* than 1.5 m (5 ft) surrounds storage	No fence or wall surrounds storage
	Warning signs posted around manure storage	Warning signs posted around manure storage	No warning signs posted	No warning signs posted
	Breathing apparatus, 3 person buddy system, and lifeline used when required to enter liquid manure tank	Breathing apparatus, 3 person buddy system, and lifeline used when entering liquid manure tank	Breathing apparatus and lifeline used when entering liquid manure tank	No breathing apparatus or other safety precautions taken when entering liquid manure tank
	All persons living and/or working on the farm trained about manure storage safety			
	Manure storage included in farmstead emergency plan in case of accidents (e.g. gas inhalation, fall), leaks, spills, and overflow	Manure storage included in farmstead emergency plan in case of accidents (e.g. gas inhalation, fall), leaks, spills, and overflow	No formal emergency plan	No emergency plan
14 Water monitoring wells	Test or monitoring well located below manure storage	Well at risk used as test well	Homestead well used as test well	
	Water sampled annually for coliforms	Water sampled annually for coliforms	Water sampled occasionally for coliforms	Water not sampled

Pasture Management

In Atlantic Canada, pastures are an important source of livestock feed, especially on beef and sheep farms. Although they are becoming less important on dairy farms, pastures are still commonly used for dry cows, heifers, and calves.

Pasture productivity varies considerably with seasons and between farms and regions. The level of management can have a significant impact on the quantity and quality of forage produced on pastures, on livestock performance, and on the environment.

What should you be aware of?

Soil compaction and rill and gully erosion are often observed in heavily grazed pastures. Erosion frequently occurs in areas that are overgrazed and in pathways created by the animals. When livestock have uncontrolled access to watercourses, they can cause excessive streambank erosion by trampling the banks.

Soil erosion in pastures and streambank erosion caused by livestock trampling contribute to sedimentation of watercourses and estuaries. Livestock can also affect surface water quality, if they have direct access to it. Although they may not stay in the water for a long period of time, livestock may urinate or defecate directly into watercourses. Nutrient enrichment and pathogens from manure reduce water quality and contribute to algae blooms.

A well managed pasture reduces or removes greenhouse gases. Maintaining productive pastures can increase soil organic matter levels and carbon sequestration. This removes carbon dioxide from the atmosphere. In addition, higher quality forages in a well managed pasture are more easily digested by cattle, resulting in reduced methane emissions.

Wildlife habitat and biodiversity can be improved considerably in a well managed pasture. Unproductive steep slopes can be removed from production and restored to their natural state. Sedimentation and loss of stream side vegetation through grazing will eventually degrade fish habitat by creating wide and shallow streambeds, thereby reducing water flow velocity and increasing water temperature. Protection of riparian buffer zones along pastures will not only reduce stream sedimentation, but will enhance biodiversity on the farm by providing shelter and habitats to fish and wildlife.

A well managed pasture can be as much as five times more productive than a poorly managed pasture. Livestock in a productive pasture will spend more time eating and resting, and less energy will be spent on finding enough feed to satisfy nutritional requirements. A well planned and managed pasture will produce a reliable source of feed for six to seven months of the year at a much lower cost than harvested feed or forages. The health and productivity of livestock on pastures depend on access to clean, potable water.

How do you rate?

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Grazing Management				
1 Pasture condition	Pasture stand contains more than 75% of desirable species	Pasture stand consists of 50% to 75% of desirable species	Pasture consists of less than 50% of desirable species	Pasture consists mainly of weeds or woody species
	Very thick stand of healthy green forages throughout the season	Thick stand but somewhat yellowish green leaves	Thin stand and presence of weeds or undesired species throughout the pasture	Pasture grazed in patches and large areas of pasture avoided
	Even grazing across pasture and no evidence of over or undergrazing	Ungrazed patches cover less than 25% of pasture	Ungrazed patches cover more than 50% of pasture	Bare spots due to overgrazing and cattle graze less than 25% of pasture
	Rapid recovery or regrowth after grazing; sward can be regrazed after 3 to 4 weeks	Sward takes 5 weeks to recover after grazing	Sward takes 6 to 7 weeks to recover after grazing	Very little recovery after grazing
	No evidence of soil compaction, slumping, rill or gully erosion	Some rill erosion confined to steepest areas; no slumping	Some rill and gully erosion confined to steepest areas	Heavy compaction, slumping, rill and gully erosion noticeable across pasture
	No signs of livestock trails	No signs of livestock trails	Scattered signs of livestock trails	Excessive livestock traffic killing plants over wide area

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Grazing Management (cont'd)				
2 Grazing systems	Rotational grazing system with at least 4 paddocks fairly equal in size and productivity	Rotational grazing system with at least 4 paddocks uneven in size	Pasture divided in two or three large paddocks	One large pasture, uncontrolled grazing
	Size of each paddock or stocking rate set so that the animals are able to graze the sward within 5 to 7 days to ensure that new growth is grazed at the right growth stage; ungrazed patches mowed	Livestock moved every 5 to 7 days but ungrazed areas of quality sward observed indicating an understocking; ungrazed patches mowed	Paddocks not sized according to need and cattle moved when overgrazing noticed; or Understocking of pasture; undergrazing observed; ungrazed patches not mowed	Livestock have access to the entire pasture at all times; overgrazing observed
	Livestock moved to pasture when sward is roughly 20 cm (8 in) high and removed when forage height is 10 cm (4 in)	Livestock moved to pasture when sward is much higher than 20 cm (8 in) and removed when forage height is between 5 and 10 cm (2 and 4 in)	Livestock moved to pasture when sward is less than 15 cm (6 in) and removed when forage height is less than 5 cm (2 in)	Livestock moved to pasture when sward is less than 10 cm (4 in) and removed when forage height is less than 5 cm (2 in)
	Extra paddocks of annual pasture species available in mid-season **OR** Pasture managed under a strip grazing system where the fence is moved daily	Grazing the aftermath of hayfields complements mid-season pasturing	Grazing of hayfield aftermath or feeding hay required in mid-season	Livestock productivity maintained through hay or silage feeding throughout the season

Risk Rating	1 (Low)	2	3	4 (High)
Watercourse Protection				
3 **Access to watercourse**	No access to watercourses	Limited access to watercourses through *fenced access ramp* for drinking purposes where permitted by legislation; fence does not cross watercourse	Limited access to watercourses but *no structures* in place to limit streambank erosion	Uncontrolled access to watercourses
4 **Fencing of watercourses**	Fences placed at least 10 m (33 ft) from any watercourse and at least 30 m (100 ft) from protected watercourses	Fences placed at least 5 to 10 m (16 to 33 ft) from any watercourse and at least 15 m (50 ft) from protected watercourses	Fences placed at less than 5 m (16 ft) from watercourses	No fences
5 **Fencing of road and/ or drainage ditches**	Fences placed at least 3 m (10 ft) from road and/or drainage ditches	Fences placed at least 1 to 3 m (3 to 10 ft) from road and/or drainage ditches	Fences placed at less than 1 m (3 ft) from road and/or drainage ditches	Unlimited access to road and/ or drainage ditches
6 **Watercourse crossing**	Well constructed and maintained *culverts or bridge* used everywhere livestock need to cross a watercourse	Well constructed and maintained *mid-level crossing* (where approved)	Well constructed and maintained *low-level crossing* (where approved)	Crossings not properly constructed or maintained; **or** No livestock crossing structures
Livestock Watering				
7 **Water source capacity**	Water source satisfies daily water requirement in *any* weather condition	Water source satisfies daily water requirement in *most* weather conditions Alternate water source or supply readily available in case of drought	Water source not reliable during hot and dry weather Water storage tank available in case of drought	Water source dries up annually Alternate water source not readily available

Risk Rating	1 (Low)	2	3	4 (High)
Livestock Watering (cont'd)				
8 Water quality	Meets higher standards than the Canadian Water Quality Guidelines for Livestock Watering	Meets Canadian Water Quality Guidelines for Livestock Watering	Does not meet some of the Canadian Water Quality Guidelines for Livestock Watering	Poor water quality; **or** Water quality never tested
9 Frequency of water testing	Tested *every year* prior to pasturing	Tested every 2 years prior to pasturing	Tested every 3 years	Never tested
10 Siting of water troughs	Placed on *well* drained and dry soil surface or structure (e.g. concrete platform) at least *20 m (60 ft)* from any watercourse including springs	Placed on *well* drained and dry surface at least *15 m (50 ft)* from any watercourse including springs	Placed on *poorly* drained surface at least *10 m (33 ft)* from any watercourse including springs	Placed on *wet and muddy* surface less than *10 m (33 ft)* from any watercourse including springs
11 Livestock travelling distance to access water troughs	Maximum distance varies between 150 to 200 m (490 to 655 ft)	Maximum distance varies between 200 to 300 m (655 to 985 ft)	Maximum distance varies between 300 to 500 m (985 to 1640 ft)	Maximum distance greater than 500 m (1640 ft)

Soil & Crop

Soil Management

The sustainability of food production in Atlantic Canada depends greatly upon the use of soil and crop management practices that enhance healthy, productive soils and protect water resources.

The rolling topography, amount of precipitation, frequency of extreme rainfall events, and intensity of row crop production make Atlantic Canada soils very susceptible to erosion. In places, land can lose between 20 to 50 tonnes of topsoil per hectare in a year, which is not an acceptable rate of loss. Therefore, soil management for crop production and protection of water are the most important challenges facing the farming community in Atlantic Canada.

What should you be aware of?

Soil organic matter is one of the key indicators of soil health. A high level of soil organic matter improves populations of soil living organisms, nutrient availability, soil structure, water infiltration and retention, soil aeration, and drainage.

Good soil management leads to better crop yields and quality while reducing the losses of soil, nutrients, and pesticides associated with runoff. Sound soil management practices also improve water quality and reduce the reliance on irrigation to meet crop water requirements.

Soil management has an influence on dust and greenhouse gas emissions. Excessive tillage and lack of residue cover can increase wind erosion, resulting in more dust in the air and nuisance complaints from nearby neighbours. Excessive tillage also accelerates microbial decomposition of organic matter emitting carbon dioxide to the atmosphere.

Maintaining a healthy soil with good soil organic matter levels will improve the diversity of living organisms in the soil. Good soil management decreases water runoff and soil erosion, which reduces the risks to water quality of nearby watercourses and helps maintain a healthy aquatic and wildlife habitat.

Sound soil management practices should improve yields and produce a more consistent high quality crop. When proper soil management practices are used, the topsoil and organic matter will be conserved. Consequently, these soils require less fertilizer to maintain production. In addition, the crop will be more vigorous and less susceptible to pests. Maintaining a healthy soil helps to reduce costs per units of production. Sound soil management practices also reduce the off-farm costs associated with soil degradation such as sediment removal from road ditches and farm ponds.

How do you rate?

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Organic Matter and Soil Health				
1 **Soil organic matter level** (determined by soil test)	Silty/sandy soils over 3% Silty/sandy loams over 3.5% Loam soils over 4% Clay loams over 5% Clay soils over 6%	Silty/sandy soils 2-3% Silty/sandy loams 2.5-3.5% Loam soils 3-4% Clay loams 4-5% Clay soils 4.5-6%	Silty/sandy soils 1-2% Silty/sandy loams 1.5-2.5% Loam soils 2-3% Clay loams 3-4% Clay soils 3-4.5%	Silty/sandy soils under 1% Silty/sandy loams under 1.5% Loam soils under 2 % Clay loams under 3 % Clay soils under 3%
2 **Soil life** (determined by counting earthworms and ground beetles in late June or early July)	More than 10 worms and/or beetles per 2 litres (2 quarts) of soil or per shovel full	5 to 10 worms and/or beetles per 2 litres (2 quarts) of soil or per shovel full	1 to 5 worms and/or beetles per 2 litres (2 quarts) of soil or per shovel full	No worms or beetles; **or** Soil is fumigated
3 **Soil moisture holding capacity**	Plant water stress rarely noticed or noticed after a long-lasting drought (*3 weeks* or more on heavier soils or 2 weeks or more on light texture soils)	Plant water stress noticed between *1 and 2 weeks* of drought	Plant water stress noticed within *1 week* of drought	Plant water stress noticed if no precipitation for *3 days*
4 **Crop rotation for soil building**	Crops that maintain or increase organic matter and provide a protective groundcover grown at least *3 years out of 4* (e.g. perennial forages)	Crops that maintain or increase organic matter and provide a protective groundcover grown *2 years out of 3*	Soil building and protective crops grown *every other year* Crops that provide little protective groundcover and deplete organic matter dominate the rotation (e.g. potatoes, vegetables, silage corn, soybeans, spring cereals (straw removed))	Soil building and protective crops grown less often than every other year Crops that provide little protective groundcover and deplete organic matter dominate the rotation

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Organic Matter and Soil Health (cont'd)				
5 **Organic amendments**	Solid manure or compost complement crop rotation taking into consideration food safety precautions Green manure crop established following application of soil amendment Application rate based on soil test, amendment analysis including carbon:nitrogen ratio (~25:1), and Nutrient Management Plan	Solid manure, compost, or other recommended amendments complement crop rotation Application rate based on soil test, NMP, and published average carbon/nitrogen ratio	Solid or liquid manure, compost, or other recommended amendments applied without soil test Application rate not known	Excessive rates of various soil amendments applied to compensate for poor crop rotation
Soil Structure and Soil Health				
6 **Soil structure** (does not apply to gravely or sandy soils)	Open, well aggregated crumbly structure, when dry, and lots of pore space No signs of surface crusting even after heavy rainfalls	Mostly open, some soil clods evident, and generally good pore space Limited surface crusting only after heavy rainfalls	Slightly dense, evidence of large soil clods, and limited pore space Surface crusting after most rainfall events	Dense, breaks into large clods, and very little pore space Poor plant emergence due to soil crusting

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Soil Structure and Soil Health (cont'd)				
7 **Evidence of soil compaction**	Healthy root growth throughout the soil profile	Good root growth but restricted at a depth below the plough layer	Poor root growth limited by plough pan	Poor root growth throughout the field
	Uniform crop growth and yield across the field	Uneven crop growth and reduced yield on most heavily travelled portions of the field	Uneven crop growth and reduced yield throughout the field	Crop growth stunted with yellowish color and poor yield throughout the field
	Good water infiltration even during extreme rainfall events; minimal runoff	Good water infiltration during most rainfall events; some runoff during heavy rainfalls events	High rates of runoff during heavy rainfall events	High rates of runoff during most rainfall events
	No evidence of water ponding	Some water ponding after heavy rainfalls	Some water still ponding 24 hours after heavy rain	Water ponding after most rainfall events
	No gearing down to till any part of the field	Must gear down to till most heavily travelled portions of the field	Must gear down to till many areas of the field	Must gear down to till the entire field; excessive wear and tear of coulters or disks
8 **Crop selection to break down soil compaction**	Deep-rooted perennial forage crops (e.g. alfalfa) used in rotation and maintained for at least 3 years	Deep-rooted perennial or bi-annual forage crops (e.g. sweet clover) used in rotation and maintained for at least 2 years	Deep-rooted annual crops (e.g. oil seed radish, rye-grass) used in rotation	Shallow rooted annual crops used in rotation
9 **Sub-soiling**	Sub-soiling never carried out or required	Sub-soiling carried out once to complement sub-surface drainage	Sub-soiling carried out once in each rotation sequence; not complemented with deep-rooted crops	Sub-soiling required every year or deep ripping sometimes required
		Sub-soiling carried out when soil is sufficiently dry and prior to establishing a deep-rooted crop	Sub-soiling carried out when soil is sufficiently dry	Sub-soiling carried out when soil is wet

Risk Rating	1 (Low)	2	3	4 (High)
Soil Structure and Soil Health (cont'd)				
10 Field operations	Low pressure, high flotation tires, or dual wheels on all equipment; four wheel drive equipment used to reduce slippage Equipment axle load always kept at minimum Field operations never carried out when soil is wet	Low pressure, high flotation tires, or dual wheels on most equipment Equipment axle load not always kept at minimum Some field operations (e.g. spraying) carried out when soil is wet	Conventional tires on most equipment; dual wheels used where feasible Equipment with high axle loads sometimes used Field operations often carried out when soil is wet Soil rutted	Conventional tires on all equipment; no dual wheels Equipment with high axle loads regularly used Field equipment often stuck in mud Soil rutted
11 Stone management	Stones that do not interfere with normal field operations left in the field intact; **or** Stones are crushed	Stones and rock removal carried out in dry conditions	Stones and rock removal generally carried out in wet conditions during late fall or early spring	Topsoil regularly de-stoned at tillage depth with a debris picker or a rock crusher
Tillage				
12 Management of crop residues	Crop residue (e.g. straw, chaff, stalks, leaves) chopped, evenly spread, and left on the surface Soil surface covered with at least 60% of crop residue over winter	Crop residue (e.g. straw, chaff, stalks, leaves) chopped, evenly spread, and left on the surface Soil surface covered with 40 to 60% of crop residue over winter	Crop residue not evenly spread–left in windrows or piles Soil surface covered with 20 to 40% of crop residue over winter	Crop produces little residue; **or** Crop residue removed, harvested, or burned Soil surface covered with less than 20% of crop residue over winter

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Tillage (cont'd)				
13 Type of tillage*	Tillage practice leaving *more than 30%* residue on surface after seeding or planting; **or** No-till	Tillage practice leaving *20 to 30%* residue on surface after seeding or planting	Tillage practice leaving *10 to 20%* residue on surface after planting or seeding	Tillage practice leaving *less than 10%* residue on surface after planting or seeding
14 Tillage practice following fall application of glyphosate	No-till; **or** Conservation tillage with a heavy cultivator in the spring; no fall tillage	Conservation tillage with a heavy cultivator in the fall	Spring mouldboard ploughing	Fall mouldboard ploughing
15 Timing of primary tillage	Primary tillage carried out in the spring; **or** Conservation tillage leaving more than 60% of crop residue over winter	Primary tillage only carried out in late fall on field with slope less than 3% or on field with a properly designed conservation system	All primary tillage carried out in late fall	Primary tillage carried out in mid-summer to early fall and soil left bare over winter Primary tillage of row crop field in the fall
16 Tillage intensity	No-till or ridge-till	Seedbed not worked fine 1 or 2 tillage passes in total Conservation tillage equipment that lifts and shatters soil (e.g. chisel) Recommended speed for tillage implement used	Seedbed worked down fine 3 tillage passes in total Conventional tillage equipment Speed sometimes greater than recommended	Seedbed very fine and soil crusts easily More than 3 tillage passes in total; **or** Tillage equipment pulverizes soil (e.g. rotary tiller and disk harrow) or summerfallow

**Note:* Residue cover can be measured by stretching a 30 m (100 ft) measuring tape diagonally across crop rows after planting and by counting the number of 30 cm (1 ft) marks with a piece of crop residue beneath it. Each mark represents 1% crop residue cover. Repeat the process several times and average.

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Tillage (cont'd)				
17 Tillage depth	No more than 10 cm (4 in) and never in subsoil	10 to 20 cm (4 to 8 in) and never in subsoil	More than 20 cm (8 in) and never in subsoil	Any tillage that brings subsoil to the surface and/or mixes it with topsoil
Soil Water Management				
18 Soil drainage (natural)	Water table always below the root zone; soil never saturated	Water table near the surface or soil saturated for short period of time in the spring and late fall	Water table near the surface or soil saturated in the spring and late fall	High water table or soil saturated for an extended part of the season
	Minimal water remains on the surface of the field right after a storm	Some water remains on the surface of the field right after a storm	Some small ponds remain on the surface of the field 24 hours after a storm (may be caused by soil compaction)	Large ponds of water remain on the surface of the field 24 hours after a storm (may be caused by soil compaction)
	Field operations rarely delayed for more than *1 day* after a heavy rainfall	Field operations occasionally delayed in early spring and late fall and/or for more than *2 days* after a heavy rainfall	Field operations usually delayed at both ends of the season and/or for more than *3 days* after a heavy rainfall	Field operations often delayed for an *extended period* or conducted in wet conditions
	Crop growth not affected by excess water anywhere in the field	Uneven crop growth in some section of the field	Uneven crop growth across the field; sometimes crop not harvested because of poor yield and poor trafficability	Crop failure most years
19 Land drainage	No drainage required	Site investigation and on-farm soil and topographic surveys used to identify cause of poor drainage and type of drainage system required	Site investigation only used to identify type of drainage system; **or**	Drainage system installed by producers and without prior field investigation and soil survey; **or**
			Soil class 4 is drained (refer to the introduction section for more information)	Soil class greater than 4 is drained

Risk Rating	1 (Low)	2	3	4 (High)
Soil Water Management (cont'd)				
20 Surface drainage	Surface drainage carried out as per engineering design and by an experienced contractor	Surface drainage carried out as per engineering design and by an experienced contractor	Surface drainage carried out by an experienced contractor	Surface drainage carried out by an inexperienced contractor
	All ditches seeded between May and August with a recommended perennial grass mix and mulched	All ditches seeded with a perennial grass mix	Ditches not seeded or seeded late	Ditches not seeded
	Ditches well maintained and mowed once a year	Ditches well maintained and mowed less than once a year	Ditches not mowed, but kept cleaned	No ditch maintenance
21 Subsurface (tile) drainage	Tile drainage carried out as per engineering design and by an experienced contractor	Tile drainage carried out as per engineering design and by an experienced contractor	Tile drainage installed by an experienced contractor and field layout plan	Tile drainage installed by an inexperienced contractor
	Installation plan geo-referenced and kept on record	Installation plan kept on record	No installation plan	No installation plan
Drainage and Waterway Outlets				
22 Outlet onto neighbouring property	Mutual agreement signed between landowners and kept on record	Mutual verbal agreement between landowners	No prior agreement between landowners	No permits or agreements
	Permits or agreements obtained if discharged in public road ditch	Permits or agreements obtained if discharged in public road ditch	Permits or agreements obtained if discharged in public road ditch	

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Drainage and Waterway Outlets (cont'd)				
23 Surface drainage outlet (ditch or waterway)	Outlets protected by drop structures or rock chute	Vegetated outlet protection, no sign of erosion at outlet	Signs of rill erosion at outlet	Gully erosion at outlet and in the ditches
	Outlets discharge in a sedimentation pond, catch basin, or a designed buffer strip	Outlets discharge in a buffer strip before entering riparian zone; no signs of erosion and sediment in riparian zone	Outlets discharge in riparian zone; signs of rill and gully erosion in riparian zone and some streambank erosion at exit	Outlets discharge directly in watercourse; severe streambank erosion at exit and sedimentation of streambed
24 Subsurface (tile) drainage outlet	Outlet protected against erosion	Some protection against erosion at outlets	Outlets not protected	Outlets not protected
	Annual inspection of outlets	Occasional inspection of outlets	Outlets rarely inspected	No inspection
	Tile drains discharge in a catch basin or a designed grassed buffer strip before entering riparian buffer zone; no sign of erosion in riparian zone	Tile drains discharge into a vegetated buffer strip before entering riparian buffer zone; no signs of erosion in riparian zone	Tile drains discharge directly into riparian zone; signs of rill and gully erosion in riparian zone and some streambank erosion at exit	Tile drains discharge directly into watercourse; severe streambank erosion at exit
	30 cm (12 in) freeboard at outlet	15 cm (6 in) freeboard at outlet	8 cm (3 in) freeboard at outlet	No freeboard
	Indicator post at outlet	Indicator post at outlet		

Risk Rating	1 (Low)	2	3	4 (High)
Evidence of Soil Erosion by Water				
25 Evidence of sheet erosion (including splash erosion and runoff)	No visible runoff	Runoff during heavy rainfall and very little sediment in runoff water	Runoff occurs during most rainfall and high level of sediment in runoff water	Sediment in streams and reservoirs and some sign of rill erosion
	No soil deposits at the base of slopes	Some evidence of soil deposits at base of slopes	Significant soil deposits at base of slopes	Deep soil deposits at base of slopes
	No pedestals of soil supporting small stones and pieces of plant debris after rainfalls	Some small stones exposed after heavy rainfall	Small stones exposed throughout the field after rainfalls	Pedestals of soil supporting small stones and pieces of plant debris after rainfalls
	Subsoil not exposed anywhere in the field	Subsoil not exposed anywhere in the field	Subsoil exposed on upslope segment of the field	Subsoil exposed in many areas of the field
	Crop growth and yield uniform across the field	Crop growth and yield slightly reduced on upslope segment of the field	Crop growth, yield, and quality reduced on upslope segment of the field	Crop growth, yield, and quality greatly reduced across the field
26 Evidence of rill or gully erosion	No rill/gully erosion	Minor or infrequent rill erosion	Rill and minor gully erosion	Gully erosion

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Soil Erosion by Water (not applicable if in permanent cover)				
27 Slope grade (S)	Less than 3% grade	3 to 4% grade	4 to 5% grade	Greater than 5% grade
28 Slope length (L) or spacing between contour diversion terraces	Less than 100 m (330 ft)	100 to 200 m (330 to 650 ft)	200 to 300 m (650 to 985 ft)	More than 300 m (985 ft)
29 Potential for soil erosion due to slope (LS) [27] + [28]	2 or 3	4	5	6, 7, or 8

Risk Rating	1 (Low)	2	3	4 (High)
Soil Conservation Structures				
30 Construction of soil conservation structures	Diversion terraces and waterways constructed as per engineering design and by an experienced contractor	Diversion terraces and waterways constructed as per engineering design and by an experienced contractor	Diversion terraces and waterways constructed by an experienced contractor	Diversion terraces and waterways constructed by a general contractor
	Diversion terraces and grassed waterways seeded with a recommended perennial grass mix and stabilized with mulch, erosion control blanket, or netting	Diversion terraces and grassed waterways seeded with a recommended perennial grass mix	Diversion terraces and grassed waterways seeded with a perennial grass mix	Diversion terraces and waterways not seeded
31 Maintenance of soil conservation structures	Sediment and debris removed as soon as they accumulate	Sediment and debris removed annually	Sediment and debris occasionally removed	Sediment and debris never removed
	Any damages immediately repaired	Repairs made annually	Damages occasionally repaired	Damages not repaired
	Vegetation mowed annually	Vegetation mowed annually	Vegetation burned or mowed every 2 years	Bushes growing on diversion terraces
	Erosion control structures not used as laneways for vehicle or machinery traffic	Light traffic by vehicle or machinery on erosion control structures	Moderate traffic by vehicle or machinery on erosion control structures	Heavy traffic by vehicle or machinery on erosion control structures
	Structures not encroached by tillage	Structures not encroached by tillage	Structures encroached by tillage	Structures encroached by tillage

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Other Water Erosion Conservation Practices				
32 Winter cover (for fields with low surface residues or following row crops)	Well established over-wintering cover crop (e.g. winter rye or winter wheat) seeded immediately after harvest; **or** Hay or straw mulch applied immediately after harvest	Well established winter cover crop (e.g. winter rye, winter wheat, oats) seeded immediately after harvest on field with slope greater than 2%; **or** Hay or straw mulch applied immediately after harvest on field with slope greater than 2%	Late seeded winter cover crop; **or** Early harvested field seeded with cover crop then ploughed under late in the fall; **or** Hay or straw mulching on steep slopes only	Bare field throughout the winter
33 Headland management at low end of row crop fields	Permanently established grassed headlands on lower end of row crop fields	Headlands established with grass one year prior to planting a row crop	Bare headlands	Headlands planted with row crop
Soil Erosion by Wind				
34 Evidence of wind erosion	No evidence of wind erosion	Minor evidence of wind erosion; occasional puff of dust on very windy days	Seasonal evidence of: • drifting soil • dirty snow drifts • deposits of soil behind weeds or crop residues	Frequent evidence of: • drifting soil • dirty snow drifts • soil deposition against buildings, hedges, or fences and in road ditches • crop damaged by sandblasting

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Soil Erosion by Wind (cont'd)				
35 Practices to reduce wind erosion	Permanent cover; **or** No-till Well established windbreaks	Adequate residue cover 80% of the time within the rotation Tillage system leaving a rough soil surface and more than 30% residue on surface after seeding or planting Winter cover crops seeded or mulch applied after harvest of low residue producing row crops (e.g. potatoes, carrots)	Adequate residue cover 50 to 80% of the time within the rotation Tillage practice leaving a moderately rough soil surface and 10 to 30% residue on surface after planting or seeding No or poorly established winter cover crop	Adequate residue cover less than 50% of the time within the rotation Tillage practice leaving less than 10% residue on surface after planting or seeding; smooth surface Bare field throughout the winter
Soil Erosion by Tillage				
36 Evidence of tillage erosion	Subsoil not exposed on hilltops (soil similar in colour to the rest of the field) Crop growth and yield uniform across the field	Subsoil not exposed on hilltops (soil similar in colour to the rest of the field) Crop growth and yield slightly reduced on hilltops and upper slopes	Subsoil exposed on hilltops (soil lighter in colour than rest of field) Crop growth and yield moderately reduced on hilltops and upper slopes	Exposed bedrocks or subsoil exposed on hilltops (soil lighter in colour and compacted) Crop growth and yield substantially reduced on hilltops and upper slopes

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Soil Erosion by Tillage (cont'd)				
37 Practices to reduce tillage erosion	No-till; **or** Land never tilled	Land tilled to a depth of less than 10 cm (4 in) Two or less tillage passes Tillage at recommended speed for the implement used If mouldboard plough or reversible plough used, all soil turned uphill	Land is tilled to a depth of 10 to 20 cm (4 to 8 in) Three or more tillage passes Tillage at recommended speed for the implement used No effort made to turn soil uphill	Land is tilled to a depth greater than 20 cm (8 in) Three or more tillage passes Tillage higher than recommended speed for the implement used Soil turned downhill
Other Soil Management Practices				
38 Marginal land management (cultivated fields with severe limitations: slope, rocks, drainage, shallow soil,...)	Unimproved land with soil capability classes 5, 6, and 7 retired from agriculture production and planted with a mix of trees and shrubs	Unimproved land with soil capability classes 5, 6, and 7 retired from agriculture production and planted with single species of trees or left in permanent cover; **or** Marginal land used within their limitations	Unimproved land with soil capability classes 5, 6, and 7 intensively grazed or continuously used for forage production	Unimproved land with soil capability classes 5, 6, and 7 continuously reseeded with annual crops

Nutrient Management

The current emphasis on nutrient management planning reflects an increased awareness of the potential impacts of nutrient use on water quality and the need to select nutrient application rates based on both realistically achievable crop production goals and environmental protection objectives.

The purpose of a nutrient management plan is to use organic and/or inorganic nutrients wisely to maximize economic benefits while minimizing contamination of surface and ground water resources and maintaining or improving the physical, chemical, and biological conditions of the soil.

What should you be aware of?

Careful management of all nutrient sources on the farm will assist in improving the soil's organic matter, structure, water holding capacity, nutrient retention, and biological activity. For example, additions of organic amendments such as manure will help to build soil organic matter over the long-term and favour the growth of the soil microbial population.

If nutrients are managed properly, there is a lower risk of contaminating surface and ground waters with nitrogen, phosphorus, or bacteria from organic and inorganic nutrient sources. Excess phosphorus or nitrogen in runoff can contribute to eutrophication of surface waters. Residual nitrogen in the soil may leach into groundwater making it unfit as a drinking water source. At high concentrations in the soil, phosphorus may leach into tile drainage waters. Bacteria from manure or other organic amendments may move with runoff water to watercourses or leach into groundwater contaminating these water sources.

Nutrient application should be managed to avoid negative impacts on air quality. Surface application of manure on warm days may result in greater release of ammonia which has an offensive odour. Depending on application methods, unpleasant odours from manure often result in nuisance complaints from neighbours. Under some circumstances, use of manure and nitrogen fertilizers can result in the emission of methane or nitrous oxide which are two potent greenhouse gases.

Organic amendments to the soil may favor the growth and diversity of the living organisms in the soil. For example, earthworm, bacteria, and fungal populations may increase after manure application. Good nutrient management practices can increase crop yields, increase crop residue in the soil, and consequently increase soil biological activity and biodiversity.

Sound nutrient management will maximize the efficiency of nutrient sources on the farm. By using soil tests to determine crop nutrient requirements and accounting for the nutrient content of manure, organic amendments, or legume plough down, a significant amount of savings can often be achieved by reduced need for inorganic fertilizers. Fertilizing for realistic yield goals will also increase the return per dollar spent on nutrient inputs.

How do you rate?

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Nutrient Management Planning				
1 **Nutrient management plan**	Nutrient management plan completed, implemented, and updated *annually* Plan prepared and/or certified by a professional agrologist who has completed a *Nutrient Management Planning* course; **or** Plan prepared by farm staff who have completed a *Nutrient Management Planning* course in the region and has met requirements to become Nutrient Management Planners	Nutrient management plan completed, implemented, and updated *every 3 years* Plan prepared and/or certified by a professional agrologist who has completed a *Nutrient Management Planning* course; **or** Plan prepared by farm staff who have completed a *Nutrient Management Planning* course in the region	Completed a nutrient budget; **or** Plan prepared by someone who has not completed a *Nutrient Management Planning* course	Nutrient Management Planning not initiated for the farm; **or** No knowledge of nutrient management planning

Risk Rating	1 (Low)	2	3	4 (High)
Farm Inventory				
2 Field mapping	Field mapped with aerial photos and/or topographic maps (preferably 1:5000 scale) with the following features: • individual field identified • sub-fields identified where different soil samples taken due to field variability • cultivated area • public areas and roads • location of ditches • sub-surface drainage layout and outlets • location of watercourses and wells • set-back distances boundaries, buffers, restricted areas, and neighbours • slope grade, direction, and length	Field mapped with aerial photos and/or topographic maps (1:10,000 or 1:50,000 scale) with the following features: • individual field identified • cultivated area • public use areas and roads • location of ditches • sub-surface drainage outlets • location of watercourses and wells • set-back distances boundaries, buffers, restricted areas, and neighbours	Field map hand sketched with the following features: • individual field identified • cultivated area	No field maps
	Field measured with GPS Field boundaries geo-referenced	Field measured with measuring wheel	Equipment area counter used to determine area cultivated	
	Photos/maps can be kept up to date with office computer and paper version available	Photos/maps can be viewed on office computer and paper version available	Paper version of field maps	

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Farm Inventory (cont'd)				
3 Soil maps	Soil survey maps with a scale of at least 1:5000; **or** On-farm soil survey done for each field identifying: • soil texture • suitability and limitations • drainage • soil depth • compaction Maps geo-referenced and available on computer	Soil survey maps with a scale of at least 1:20 000 used to determine: • soil texture • suitability and limitations • drainage • soil depth • compaction Maps available as paper version and/or digitized and made available on computer	Soil survey maps with a scale less than 1:20 000 to determine soil properties Problem areas identified on field maps	Soil characteristics unknown or not taken into consideration
Soil Testing				
4 Soil sampling frequency	Soil samples taken every 3 years or more frequently when soil fertility suspected to have changed Samples taken at the same time of year	Soil samples taken every 3 years Samples taken at the same point in rotation; before crops with high nutrient requirements and/or crops sensitive to deficiencies or toxicities Samples taken at the same time of year	Soil regularly sampled but less frequently than every 3 years; **or** Samples taken at different points in rotation Samples taken at different times of year	Soil not regularly sampled
5 Soil sampling method	Samples taken with soil probe Composite soil sample consists of *more than 5 cores* per ha (or per 2.5 ac) taken randomly to a depth recommended for the crop to be grown	Samples taken with soil probe or with a shovel from which soil slices are taken Composite soil sample consists of *less than 5 cores/ slices* per ha (or per 2.5 ac) taken at variable depths within tillage layer	Samples taken with a shovel Soil sample consists of one shovel sample per ha (or per 2.5 ac) taken at variable depths	Samples taken with a shovel Soil sample consist of less than one shovel sample per ha (or per 2.5 ac) at the surface

Risk Rating	1 (Low)	2	3	4 (High)
Soil Testing (cont'd)				
6 Soil sampling (field stratification)	Stratified random sampling, that is, separate soil samples to reflect such field variability as: yield, topography, field history, drainage etc.; no more than *3 ha* (7.5 ac) per sample; **or** Grid sampling approach, that is collection of samples based on a regular or systematic plan; one composite soil sample per ha (or per 2.5 ac)	Stratified random sampling, that is, separate soil samples to reflect such field variability as: yield, topography, field history, drainage, etc.; no more than *5 ha* (12 ac) per sample	Samples taken randomly and do not reflect field variability; more than 5 ha (12 ac) per sample	Field not randomly sampled; one sample per field
7 Soil analysis	Soil samples analysed at the same accredited laboratory year after year with methods that reflect soil conditions of the region	Soil samples analysed at same accredited laboratory year after year or at different labs using same methods of analysis that reflect soil conditions of the region	Soil samples often analysed at different laboratory which could have different methods of analysis	Soil not tested; **or**
	Soil tested for pH, buffer pH (soil or lime index), phosphorus, potassium, magnesium, calcium, aluminium, sodium, CEC, organic matter, and micronutrients Soil nitrate or residual nitrogen testing carried out in early spring, where test available	Soil tested for pH, buffer pH (soil or lime index), phosphorus, potassium, magnesium, and calcium	Soil tested for pH, buffer pH (soil or lime index), phosphorus, potassium, magnesium, and calcium	Soil tested for pH only

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Nutrient Application				
8 **Fertilizer application rate**	Nutrient application rate based on nutrient sufficiency approach taking into account: • soil test results and crop requirements • realistic yield goal based on field crop history • residual nutrients from previous crop • nutrients supplied by manure or previous soil amendments • nutrients supplied through mineralization of organic matter • soil type Tissue analysis at specific crop growth stages to monitor results (where available)	Nutrient application rate based on building soil fertility to medium levels and then on nutrient sufficiency approach taking into account: • soil test results and crop requirements • realistic yield goal based on crop history • residual nutrients from previous crop • nutrients supplied by manure and previous soil amendments • soil type Tissue analysis done once in the season to monitor results (where available)	Nutrient application rate based on nutrient build-up and maintenance approach taking into account: • soil test results • maximum yield goal **or** Nutrient application rate based on nutrient balance or base saturation approach	Nutrient application rate based on published general recommendations
9 **Fertilizer application method**	All fertilizer banded at safe rates with the seed; **or** For crops with sensitive seeds, split applications used; one part banded and rest incorporated later or foliar applications Perennial crops fertilized in split applications when crop can most utilize nutrients being applied	Split applications where feasible; one part banded and rest broadcast Perennial crops fertilized once per year when crop can most utilize nutrients	Fertilizer broadcast prior to seeding All fertilizer applied on perennial crops in late summer	Fertilizer broadcast in the fall prior to the seeding year All fertilizer applied on perennial crops in late fall

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Nutrient Application (cont'd)				
10 Calibration of fertilizer applicators	Fertilizer applicators calibrated every year and when fertilizer rate, blend, or source changes Precision of calibration monitored in the field	Fertilizer applicators calibrated every year and when fertilizer rate or blend changes	Fertilizer applicators calibrated once a year to verify equipment chart Fertilizer blend not considered in calibration	Fertilizer application rate based on equipment chart only
Use of Manure				
11 Manure sampling	Manure tested once a year or more based on livestock management changes Samples collected using recommended procedures *More than 15* sub-samples collected and mixed to acquire a representative sample Manure sampled in storage prior to spreading. Liquid manure well agitated before sampling	Manure tested once a year Samples collected using recommended procedures *At least 10* sub-samples collected and mixed to acquire a representative sample Manure sampled in storage during spreading. Liquid manure well agitated before sampling	Manure tested periodically, but not every year Samples taken in a non systematic fashion *Less than 10* sub-samples collected and mixed to acquire sample Manure sampled in spreader	Manure not tested; **or** Not properly sampled
12 Manure analysis	Manure analysed at same accredited laboratory year after year for total nitrogen, ammonium nitrogen, phosphorus, potassium, dry matter, and C:N ratio	Manure analysed at different accredited laboratories using same method of analysis for total nitrogen, ammonium nitrogen, phosphorus, potassium, dry matter, and C:N ratio	Manure analysed at different accredited laboratories using different method of analysis Manure not analysed for C:N ratio or ammonium nitrogen	Manure not analysed or analysed at non accredited laboratories or methods

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Use of Manure (cont'd)				
13 Total amount of nutrients available from manure	Total amount of nutrients available from manure determined by: • measured volume of manure • nutrient value of manure as determined by analysis	Total amount of nutrients available from manure determined by: • estimates from last year's number of loads spread • previous manure analysis	Total amount of nutrients available from manure determined by: • number of animal units • nutrients produced per animal unit • book value of manure	Total nutrients available from manure unknown
14 Excess nutrients from manure	Total amount of nutrients in manure does *not exceed* total crop requirements for the farm on a field by field basis	Total amount of nutrients in manure *exceeds* total crop requirements for the farm on a field by field basis Excess manure is exported to neighbouring farms; **or** Composting done to increase potential use or sale; **or** Other manure treatment system (solid–liquid separation, biogas production) used to reduce nutrient content Livestock rations supplemented to reduce amounts of nitrogen and/or phosphorus in manure	Total amount of nutrients in manure *exceeds* total crop requirements for the farm on a field by field basis Crops with high nutrient removal continuously grown to limit nutrient loading	Manure disposed of on available land base regardless of crop uptake

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Use of Manure (cont'd)				
15 Manure application rate	Application rate of manure based on: • soil test results • two or more years of manure analysis results • realistic yield goal based on field crop history • residual nutrients from previous crop • nutrients supplied by prior manure or other soil amendments • nutrients supplied through mineralization • soil type • risk for water contamination (nitrogen or phosphorus index) • time and method of application Manure supplies 100% of *nitrogen, phosphorus, or potassium* requirement but does not exceed crop uptake for any one of those nutrients	Application rate of manure based on: • soil test results • at least one year of manure analysis results • realistic yield goal based on field crop history • residual nutrients from previous crop • nutrients supplied by prior manure or other soil amendments • soil type • risk for water contamination (nitrogen or phosphorus index) • time and method of application Manure supplies 100% of *nitrogen or phosphorus* requirement but does not exceed crop uptake for any one of the two nutrients	Application rate based on: • soil test results • provincial book value of manure • maximum yield goal Manure supplies 100% of *nitrogen* requirement; rates may exceed crop uptake for phosphorus or potassium	Application rate based on volume of manure to be disposed of Nutrient value of manure not considered

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Field Selection for Manure Spreading				
16 Soil fertility	Only fields with *low to medium* fertility levels selected	Manure spread on *medium to high* fertility soils	Manure spread on field with *extremely high* fertility level	Manure spread on field closest to the barn year after year without consideration for soil fertility
17 Crop nutrient uptake	Manure spread on crops with *highest* nutrient removal	Manure spread on crops with *moderate* nutrient removal	Manure spread on most crops regardless of crop removal	Manure spread on a non cultivated or a bare field
18 Field slope	Manure not spread on fields with slopes *greater than 5%*	Manure not spread on fields with slopes *greater than 9%*	Manure spread on fields with slopes between *9 to 15%*	Manure spread on fields with slopes *greater than 15%*
19 Minimum separation distance	Minimum separation distances or legislated set-backs to wells, watercourses, and neighbours *exceeded* at all times	Minimum separation distances and legislated set-backs to wells, watercourses, and neighbours *respected* at all times	Minimum separation distances or legislated set-backs to wells and watercourses *respected* at all times	Minimum separation distances to wells, watercourses, and neighbours *not respected*
20 Food safety	Manure not spread on crops grown for human consumption; spread on other crops in the rotation	Manure spread at least four months prior to harvesting on crops destined for human consumption	Manure spread one to four months prior to harvesting on crops destined for human consumption	No consideration for food safety
21 Soil conditions when spreading manure	Manure applied when soil dry enough to be cultivated and just prior to seeding or planting	Manure applied in the spring and fall when soil is dry	All manure applied in early fall when soil is dry	Soils often wet, frozen, or covered with snow
	No surface cracks or if surface cracks are present, one tillage pass is carried out prior to liquid manure application	Few shallow surface cracks	Many deep surface cracks	
	Low risk of soil compaction	Low risk of soil compaction	Moderate risk of soil compaction	High risk of soil compaction
	No heavy rainfall forecast for 4 days	No heavy rainfall forecast for 2 days	Heavy rainfall forecast within 24 hours	Spreading during heavy rainfall

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Manure Spreading				
22 **Method of manure application**	All solid manure spread and incorporated within 24 hours All liquid manure spread with low ramp or drop tube and incorporated within 24 hours; **or** Injected	Most solid manure spread and incorporated within 24 hours Most liquid manure spread with low ramp or drop tube and incorporated within 24 hours; **or** Applied at surface within crop canopy	Solid manure spread and not incorporated within 24 hours Liquid manure spread with low splash plate system and not incorporated within 24 hours	Solid manure not incorporated Liquid manure spread with irrigation system or raised splash plate system; not incorporated
23 **Calibration of manure spreading equipment**	Manure spreading equipment calibrated each time the spreading rate changes and each time there is variation in manure consistency Spreading width monitored closely and manure evenly spread	Spreading equipment calibrated once a year Manure rates based on spreader capacity and spreading area Spreading width monitored closely and manure evenly spread	Manure application rates based on spreader chart; not verified with field calibration Manure unevenly spread; overlapping often occurs	Manure application rates unknown
24 **Transportation and handling of manure**	Spreading and handling equipment well maintained All safety precautions to minimize risk of leaks or spills Spill emergency plan in place All spill occurrences reported immediately to appropriate authorities Proper cleanup procedures followed	Spreading and handling equipment well maintained All safety precautions to minimize risk of leaks or spills Spill emergency plan in place Major spill occurrences reported as soon as possible to appropriate authorities Proper cleanup procedures followed	Maintenance carried out when breakdown occurs Leaks often noticed but repaired No spill emergency plan Spill occurrences not reported	Equipment not maintained Manure spreader leaks on roads No spill emergency plan Spill occurrences not reported or cleaned up

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Other Soil Amendments				
25 Lime application	Rate of lime based on soil test and provincial recommendation for crop being grown	Rate of lime based on soil test but applied at a higher rate than recommended for crop being grown	Rate of lime based on soil test but applied at lower rate than recommended for crop being grown	Lime spread without prior soil testing
	Lime spread evenly before tillage and uniformly worked in	Lime spread evenly before tillage and uniformly worked in	Lime spread on soil surface in the fall or during cropping season	Lime spread and completely turned under with a plough
	Lime spread using variable rate application where soil sampled for this purpose			
26 Application of industrial or off-farm waste materials (waste other than compost or manure)	No industrial or off-farm waste materials used	Waste materials seldom used	Waste materials often or continuously used to replace part of crop nutrient requirements	Waste materials used as a main source of nutrients
		Waste materials sampled and analyzed before using	Average waste material analysis used	
		Heavy metal content of waste and soil used in determining waste application rate	Heavy metal content of waste and soil used in determining waste application rate	Heavy metal content of waste or soil unknown
		Material license for use or all permits obtained before using	Material license for use or all permits obtained before using	

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Other Soil Amendments (cont'd)				
27 Compost application	Rate of compost based on: • nutrient analysis of compost • soil test • crop requirement and removal • residual nutrients from prior compost or other soil amendments and previous crop	Rate of compost based on: • nutrient analysis of compost • soil test • crop requirement and removal • residual nutrients from prior compost application and previous crop	Rate of compost based on: • typical nutrient content of compost • soil test	Rate of compost based on maximum equipment capacity
	Compost not only source of nutrients	Compost main source of nutrients	Compost only source of nutrients	Nutrient value of compost not considered
Other Nutrient Management Practices				
28 Catch crops	Catch crops grown regularly	Catch crops grown only following highly fertilized crops	Catch crops rarely grown	Catch crops not grown and not considered as part of the operation
	Residual nutrient value of catch crop taken into consideration when calculating rate of nutrients to be applied	Residual nutrient value of catch crop taken into consideration when calculating rate of nutrients to be applied	Residual nutrient value of catch crop not taken into consideration	
29 Crop rotation	High fertility demanding crops not grown more frequently than once every 4 years	High fertility demanding crops not grown more frequently than once every 3 years	High fertility demanding crops grown half of the time in the rotation	Continuous cropping of high fertility demanding crops
	Crop rotation sequence for each field planned and designed to efficiently use any remaining fertility from the previous crop	Crop rotation sequence for each field planned and designed to efficiently use any remaining fertility from the previous crop	Other crops grown are shallow rooted and do not efficiently use residual fertility	

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Other Nutrient Management Practices (cont'd)				
30 Legume and green manure crops	Deep rooted legumes and/or green manure crops grown regularly to: • reduce amount of nutrients to be applied • reduce nutrients in subsoil • build up soil organic matter	Shallow rooted legumes and/or green manure crops grown regularly to: • reduce amount of nutrients to be applied	Nutrients from legumes and green manure not taken into account	Legumes and green manure crops not seeded on the farm
31 Odour control	Application of manure and other wastes scheduled to avoid nuisance conflicts	Application of manure and other wastes scheduled to best meet crop needs	Application of manure and other wastes scheduled to best meet crop needs	No attempts made to reduce odours during application
	Neighbours always consulted prior to applying manure, and where nuisance complaints anticipated, the following practices are implemented: • manure injected, incorporated immediately, composted, or treated • separation distance increased	Where nuisance complaints anticipated, neighbours are notified/advised prior to applying manure Liquid manure applied with low ramp or drop tube spreader	Where nuisance complaints anticipated, no attempt made to notify/advise neighbours prior to nutrient application Manure spreader not adapted to reduce odours and manure not incorporated	
	Manure applied during cool weather conditions and wind direction considered	Manure applied during cool weather conditions and wind direction considered	Manure applied during cool weather	Manure spread in hot summer days during weekends or holidays

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Other Nutrient Management Practices (cont'd)				
32 Record keeping	The following records are kept for nutrient management purposes: • soil test • manure and amendment analysis • fertilizer purchased • fertilizer and manure application rates • crop yields • seeding and harvesting dates • nutrient removal (analysed) • date and crop growth stage when fertilizer and manure applied • weather and soil condition at application • equipment calibration dates	The following records are kept for nutrient management purposes: • soil test • manure and amendment analysis • fertilizer purchased • fertilizer and manure application rates • crop yields • seeding and harvesting dates • nutrient removal (book value) • date when fertilizer and manure applied	The following records are kept for nutrient management purposes: • soil test • manure analysis • fertilizer purchased • application rates of fertilizer and manure • crop yields • seeding and harvesting dates	No record kept

Pest Management

Every year, millions of dollars are spent on controlling pests such as weeds, insects, and diseases which affect the yield and quality of crops. Since their introduction in the early 1940s, pesticides have contributed significantly to increased crop productivity, quality, and profitability. However, during the same period, many agricultural producers have intensified their production by relying heavily on pesticides. This has led to concerns related to the impact of pesticides on the environment, food safety, and pest resistance.

Management tools are being developed to better manage crop pests and reduce the use of pesticides. Integrated Pest Management (IPM) which was developed in Nova Scotia in the mid 40s is now being practiced around the world on many crops. It involves pest monitoring and using a combination of cultural, mechanical, and biological control measures including pesticides when necessary.

What should you be aware of?

Pesticide contamination of agricultural soils is normally not a problem since the most persistent pesticides have been banned for use in Canada since the mid 1970s. However, soil organisms can negatively be affected by repeated and intense pesticide use. The persistence of pesticides in the soil varies with the chemical properties of the pesticide and the capability of the soil to filter, degrade, and immobilize pesticides. Soil organic matter, soil clay content, pH, CEC, and permeability are all soil properties that play an important role in pesticide adsorption or retention.

If pesticides are managed properly, there is a low risk of contaminating surface and ground waters. Pesticides can find their way to various water sources through runoff, subsurface drain outlets, leaching, drift, atmospheric depositions, and spills. Runoff, leaching and spills are the most important pathways. Although pesticides have been detected in groundwaters of many intensively cropped areas, the levels are usually below established guidelines developed for drinking water. Care must be exercised to avoid any groundwater contamination through spills or during the cleaning of sprayers. Pesticide contamination of surface waters has been occasionally reported after heavy rainfalls shortly after pesticide application.

Drift during application and volatilization are the two main sources of air pollution with pesticides. Once airborne, wind can transport the pesticides through long distances before depositing them on soils and waters. Pesticides have been found in non-agricultural and remote areas where they have never been used before. Reducing pesticide drift and frequency of pesticide use through alternative pest management practices are important means of reducing air contamination with pesticides.

The presence of pesticides in the environment can have adverse ecological effects ranging from fish to wildlife kills as well as having an impact on reproduction. Pesticides may have negative impacts on biodiversity. Their impacts vary with their levels of toxicity and selectivity. Continuous use of the same pesticide may also contribute to the development of pesticide resistance and increasing populations of pest not controlled by the pesticide.

The objective of a sound pest management program is to better schedule the required control measure at the right time to maximize the benefits. On most farms, IPM should reduce the overall cost of pest management while maintaining or increasing yield and quality. The use of multiple pest management tactics optimizes pest control in an economically and environmentally sound manner. These practices should also improve the social and market acceptance of pest control measures.

How do you rate?

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Awareness and Training				
1 **Awareness of IPM**	Principles of IPM understood and followed: • preventative and sanitation measures • scouting for pests and natural enemies • control decision based on economic or action threshold • sound crop management practices • integrates mechanical, biological, and chemical control	Principles of IPM understood and some principles followed: • preventative and sanitation measures • scouting for pests and natural enemies • chemical control based on economic or action threshold	Some knowledge of IPM. Pest management based on: • scouting for pests • chemical control when pest found	No knowledge of IPM Chemical pest control based on crop growth stage or calendar date
2 **Pesticide training**	Everyone handling pesticides or pesticide contaminated materials has taken pesticide safety course Producer and pesticide applicator attend pest management sessions at least once a year *and* read materials to learn more about non-chemical alternatives, new types of pesticides, better application technologies, etc.	Producer and pesticide applicator have taken pesticide safety course Producer and pesticide applicator attend pest management sessions at least once a year *or* read materials to learn more about non-chemical alternatives, new types of pesticides, better application technologies, etc.	Only the pesticide applicator trained in pesticide safety	Producer or employees have not taken pesticide safety course

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Awareness and Training (cont'd)				
3 **Pest identification**	Can identify all insects, weeds, and diseases in the field as well as their natural enemies and hosts	Can identify all insects, weeds, and diseases in the field	Can identify major insects, weeds, and diseases in the field	Can not identify major pests in the field and does not seek assistance in identifying pests
Pest Monitoring				
4 **Crop scouting**	All crops scouted or monitored for insects, diseases, and weeds as well as for natural enemies	All high valued crops scouted for insects, diseases, and weeds	Informal scouting while doing other routine farming operations and spray when pest found	No crop scouting
	Frequency of scouting based on crop growth stage, type and stage of development of pest, and severity of infestation	Crop scouted once a week		Timing of spray based on crop growth stage, calendar date, or when neighbours spraying
	Sampling or monitoring technique varies according to the pest and its stage of development	Sampling or monitoring technique varies according to the pest and its stage of development		
5 **Economic threshold**	Economic threshold level (if available) of most pests known and always used to make pest control decisions	Records kept to develop economic threshold such as: • pest densities • distribution and location • crop yield and quality	Spray when pest populations start to increase	Not aware of the economic threshold levels and sprays as soon as pests are found; **or** Timing of spray based on crop growth stage or calendar date

Risk Rating	1 (Low)	2	3	4 (High)
Preventative Measures				
6 **Seed selection**	Use high quality seeds free of weed seeds, insects, and diseases	Use seeds relatively free of weed seeds, insects, and diseases	Use own seed but only after it went through proper cleaning or grading process to remove most weed seeds, insects, and diseased seeds	Use bin run seed without prior cleaning or grading
7 **Crop waste management**	All culls and other crop wastes properly composted, fed to livestock, or sent for processing (e.g. dehydration)	All culls and other crop wastes buried on the farm in an appropriate, safe, and timely manner	All culls and other crop wastes evenly spread on land and incorporated; **or**	All culls and other crop waste spread on land but not incorporated; **or**
		Necessary permit obtained	Sent to a local landfill site	Dumped on the farm
8 **Pest control in storage**	Storage (e.g. grains, vegetables) kept clean	Storage (e.g. grains, vegetables) kept cleaned	Storage (e.g. grains, vegetables) kept cleaned but not monitored for pests	No preventative pest management in storage
	Storage disinfected once emptied	Storage disinfected when a pest is found	Storage disinfected when pest problem occurs	
	Everyone dips their shoes in a disinfectant before entering storage	Visitors dip their shoes in a disinfectant before entering storage		
9 **Field machinery or equipment**	Field machinery and equipment thoroughly washed with a pressure washer and disinfectant to remove soil and plant debris when moved from field to field	Field machinery and equipment cleaned from soil and plant debris when moved from field to field; only the tires and parts in direct contact with the crop or soil are disinfected	Field machinery and equipment cleaned from soil and plant debris when moved from farm to farm	Field machinery and equipment not regularly cleaned

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Cultural Control				
10 Crop and variety selection	Selected crops well adapted to local soil and climate conditions Only pest resistant varieties selected when available; **or** Pest sensitive varieties grown in a longer rotation	Selected crops well adapted to local soil and climate conditions Available pest resistant varieties not always selected	Selected crops not always adapted to local soil and climate conditions Pest resistant varieties not given priority	Selected crops not suited to local soil or climate conditions No consideration for pest resistant varieties
11 Crop rotation	Practice a minimum 4-year rotation with crops of different families Provide spatial separation between fields to break up pest cycles on the farm No crop is a potential disease or insect host for another crop in the rotation	Practice a minimum 3-year rotation with crops of different families Provide spatial separation between fields to break up pest cycles on the farm	Practice at least a 2-year rotation with crops of different families	Continuous cropping of the same crop or crops of the same family
12 Disease and insect host plants	Alternate host plants for most pests known and removed where found on the farm (e.g. clipping, hand picked)	Field edges clipped regularly to control any potential alternate hosts for pests	Field edges spayed with fungicides, insecticides, or herbicides	Alternate hosts not managed

Risk Rating	1 (Low)	2	3	4 (High)
Physical or Mechanical Control				
13 Insect control	Minor use of insecticides to complement non-chemical techniques to control insect pest such as thermal control, plastic trenches, vacuum, traps, etc. Remove insects by hand when practical	Insecticides used with non-chemical techniques to control insect pest such as thermal control, plastic trenches, vacuum, traps, etc.	Insecticides often required	Completely reliant on insecticides
	Crop residue evenly spread on surface and left throughout the winter	Crop residues and insects sometimes buried deep in the ground through deep tillage when necessary	Crop residues and insects buried deep in the ground or burned	
14 Weed control	Use non-chemical techniques for weed control (e.g. Lely weeders, Reigi weeders); **or** Weeds clipped before they go to seed; **or** Rows intercropped to keep weeds down; **or** Minor weeds rogued	Optimize mechanical weed control by timing appropriately with herbicide applications (e.g. fall application of glyphosate, spring plough only); **or** If mulching required, weed free organic mulch used	Mechanical and herbicide used; **or** If mulching required, only plastic mulch used	Completely reliant on herbicides; **or** Summer fallow
15 Disease control	Diseased plants or parts of plants removed to avoid further spreading Fungicides applied to the surroundings of the infested area to avoid further spreading	Any section of field heavily infested by a disease ploughed down or destroyed Fungicides applied to the surroundings of the infested area to avoid further spreading	Diseased area not harvested or harvested later and stored separate from healthy crop Infested area treated with fungicides until harvest to avoid further spreading	Completely reliant on fungicides; diseased and healthy crops stored together

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Biological Control				
16 **Beneficial organisms or natural pest enemies**	Can identify beneficial organisms on the farm and only uses farming operations that will encourage their growth and survival; **or** Beneficial organisms regularly introduced to control pests	Can identify major beneficial organisms on the farm and tries to use control measures for other pests that will have the least impact on beneficial organisms	Can identify some beneficial organisms, but do not know how to promote them	Beneficial organisms destroyed with other pests
17 **Biological pesticide**	Biological pesticides (e.g. Bt, compost tea) integrated with other cultural, physical, and mechanical control measures	Biological pesticides (e.g. Bt, compost tea) integrated with cultural, physical, and mechanical control measures and with reduced risk chemical pesticides	Biological and chemical pesticides used	Only chemical pesticides used
18 **Green manure crop**	Green manure crops with one of the following characteristics used in the rotation: • fumigation properties • effective in smothering weeds • effective in trapping pests	Green manure crops sometimes used in the rotation to control pest populations	Green manure crops seeded but not necessarily selected for any pest control benefits	Green manure crops not considered in the pest management system

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Chemical Control				
19 Pesticide selection	Pesticide selection based on cost, product toxicity and selectivity, persistence in the environment, efficacy, resistance management, effect on beneficial and other non-target organisms, and impact on human health	Pesticide selection based on cost, efficacy, human health, resistance management, and effect on non-target organisms	Pesticide selection based on cost, efficacy, and human health effects	Pesticides selection based on cost and efficacy only
20 Timing of pesticide application	Decision to spray based on crop scouting results and recommendations, economic threshold, crop condition, pest prediction models, current weather conditions and forecasts	Decision to spray based on crop and pest growth stage, current weather conditions and forecasts	Decision to spray based on presence of pests and current weather conditions	Decisions to spray based on crop growth stage and/or calendar date
21 Sprayer calibration and maintenance	All spray and granular equipment serviced (worn nozzles replaced, leaky hoses and valves repaired) and calibrated (rate, uniformity, drift potential) before the start of each crop season Sprayer thoroughly rinsed and recalibrated between applications of different types of pesticides	All spray and granular equipment serviced (worn nozzles replaced, leaky hoses and valves repaired) and calibrated (rate, uniformity, drift potential) before the start of each crop season Sprayer thoroughly rinsed between applications and recalibrated at least once during growing season	All spray and granular equipment serviced and calibrated (rate) before the start of each growing season	Equipment serviced only after it breaks Spray output based on area covered (e.g. 6 ha (15 ac) per tank)

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Chemical Control (cont'd)				
22 Drift control	Directions on pesticide label *followed* regarding soil, crop, and weather conditions	Directions on pesticide label *followed* regarding soil, crop, and weather conditions	Directions on pesticide label *not followed* regarding soil, crop, and weather conditions	Directions on pesticide label *not followed* regarding soil, crop, and weather conditions
	No spraying if winds greater than 10 km/hr (6 mph); small branches moving in wind	Spraying sometimes carried out in wind speed slightly above 10 km/hr (6 mph); spray nozzle and pressure changed to reduce drift and/or shielded boom sprayer used	Spraying carried out on windy days; wind speed more than 15 km/hr (9 mph)	Spraying carried out on windy days; wind speed more than 20 km/hr (12 mph)
	Spray quality (e.g. drop size) selected based on weather conditions at the time of spraying			
	No visible spray drift	Slight drift visible	Spray drift clearly visible	Spray drift clearly visible
Health and Safety				
23 Protective clothing and equipment	Pesticide label *always* read for safety precautions	Pesticide label *often* read for safety precautions	Pesticide label *sometimes* read for safety precautions	Pesticide label *not* read for safety precautions
	Recommended protective clothing and personal safety equipment worn for mixing, loading, spraying, and clean up	Recommended protective clothing and personal safety equipment worn for mixing, loading, spraying, and clean up	Rubber gloves worn for mixing, loading, and clean up	Protective clothing or personal safety equipment not worn
	All personal safety equipment cleaned after use and properly maintained (e.g. respirator cartridge)	All personal safety equipment cleaned regularly		
	Clean water tank installed on applicator equipment			
	Tractor or self propelled sprayer equipped with air filtered cab	Tractor or self propelled sprayer equipped with a cab with air conditioning; **or** Windows and door kept closed when spraying	Tractor used for spraying equipped with a cab	Tractor used for spraying not equipped with a cab

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Health and Safety (cont'd)				
24 In-field loading and mixing	No pre-mixing of pesticides; use of in-line injection system No pesticides in sprayer water tank Clean water brought to the sprayer using a water tank Sprayer loaded in the field at a site more than 30 m (100 ft) away from surface water source and more than 60 m (200 ft) away from well	Conventional sprayer where pesticides mixed in sprayer water tank Clean water brought to the sprayer using a water tank Sprayer loaded in the field at a site more than 30 m (100 ft) away from surface water source and more than 60 m (200 ft) away from well	Conventional sprayer where pesticides mixed in sprayer water tank Sprayer loaded at water source, but more than 30 m (100 ft) away from surface water source and more than 60 m (200 ft) away from well	Conventional sprayer where pesticides mixed in sprayer water tank Sprayer loaded near water source that is less than 30 m (100 ft) from surface water source or from well
25 Disposal of rinsate (rinse water)	Sprayer rinsate kept at minimum and reused on crops listed on label	Sprayer rinsate applied to crops listed on label	Sprayer rinsate applied on crops not listed on label	Sprayer rinsate dumped at the farm
26 Spill prevention	Constant supervision during loading and mixing in sprayer Anti-backflow device used Transports only what is needed for the field Clean up material available Spills reported immediately	Constant supervision during loading and mixing Transports only what is needed for the day Clean up material available Spills reported immediately	Intermittent supervision during loading; **or** Transports more pesticides than what is needed for the day; **or** Spills reported only if near water source	Loading not supervised; **or** Spills not reported

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Health and Safety (cont'd)				
27 Minimum separation distance for spraying	Minimum separation distances or legislated set-backs to wells, watercourses, and neighbours exceeded at all times Where nuisance complaints are anticipated, neighbours notified prior to pesticide application	Minimum separation distances or legislated set-backs to wells and watercourses respected at all times Where nuisance complaints are anticipated, an attempt made to notify neighbours prior to pesticide application	Minimum separation distances or set-backs to wells and watercourses respected at all times Where nuisance complaints are anticipated, no attempt made to notify neighbours prior to pesticide application	Minimum separation distances to wells, watercourses, and neighbours not respected Where nuisance complaints are anticipated, no attempt made to notify neighbours prior to pesticide application
28 Record keeping	Following records kept: • stage of crop and pest development • mapping of pest distribution and density within field • date and time of day when spraying • weather conditions • control measure used • equipment settings • rates applied	Following records kept: • presence and distribution of pests within field • date and time of day when spraying • weather conditions • type of pesticide • rates applied	Records kept of pesticides used and their rates	No records kept; **or** Pesticides used are known by memory or invoices

Irrigation

Producing quality food depends on the availability of adequate water for crop growth. In general, in Atlantic Canada, annual precipitation is greater than annual evapotranspiration. However, the distribution of rainfall throughout the crop season is uneven and there can be periods of water deficit during which supplemental irrigation may be of benefit for high value cash crops.

Management of supplemental irrigation for crop production and strategies for the sharing and the protection of water resources is becoming an important challenge for the farming community.

What should you be aware of?

Soil organic matter plays an important role in maintaining good soil structure allowing water to infiltrate into the soil profile when it rains while retaining soil moisture between rainfalls. Even when supplemental irrigation is used to compensate for occasional moisture deficit, good soil health can significantly reduce the requirement for irrigation. Supplemental irrigation should not be undertaken solely to compensate for poor soil management.

For irrigation water to be safe for use on crops, it must be free of pesticide residues (particularly herbicides), heavy metals, excessive salts, and pathogens.

Poor irrigation practices can also potentially pose risks to water quality and quantity. Sediments, nutrients, and pesticides can be transported in irrigation runoff to watercourses. Some nutrients and pesticides can also be leached to groundwater sources. Excessive pumping of water from surface and ground water sources can lower stream flow which may reduce fish habitat. During a prolonged period of drought, there may be competition for water use between agriculture and hydro-electric production, municipalities, industries, recreational users, and home owners. It is important to properly select water sources and design the irrigation system to avoid potential conflicts with other users.


Source: PEIDA

Irrigation can improve the nutrient efficiency of crops through optimizing soil moisture content. Also nutrients can be supplied through fertigation. Efficient utilization of nutrients may reduce nitrous oxide emissions which is a greenhouse gas. In some situations, irrigation may reduce wind erosion.

Excessive withdrawals of water from streams or lakes for irrigation can potentially lower the water levels in these watercourses. This has an impact on available aquatic habitat and may change its ecology (e.g. increased stream temperatures). As habitat is reduced, a smaller range of species can be supported.

Supplemental irrigation can increase the profitability of farms. However, the profitability of irrigation depends on the value of the crop, the amount of precipitation during critical growth stages, the cost of the system including water sourcing, as well as its management. For some frost sensitive crops, irrigation may be the only means to secure a good crop year after year.

How do you rate?

Risk Rating	1 *(Low)*	2	3	4 *(High)*
1 Need for irrigation	No irrigation used or required on the farm ⇩ Proceed to the next subsection	Supplemental irrigation only required after 10 days of extended drought because soil has high soil organic matter, high moisture holding capacity, and high water infiltration rate **or** Irrigation needed for frost protection only	Supplemental irrigation required after 5 days of extended drought	Supplemental irrigation required most years because: • low soil organic matter • soil compaction • low water holding capacity and water infiltration
2 Type of water source	Impoundment pond(s) recharged by intermittent stream, spring, and rainfall runoff; **or** Dugout pond(s) recharged by groundwater source or artesian spring; if dugout built over an artesian spring, surface runoff diverted away from dugout to prevent contamination of groundwater	Direct pumping from a large river; **or** Direct pumping from a high capacity well; **or** Bypass pond adjacent to a stream diverting less than 20% of stream water through controlled diversion channel or pipe	Direct pumping from a mid-size stream or a lake	No access to an approved water source

Risk Rating	1 (Low)	2	3	4 (High)
3 **Capacity of water source**	Sufficient water storage to meet irrigation need	Insufficient water storage to meet irrigation need Readily accessible and reliable alternate water source (e.g. watercourse, well) within season to recharge water storage	Insufficient water storage to meet irrigation need Limited capacity within crop season to recharge water storage because of distance, accessibility, or reliability of alternate water source	Insufficient water storage to meet irrigation need No access to alternate water source
4 **Water withdrawal permits**	Permits obtained for surface and ground waters withdrawal Excellent knowledge of permits' requirements and water withdrawal limitations Withdraws less water than allowed under permit	Permits obtained for surface and ground waters withdrawal Limited knowledge of permits' requirements and water withdrawal limitations Withdraws the volume of water allowed under permit	Permits obtained for surface and ground waters withdrawal Limited knowledge of permits' requirements and water withdrawal limitations Withdraws more water than allowed under permit	No permits or permits not renewed
5 **Construction of irrigation pond**	Pond constructed as per engineering design and by an experienced contractor following on-site soil suitability testing Pond properly sealed; no noticeable seepage or leaks Permanent grass cover at least 10 m (33 ft) around perimeter of pond	Pond constructed as per engineering design and by an experienced contractor using soil suitability information Pond properly sealed; no noticeable seepage or leaks Permanent grass cover at least 5 m (16 ft) around perimeter of pond	Pond constructed as per an experienced contractor without an engineering design Pond not properly sealed; evidence of seepage Permanent grass cover at least 3 m (10 ft) around perimeter of pond	Pond constructed by an inexperienced contractor without an engineering design Pond not properly sealed; evidence of seepage and leaks No grass cover around perimeter of pond

Risk Rating	1 (Low)	2	3	4 (High)
6 **Pond safety**	Pond fenced and deep water warning signs posted	Pond fenced but no deep water warning signs	Deep water warning signs posted but pond not fenced	Pond not fenced and no deep water warning signs
7 **Pond inlet**	Runoff water goes through a well vegetated, mowed, and maintained waterway, ditch, or buffer strip before entering pond	Runoff water goes through a well vegetated waterway, ditch, or buffer strip before entering pond; not mowed regularly	Non maintained ditch leads to pond	Eroded ditch leads to pond
8 **Pond outlet**	Safe spillway; capacity to handle excessive runoff (25-year storm)	Safe spillway; capacity to handle runoff from a 10-year storm event	Safe spillway with limited capacity (5-year storm)	No spillway
9 **Water quality**	Water quality tested annually within 2 weeks before irrigating Meets higher standards than the Canadian Water Quality Guidelines for irrigation water with respect to: coliforms, salinity, and heavy metals Water always clear; no suspended sediments	Water quality tested annually within 2 weeks before irrigating Meets the Canadian Water Quality Guidelines for irrigation water with respect to: coliforms, salinity, and heavy metals Suspended sediments after heavy rainfall	Water quality not tested annually; **or** Irrigation water contains either coliforms, high salinity, or heavy metals Suspended sediments often present	Water not tested
10 **Water use efficiency of irrigation system**	Micro-irrigation system applies water to plant root system or at the base of each plant (e.g. drip or trickle irrigation); **or** Sub-irrigation or controlled drainage system	Centre pivot or lineal move system with drop tubes and low pressure sprinklers; **or** Low-level sprinkler system; **or** Low pressure travelling boom system	Centre pivot or lineal move system with high pressure sprinklers; **or** High or mid-level sprinkler system	High volume fixed gun system; **or** High volume travelling gun system

Risk Rating	1 (Low)	2	3	4 (High)
11 Design and maintenance of irrigation system	System properly designed	System properly designed	System not properly designed *or* not sized for operation	System not properly designed *and* not sized for operation
	Daily check for leaks	Weekly check for leaks	Monthly check for leaks	No maintenance; leaks are common and not fixed
	Sprinkler nozzles checked yearly	Sprinkler nozzles checked every 2 years	Sprinkler nozzles replaced only upon failure	Sprinkler nozzles not checked or replaced
12 Scheduling of irrigation	Scheduling and amount of water applied based on: • crop water requirement at specific growth stage • soil texture • soil moisture measurement using an instrument • rainfall received and forecast	Scheduling and amount of water applied based on: • crop water requirement at specific growth stage • soil texture • soil moisture measurement using an instrument • rainfall received and forecast	Scheduling and amount of water applied based on: • crop water stress symptoms • soil moisture measurement by feel method • rainfall received • weather forecast	Scheduling and amount of water applied based on: • crop wilting symptoms • no soil moisture measurement • number of days without rain
	Measurement of: • soil water holding capacity • water infiltration rate • evapotranspiration • soil water balance	Charts used to estimate: • soil water holding capacity • water infiltration rate • evapotranspiration • soil water balance		
	Computers and weather network used to continuously adjust irrigation schedule	Worksheet used for scheduling		
	No runoff and no ponding following irrigation	No runoff, but some ponding following irrigation	Minor runoff and significant ponding following irrigation	Significant runoff and ponding following irrigation

Risk Rating	1 *(Low)*	2	3	4 *(High)*
13 Timing for surface irrigation	Irrigation throughout the night, early morning, or on cloudy days No wind or wind speed less than 5 km/hr (3 mph)	Irrigation throughout the night, early morning, or on cloudy days Wind speed less than 10 km/hr (6 mph)	Irrigation during cool sunny days; **or** Wind speed between 10 and 20 km/hr (6 and 12 mph)	Irrigation during hottest part of the day; **or** Wind speed exceeds 20 km/hr (12 mph)
14 Impacts of water use on other water users	Quantity and quality of water are not changed as a result of irrigation	Quantity and/or quality of water is slightly changed but does not have an impact on downstream water users, including natural systems	Quantity and/or quality of water is slightly changed and has a negative impact on other water users, including natural systems	Quantity and/or quality of water is greatly changed and has a negative impact on other water users, including natural systems

Field Windbreaks

Properly designed and managed field windbreaks are effective in controlling wind erosion, distributing snow uniformly, improving water use efficiency, and reducing wind damage to crops. As a result, crop yield and quality improve. The effectiveness of field windbreaks is dependent upon their height, density, length, spacing, and orientation. The ideal field windbreak system consists of a series of multi-row windbreaks perpendicular to prevailing winds. The distance between the windbreaks should not exceed 15 times the expected tree height and the density should be maintained at approximately 50%. Trees and shrubs selected for field windbreaks should be adapted to the climate and resistant to diseases, insects, rodents, and to potential pesticide drift. If windbreaks are located near salt water shorelines or roads, salt tolerant species should be selected.

What should you be aware of?

Windbreaks can be used as a sole wind erosion control measure; however, their effectiveness can be greatly improved when combined with other measures such as residue management, crop rotation, strip cropping, and conservation tillage. A lower density windbreak can be used to distribute snow uniformly over a distance as much as 25 times the height of the trees. This provides winter cover to perennial crops and reduces the risk of soil erosion during snow melt. Windbreaks benefit the soil in a strip cropping system by reducing runoff and providing permanent markers to guide producers in maintaining the orientation of their strips. A field windbreak system should be designed in a way that complements water management systems where soil erosion by water is a concern.

The positive impact that windbreaks have on water conservation outweighs any competition that may occur between windbreaks and adjacent crops for soil moisture. Better snow distribution reduces runoff and retains more water for crops. By reducing wind velocity, field windbreaks reduce evapotranspiration, thus conserving soil moisture. Windbreaks can filter surface and ground waters and the filtration effectiveness will vary with the species and their root system, windbreak width, and volume of water flowing through the windbreak.

Established windbreaks improve the off-farm environment by reducing pesticide drift and by acting as odour, dust, and sound barriers. A well designed windbreak can reduce dust and noise by 30%. Windbreaks can play an important role for reducing greenhouse gases on the farm by sequestering carbon and by improving productivity.

In many intensively farmed areas, windbreaks may be the only meaningful habitat for wildlife. Windbreaks provide shelter, food, travel corridors, reproductive, and nesting sites for wildlife. The diversity of wildlife in the windbreak is dependent on the width and diversity of the shelter and the integration or connection of the windbreak with other wildlife habitats (e.g. forests, woodlots or old fields).

Fields protected by windbreaks have higher yields due to improved soil water use efficiencies, reduced physical damage, improved pollination, and increased crop heat units. Perennial crops will have less winter kill because of evenly distributed snow cover. Wood, nuts, and fruit harvested from windbreaks can be an important source of income for producers. Windbreaks are also beneficial to the landscape contributing to the aesthetic beauty of the countryside thus increasing the value of the farmstead and the farmland.

How do you rate?

Risk Rating	1 *(Low)*	2	3	4 *(High)*
1 **Presence of field windbreaks**	Windbreaks spaced at 10 to 15 times their height at maturity	Windbreaks spaced at 15 to 20 times their height at maturity	Windbreaks spaced at a distance greater than 20 times their height at maturity	No windbreaks ⇩ Complete the Action Plan for this question and proceed to the next subsection
2 **Orientation**	Windbreaks oriented at a right angle (90°) to the most troublesome prevailing wind; **or** Windbreaks on all sides of the field; **or** On field where soil erosion by water is a concern, windbreaks are integrated into a soil conservation system (e.g. installed across the slope or following field contour)	Windbreaks oriented between 45° and 90° angle to the most troublesome prevailing wind; density adjusted accordingly	Windbreaks oriented between 45° and 90° angle to the most troublesome prevailing wind; density *not* adjusted	Windbreaks not oriented or positioned to provide any wind protection

Risk Rating	1 (Low)	2	3	4 (High)
3 Density and uniformity	Density is 40 to 60% and uniform across length and height of windbreaks	Overall density is 40 to 60% but not uniform across length and height of windbreaks	Windbreaks too thick	Density varies considerably across length and height of windbreaks or too thin
	Shrubs provide a uniform density at the bottom of windbreaks	Snow distribution not uniform and accumulation occurs in areas near windbreaks	Snow accumulation near windbreaks	
	No gaps on the entire length of windbreaks except where frost pockets are a problem	No gaps on the entire length of windbreaks except where frost pockets are a problem	No gaps in windbreaks but they do not cover the full area needing protection	Windbreaks broken up with too many gaps
4 Wildlife protection and biodiversity	Windbreaks consist of at least 3 rows of trees and shrubs of deciduous and coniferous species of various ages and structure	Windbreaks consist of at least 2 rows of trees and shrubs of deciduous and coniferous species	Windbreaks consist of 1 row of trees and shrubs of mixed species	Windbreaks consist of one row of one species
	Windbreaks interconnected to each other or to other wildlife habitats (e.g. woodlots and wetlands)	Windbreaks not interconnected to each other or to other wildlife habitats (e.g. woodlots and wetlands) but still allow safe passage	Windbreaks not interconnected to each other and do not allow safe passage	
	Groundcover at the bottom of windbreaks and between windbreaks and field			

Peatlands, Dykelands & Floodplains

Wetlands play an important role in water filtration, flood control, groundwater recharge, and in wildlife habitat. Since European settlement, many wetlands in Atlantic Canada have been converted from their natural states to agricultural purposes. Some of the types of wetlands converted to cultivation in Atlantic Canada include peatlands, dykelands, and floodplains.

Peatlands are comprised of about 93 to 97% organic matter. They are formed by the accumulation of organic matter in poorly drained areas over thousands of years. Peatlands differ from other wetlands as they only receive water from precipitation. They have a limited life span when developed because the rate of peat formation is much lower than the rate of loss.

Dykelands are tidal salt water marshes that have been drained by dykes, ditches, aboiteaux, and land forming. These lands are also very rich in nutrients and were first drained in the Maritimes by Acadians.

Floodplains are low-lying areas adjacent to watercourses that are subject to flooding and naturally dissipate flood water. As the land floods, water deposits fine soil particles, enriching the soil with nutrients.

What should you be aware of?

Natural wetlands can retain a great deal of water helping to protect adjacent areas from flooding. However, when developed for agriculture, they can be very productive when carefully managed. Development of such land may require planning and environmental approvals.

Peatlands decompose rapidly when exposed to the air, as such they are a non-renewable resource. The rate of decomposition is in proportion to the intensity of tillage, so careful management will extend their productive life. Peatlands can be very productive under good drainage and fertility management.

Floodplains and dykelands are often very rich in nutrients. They are prone to compaction and erosion because of their proximity to water.

Historically, much of Atlantic Canada's coastal wetlands have been converted to dykelands. While some of this land has been restored to tidal marshes or freshwater wetlands, much of this land will remain in agricultural production. Draining these lands is a concern to water quality because there is potential for soil particles and other contaminants to be transported into the drainage system and find their way to nearby watercourses. When left undisturbed, wetlands are important for water filtration and improving water quality.

In some cases, natural wetlands can be a source of methane emissions. However, wetland cultivation can accelerate organic matter decomposition and thus, release carbon dioxide emissions. It is unclear at this time if wetlands are a net sink or a net source of greenhouse gases.

In their natural state, peatlands, marshlands, and floodplains can be a valuable wildlife habitat for many threatened species. Completely draining the land results in habitat loss; however, it is possible to manage this land in a way to enhance biodiversity.

When properly managed, peatlands and dykelands can grow a variety of crops of high quality and yield. However, developing these lands for agriculture can prove to be a costly endeavour. It is also expensive to maintain and manage the drainage structures. These lands may require different types of equipment or modifications to current equipment.

How do you rate?

Risk Rating	1 *(Low)*	2	3	4 *(High)*

Peatlands

Peatland Development

1	**Presence and use of peatlands**	No peatlands on the farm; **or** Peatlands left in their natural state ⇩ Proceed to question 17	Peatlands not intensively cropped (e.g. row crop production once every 3 years or less)	Continuous row crop production	Peat extraction as a source of income
2	**Peatland selection for development**	Fibric peat material (peat at early stage of decomposition)	Mesic peat material (peat at intermediate stage of decomposition)	Humic peat material (peat at advanced stage of decomposition)	Humic peat material (peat at advanced stage of decomposition)
		Peat deeper than 2 m (6.5 ft)	Peat deeper than 1.6 m (5 ft)	Peat deeper than 1 m (3 ft)	Peat less than 1 m (3 ft) deep
		Wood content less than 5%	Wood content less than 10%	Wood content less than 20%	Wood content greater than 20%
		Underlying material is sand	Underlying material is silt or loam	Underlying material is clay	Underlying material is bedrock
		Peatlands with pools (flashets) not developed	Peatlands with pools (flashets) not developed	Pealtands with few small pools (flashets) developed	Peatlands with many large pools (flashets) developed

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Peatland Development (cont'd)				
3 **Peatland development**	Permits obtained before draining peatland	Permits obtained before draining peatland	Permits obtained before draining peatland	No permits obtained before draining peatland
	Long term peatland development plan implemented according to an engineered design	Long term peatland development plan implemented according to an engineered design		
	Gradual development of best suited portion for agricultural production developed	Only portion of peatland best suited for agricultural production developed	Only peatlands well suited for agricultural production developed	Peatlands developed without consideration of suitability for agricultural production
	Low-lying areas not developed	Some low-lying areas developed	Low-lying areas developed	Low-lying areas developed
Peatland Drainage				
4 **Perimeter ditches**	Approximately 1.5 m (5 ft) deep	Between 1.25 to 1.5 m (4 to 5 ft) deep	Between 1 to 1.25 m (3 to 4 ft) deep	Less than 1 m deep or more than 1.5 m (5 ft) deep
	Well vegetated buffer zone of 5 m (16 ft) along ditch	Well vegetated buffer zone of 3 m (10 ft) along ditch	Well vegetated buffer zone less than 3 m (10 ft) along ditch	No buffer zone between ditch and cropped area
5 **Drainage outlet**	Water directed to settling ponds and then to a low-lying peatland buffer before entering a watercourse	Water discharged in a riparian buffer zone before entering a watercourse		Water discharged directly into a watercourse
6 **Perimeter and lateral ditch inspection**	Ditches and outlets inspected every spring and fall and cleaned regularly	Ditches and outlets inspected once a year and cleaned regularly	Ditches and outlets inspected and only cleaned when blockages occur	Ditches and outlets not inspected or cleaned

Risk Rating	1 (Low)	2	3	4 (High)
Peatland Drainage (cont'd)				
7 Lateral ditch shape	V-shaped and well maintained	Straight wall and well maintained	V-shaped and not well maintained	Straight wall and not well maintained
8 Drainage between laterals	Mole drains between lateral ditches for secondary drainage Landforming between lateral ditches	Tile drains between lateral ditches Landforming between lateral ditches	No subsurface drainage between lateral ditches Landforming between lateral ditches	No subsurface drainage between lateral ditches No landforming between lateral ditches
9 Lateral ditch distance	Less than 15 m (50 ft) between lateral ditches			More than 15 m (50 ft) between lateral ditches
10 Lateral ditch depth	Approximately 1 m (3 ft) deep Ditch flow velocity control by weirs, flumes, etc.	Approximately 1 m (3 ft) deep No ditch flow velocity control	Approximately 0.75 m (2.5 ft) deep No ditch flow velocity control	Approximately 0.5 m (1.5 ft) deep No ditch flow velocity control
11 Lateral ditch buffer	Vegetated buffer zone of 2 m (6.5 ft) or more along ditch	Vegetated buffer zone of 1 to 2 m (3 to 6.5 ft) along ditch	Non vegetated buffer zone between ditch and field	No buffer zone between ditch and field
Peatland Management				
12 Tillage frequency	1 pass with tillage equipment	2 passes with tillage equipment	3 passes with tillage equipment	More than 3 passes with tillage equipment
13 Inter-row cultivation	Row crops grown in raised beds Intercropping between beds	Row crops grown in flat beds Intercropping between beds	Row crops grown in raised beds Cultivation between beds	Crops grown in flat beds Cultivation between beds

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Peatland Management (cont'd)				
14 Field equipment	All equipment adapted to peatlands (e.g. light equipment with flotation tires, dual wheels, tracks, or half tracks)	Only light equipment used	Heavy equipment adapted to peatlands (e.g. flotation tires, dual wheels, tracks, or half tracks)	Heavy equipment not adapted to peatlands
15 Nutrient management	Annual testing for pH, micro- and macro-nutrients	Annual testing for pH and macronutrients	Testing every 2-3 years for pH, micro- and macro-nutrients	Excessive nutrients applied pH not adjusted
	Nutrients applied according to a nutrient management plan	Macronutrients applied according to a nutrient management plan	No nutrient management plan; nutrients applied according to published fertility recommendation	No nutrient management plan
	Manure applied only as compost	Solid manure occasionally applied	Solid manure regularly applied	Liquid manure regularly applied
	Catch crop established in the fall			
16 Pesticide use	Practicing Integrated Pest Management (IPM)	Practicing Integrated Pest Management (IPM)		
	No pesticide use	Pesticides used only when strictly necessary	Pesticides used when pests are noticed	Prescheduled pesticide application based on growth or calendar date
		Spot spraying (with boom or hand held applicator)		
		No pesticide drift	Some pesticide drift but none reaches ditches	Pesticide drifting in ditches when spraying

Risk Rating	1 (Low)	2	3	4 (High)

Dykelands

Use of Dykelands

17 Presence and use	No dykelands on the farm ⇩ Proceed to question 26	Dykelands used for rotational grazing; **or** Dykelands used for cereal and perennial forage production	Dykelands used for continuous grazing; **or** Dykelands used for continuous annual non row crop production; **or** Row crop produced once every 3 years	Dykelands used for intensive row crop production; **or** Dykelands continuously grazed with high stocking rate

Dykeland Drainage

18 Dyke inspection	Spring and fall inspection of dyke, aboiteau, culvert, and inner dyke ditch Deterioration and problems reported to provincial authorities	Annual inspection of dyke, aboiteau, culvert, and inner dyke ditch Deterioration and problems reported to provincial authorities	Annual inspection of dyke, aboiteau, culvert, and inner dyke ditch Deterioration and problems not reported to provincial authorities	No inspection of dyke, aboiteau, culvert, and inner dyke ditch
19 Ditch maintenance	Ditches have uniform bottom and are of the proper grade Ditches well vegetated, maintained, and mowed annually	Ditches have uniform bottom and are of the proper grade Ditches well vegetated and mowed annually	Ditches have uniform bottom but insufficient grade Ditches are not vegetated	Ditches do not have uniform bottom Ditches are not vegetated
20 Ditch buffer	3 m (10 ft) vegetated buffer between ditch and field	2 m (6.5 ft) vegetated buffer between ditch and field	1 m (3 ft) vegetated buffer between ditch and field	No buffer between ditch and field
21 Land forming	Land properly formed with uniform dales that drain efficiently in clean ditches	Land properly formed with uniform dales that drain into ditches not properly cleaned	Dales fairly uniform with some depressions that trap water	Dales not uniform and do not allow proper water evacuation into ditches

Risk Rating	1 (Low)	2	3	4 (High)
Dykeland Management				
22 Tillage	Permanent forage	No-till or conservation tillage (40% crop residues left on the surface)	Reduced tillage (between 10 to 40% residues left on the surface)	Conventional tillage (less than 10% residues on the surface)
23 Nutrient management	Nutrients applied according to a nutrient management plan	Nutrients applied according to a nutrient management plan	Nutrients applied according to published fertility recommendation	No nutrient management plan
	Manure applied only as compost	Manure injected or immediately incorporated once applied	Manure applied on surface when it can be best utilized by growing crop	Manure applied in the fall
24 Pest management	No pesticide use	Practicing Integrated Pest Management (IPM)		
		Pesticides used only when strictly necessary	Pesticides used when pests are noticed	Prescheduled pesticide application based on growth or calendar date
		Spot spraying (with boom or hand held applicator)		
		No pesticide drift	Some pesticide drift but none reaches ditches	Pesticide drifting in ditches when spraying
25 Livestock access to ditches	No access to any ditches	Access to lateral (dale) ditches	Access to connection and lateral (dale) ditches	Access to all ditches

Risk Rating	1 *(Low)*	2	3	4 *(High)*

Floodplains

Use of Floodplains

26 Presence and use	No floodplains; **or** Floodplains remain in or restored to their natural state ⇩ Proceed to the next subsection	Floodplains used for forage production	Floodplains used as pasture or for annual non row crop production	Floodplains used for row crop production

Floodplain Management

27 Tillage	Floodplains never reseeded; **or** No-till seeding	Conservation tillage when dry and no risk of flooding	Conventional tillage when dry and no risk of flooding	Fall tillage
28 Nutrient management	Nutrient management plan in place Fertilizer applied only when crop can best utilize it No organic fertilizer applied unless composted	Nutrient management plan in place Fertilizer and manure applied only when crop can best utilize it	Organic and inorganic fertilizers applied in spring when water has retreated	Organic and inorganic fertilizers applied in the fall

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Floodplain Management (cont'd)				
29 Pest management	No pesticide use	Practicing Integrated Pest Management (IPM)		
		Pesticides used only when strictly necessary	Pesticides used when pests are noticed	Prescheduled pesticide application based on growth or calendar date
		No pesticide drift	Some pesticide drift but none reaches watercourse	Pesticide drifting to watercourse when spraying

Ecological Resources

Riparian Buffer Zone

A riparian buffer zone is a strip of permanent vegetation located between a watercourse and any potential source of contamination. The health of riparian buffers can easily be determined by evaluating the conditions of the watercourse and by assessing surface water quality.

Ideally, a riparian buffer consists of three zones each of which have distinct functions. The zone at the edge of the watercourse is designed to protect the streambank from erosion and is primarily composed of densely rooted moisture-loving trees and shrubs. The zone along the fields or other potential sources of contamination should be composed of dense perennial grasses which filter sediments and other contaminants in the runoff water. The intermediate zone is composed of larger and deeper rooted trees and shrubs which filter the remaining surface and shallow ground waters.

What should you be aware of?

Fields along watercourses can easily be chewed away by streambank erosion or flooded if riparian buffer zones are not properly maintained. Streambank erosion normally occurs during heavy flows such as spring thaw and after severe storms. Streambanks can be eroded by the action of stream flow and/or by uncontrolled runoff water flowing over the banks. The most effective means of stabilizing streambanks is by controlling runoff.

Riparian buffer zones are effective in filtering surface and shallow ground waters and are designed to complement sound land management practices. The filtration of surface runoff begins with the grassed zone which slows runoff, enhances water infiltration, and physically intercepts most of the sediments and the attached contaminants. The intermediate zone also filters shallow groundwater as well as runoff water that has not been filtered by the grassed strip. A well managed riparian buffer therefore helps prevent nutrients, pesticides, and other contaminants from reaching the watercourse and groundwater, thus maintaining high quality water.

Since riparian buffer zones are permanently vegetated areas, they can be important for carbon sequestration. As plants in the riparian buffer zone remove excess nitrogen, nitrous oxide emissions may be reduced. Also, any potential pesticide drift reaching the watercourse can be reduced by the presence of a healthy riparian buffer zone.

A healthy riparian ecosystem includes a diversity of vegetation and wildlife (e.g. fish, insects, birds, mammals), because it is a transition between aquatic and terrestrial habitats. Riparian buffer zones improve habitat for aquatic life by preventing sediments from entering the watercourse and by providing shade from trees, which decreases water temperature and increases oxygen levels in the water. Also, buffer zones harbour beneficial insects and birds which help keep pests under control. Mammals use the riparian zone for shelter, food, and as travel corridors to move between different habitats.

Well maintained riparian buffer zones can reduce flooding by slowing flood velocity and storing water for future use. This can help protect buildings/structures near the watercourse. Also, the presence of a healthy riparian zone increases farmland value, can give access to many leisure activities such as fishing and hunting, and can be an additional source of income (e.g. wood harvesting and trapping).

How do you rate?

Risk Rating	1 (Low)	2	3	4 (High)
1 Width of riparian buffers along watercourses	More than 30 m (100 ft) along all natural watercourses (streams, rivers, ponds, lakes, and wetlands) consisting of: • More than 5 m (17 ft) of grass strip between field and forested zone • More than 20 m (66 ft) of managed forested zone • More than 5 m (17 ft) of undisturbed forested zone along edge of watercourse	Between 15 to 30 m (50 to 100 ft) of maintained natural vegetation consisting of: • Between 3 to 5 m (10 to 17 ft) of grass strip between field and forested zone • Between 5 to 20 m (17 to 66 ft) of managed forested zone • More than 5 m (17 ft) of undisturbed forested zone along edge of watercourse	Between 5 to 15 m (17 to 50 ft) of vegetated buffer between field and edge of watercourse; **or** Buffer width meets legislation	Less than 5 m (17 ft) of vegetated buffer between field and watercourse
2 Buffer strips for drainage and road ditches	More than 5 m (17 ft) of grass strip between field and ditch (high water mark)	Between 3 to 5 m (10 to 17 ft) of grass strip	Between 1 to 3 m (3 to 10 ft) of grass strip	No vegetated buffer strip between field and ditch
3 Watercourse crossings	Well designed, constructed, and maintained bridges Road approaches prevent water from draining directly into the watercourse	Well designed and constructed culverts Road approaches prevent water from draining directly into the watercourse	Temporary bridge or culvert Road approaches allow the direct entry of water into the watercourse	Cross directly through watercourse

Risk Rating	1 (Low)	2	3	4 (High)
4 Vegetation	Streambank vegetated with deep binding root mass, moisture-loving trees, shrubs, and grasses; no maintenance required Intermediate forested zone composed of deep rooted trees, shrubs, and grasses; regular maintenance and harvesting allow various age groups Grass buffer strip composed of dense perennial grasses; mowing and/or controlled grazing in dry conditions	Streambank and forested zones composed of unmanaged stand of trees and shrubs Grass buffer strip composed of perennial grasses and forbs	Buffer zones consist mainly of grasses and forbs and few trees and shrubs or over mature and fallen trees Presence of invasive weeds throughout the buffer zone No signs of establishing seedlings	No trees or shrubs present in buffer zone Mainly invasive weeds
5 Habitats (fish and wildlife)	Trees and shrubs provide 50 to 70% shade to the stream Wide variety of plant species that provide shelter and food to wildlife	Trees and shrubs provide 25 to 50% shade to the stream Wide variety of plant species that provide shelter and food to wildlife	Trees and shrubs provide less than 25% shade to the stream Few trees and area offers little protection or food to wildlife	No trees or shrubs to provide shade to the stream Few plant species and area offers no protection or food to wildlife
6 Condition of watercourse	No signs of streambank erosion No evidence of sedimentation of watercourse Stream channel narrow and deep Flooding does not occur	Minor evidence of streambank erosion Sedimentation of watercourse in some locations where water flow is less rapid Stream channel enlarging in some locations Flooding rarely occurs	Severe erosion along some areas of streambanks Sedimentation of watercourse in many locations Stream channel enlarging and flat in many areas Flooding occurs most springs	Severe erosion throughout streambanks Sedimentation of watercourse Stream channel wide and flat Flooding occurs regularly

Wetlands

Natural wetlands (marshes, shallow water, fens, bogs, and swamps) can be generally described as any area of land that is regularly covered or saturated with water. They can be found on many farms and can range from thousands of hectares to less than one hectare in size. Some wetlands have permanent open water ponds while others are entirely vegetated and may only be saturated with water for a few weeks annually. Wetlands play an important role in water purification and storage, shoreline protection, and flood control.

Constructed wetlands are manmade, shallow aquatic systems designed to capture and filter effluents from feedlots and manure storages, milkhouse wastewater, and agricultural runoff. These constructed wetlands are designed to filter water by the same processes found in a natural wetland. Constructed wetlands can effectively filter bacteria, nutrients, and sediments thus reducing the threat to surface or ground water.

What should you be aware of?

Wetlands act like a sponge and have the ability to absorb and store excess water which prevent flooding. Protecting agricultural land from floods will reduce nitrate loss, soil compaction, runoff, and soil erosion.

Wetlands play a critical role in protecting the quality of surface and ground waters by filtering water flowing from agricultural fields or other sources of contamination. This water may contain sediments, nutrients, bacteria, or other compounds that can potentially contaminate water. The natural ecological processes of a wetland help to remove these contaminants resulting in improved water quality. Wetlands are also important reservoirs for the recharge of surface and ground waters. Many communities depend on wetlands for continued access to high quality drinking water.

Wetlands are known to produce methane. However, the vegetation in these ecosystems can potentially reduce greenhouse gas emissions through carbon sequestration and nitrate assimilation. Climatologists are predicting that extreme weather events such as hurricanes will occur more often in the future which means that we will be more dependent upon wetlands for flood prevention.

Wetlands provide some of the most productive and diverse habitat for wildlife. By maintaining quality wetlands, farmers contribute to diverse ecosystems and support up to 600 species of plants and animals. Some common wetland vegetative species include cattails, sphagnum, and larch. Wetlands also shelter a wide variety of insects, crustaceans, molluscs, fish, reptiles, amphibians, birds, and mammals. Many species can not exist without wetlands. In fact, several species at risk take refuge in wetlands. All species in wetlands are closely interlinked and if one species disappears, the whole food web can be altered.

Constructed wetlands designed for wastewater treatment can be an inexpensive way to filter contaminated water. Wetlands can be used as a water recharge system for irrigation or livestock watering ponds thereby eliminating the cost of drilling wells. Wetlands reduce the negative impacts caused by flooding (e.g. damage to farm structures and cropland and delayed planting times). On some farms, wetlands can provide a diversified source of income such as wood harvesting, fur trapping, or hunters paying for access to wetlands. Wetlands can add to the aesthetic value of the farm and provide good places for bird watching or fishing.

How do you rate?

Risk Rating	1 (Low)	2	3	4 (High)
Natural Wetlands				
1 **Presence of natural wetlands**	Surveyed farm property to locate and map all wetlands ⇩ If no evidence of past or present wetlands, proceed to the Woodlot subsection	Used GIS maps where available or aerial photos to locate and map all wetlands on the farm	Some knowledge of where wetlands are located; wetlands not mapped	No knowledge of the presence of wetlands on the farm
2 **Wetland restoration/ alteration**	No wetlands have been in-filled or drained	Altered wetlands identified and restored according to a plan prepared by a specialist	Some wetlands have been in-filled or drained; remaining being conserved No intention of restoring altered wetlands	Wetlands being in-filled or drained
3 **Wood harvesting in/ near wetlands**	Trees harvested according to a forest management plan Extracted only during frozen conditions Necessary permits obtained	Trees harvested according to a forest management plan Sometimes extracted when soil is thawed Necessary permits obtained	Trees harvested according to a forest management plan Extracted when soil is thawed	Trees harvested without a forest management plan Extracted when soil is thawed
4 **Discharge into natural wetlands**	No direct discharge of contaminated water from ditches, barnyards, feedlots, etc. into natural wetlands	Runoff and drainage waters filtered before entering wetlands	Some runoff and subsurface drainage entering wetland during a heavy rainfall	Direct discharge into wetlands

Risk Rating	1 (Low)	2	3	4 (High)
Natural and Constructed Wetlands				
5 Farming activities near wetlands	No activities within 30 m (100 ft) of wetland except forage harvesting or controlled grazing outside the first 5 m (15 ft)	No activities within 15 m (50 ft) of wetland except forage harvesting or controlled grazing outside the first 5 m (15 ft)	No activities except forage harvesting within 5 m (15 ft) of wetland	Activities within 5 m (15 ft) of wetland
6 Water extraction	No water extracted	Water extracted through a by-pass pond Permit obtained and requirements respected	Water extracted directly from natural wetland Permit obtained and requirements respected	Water extracted directly from natural wetland No permit obtained
Constructed Wetlands for Wastewater Treatment				
7 Wetland construction	Wetland constructed according to approved engineering design All permits obtained	_____	_____	Wetland constructed without any approved designs or permits
8 Farm safety	Fence surrounds constructed wetland and warning signs posted	Fence surrounds constructed wetland	Warning signs posted	No warning signs nor fence in place
9 Wetland inspection	Dams and berms inspected during spring and fall Adequate water levels maintained at all times	Dams and berms inspected annually Adequate water levels maintained at all times	Dams and berms inspected annually Water levels sometimes too low or too high	No inspection or monitoring of wetland

Risk Rating	1 (Low)	2	3	4 (High)
Constructed Wetlands for Wastewater Treatment (cont'd)				
10 Type of wastewater treated	Constructed wetland used to treat tertiary wastewater (treated through two different systems before entering wetland)	Constructed wetland used to treat secondary wastewater (treated through one system before entering wetland)	Very little treatment before wastewater enters constructed wetland	Wastewater directly discharged into a constructed wetland
11 Outflow of water from constructed wetland	Outflow diffused through a well vegetated riparian buffer zone of at least 30 m (100 ft) before entering a watercourse or natural wetland	Outflow diffused through a well vegetated riparian buffer zone of at least 20 m (65 ft) before entering a watercourse or natural wetland	Outflow diffused through a well vegetated riparian buffer zone of at least 10 m (30 ft) before entering a watercourse or natural wetland	Concentrated flow exits directly into a watercourse or natural wetland

Woodlots

Canada is often referred to as a forest nation. In fact, approximately 42% of Canada's land mass is covered by forests and Canada is the largest exporter of forest products worldwide. Though forests are important for economic reasons, they also provide a multitude of environmental and social benefits.

Farm woodlots are usually natural forests that are variable in size and often isolated in an agricultural environment. Many farmers use their woodlots to generate supplemental income. Many people enjoy the recreational activities that woodlots offer such as hiking, bird watching, camping, and hunting. Woodlots provide food and shelter to a wide variety of wildlife.

Woodlots are important for conserving the quality of air and water. Trees produce oxygen and capture carbon dioxide. Shallow ground water and runoff can be filtered as they flow past the root system. A well-managed woodlot can generate income, protect soil and water resources, and provide wildlife habitat.

What should you be aware of?

Woodlots act like a sponge and can prevent flooding and erosion of adjacent fields. Woodlots can be used as a soil conservation measure to prevent neighbouring runoff from causing erosion on the farm. Flood prevention and erosion control will reduce nutrient loss and soil compaction. When woodlots are situated near fields, the trees protect crops against strong winds and reduce wind erosion.

Woodlots store excess water and help maintain the water table level. They also improve groundwater quality as they filter excess nutrients and chemicals applied to farmlands. In fact, they are sometimes used for the safe disposal of surface runoff. By reducing wind velocity, woodlots provide a higher relative humidity in the fields and reduce evapotranspiration. This conserves soil moisture and increases crop productivity while reducing the requirement for irrigation. Woodlots also protect the water quality of nearby streams, rivers, and lakes.

Trees play an important role in reducing greenhouse gas emissions by sequestering carbon dioxide from the air. Trees also conserve air quality by producing oxygen and by acting as a barrier to dust particles, odours, and other gaseous pollutants. Trees can affect the local climate and influence the amount of precipitation and growing degree days in an area.

Woodlots support a variety of plants and animals. The proximity of a woodlot to other natural habitats (e.g. forests, riparian buffer zones, wetlands) allows wildlife to safely travel in search of food and shelter. In certain cases, forest corridors (e.g. windbreaks) are required to link woodlots with other natural habitats.

A well managed woodlot can generate various products such as maple syrup, wood for heating and wood for construction. When situated near a field, woodlots can increase crop yields by reducing evapotranspiration stress and soil erosion and by acting as a barrier to the transmission of diseases between fields. Woodlots can add to the aesthetic value of the farm and provide good places for bird watching or hunting. Woodlots may also allow farmers to generate additional income through agritourism.

How do you rate?

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Presence of Woodlots				
1 Woodlot area	Woodlots occupy land capability classes 3 to 7	Woodlots occupy land capability classes 4 to 7	Woodlots occupy land capability classes 5 to 7	Woodlots occupy land capability classes 6 and 7
2 Woodlot use	Woodlot conserved for wildlife habitat and recreational use	Woodlot used to diversify income on the farm, such as: selective tree harvesting, maple syrup production, Christmas wreath production, etc.	Clear cutting woodlot and abundant natural regrowth Woodlot kept for future agricultural development	Clear cutting woodlot and replanting with one species
Woodlot Management				
3 Forest management plan	Forest management plan prepared for woodlot within last 5 years that includes: • owners' objectives • woodlot inventory and map • annual woodlot operating plan	Forest management plan prepared for woodlot, but older than 5 years that includes: • owners' objectives • woodlot inventory and map • woodlot operating plan not updated annually	Forest management plan for woodlot initiated, but only includes: • owners' objectives • woodlot inventory and map	No management plan

Risk Rating	1 (Low)	2	3	4 (High)
Woodlot Management (cont'd)				
4 **Woodlot access roads**	No need for access roads; **or** Well maintained woodlot access road system: • built upon well drained soils • built as narrowly and as short as possible • roads follow natural contour • avoid watercourses and other sensitive areas • well maintained ditches	Woodlot access road system: • built upon well drained soils • avoid watercourses and other sensitive areas • well maintained ditches • drain into ditches and away from watercourses	Woodlot access road system: • built upon moderately well drained soils • built wider than necessary • ditches not properly maintained • built near watercourses and other sensitive areas	Woodlot access road system: • built upon poorly drained soils • built wider than necessary • go through sensitive areas • ditches drain directly into watercourse
5 **Watercourse crossings**	Well designed, constructed, and maintained bridges Road approaches prevent water from draining directly into the watercourse Road system designed to minimize need for crossings	Well designed and constructed culverts Road approaches prevent water from draining directly into the watercourse	Temporary bridge or culvert Road approach allow the direct entry of water into the watercourse	Cross directly through watercourse

Risk Rating	1 (Low)	2	3	4 (High)
Woodlot Management (cont'd)				
6 Harvest	Harvest follows schedule identified within a management plan	Harvest follows schedule identified within a management plan	Harvest does not follow a planned schedule	Harvest does not follow a planned schedule
	Selective harvesting of mature stand or as a stand improvement treatment	Selective harvesting of immature stands	Harvesting of all mature trees	Clear cutting without consideration for wood maturity
	Forest regeneration planned as part of the harvest operation	No commitment to forest regeneration	No commitment to forest regeneration	
	No harvesting during wet periods; done mainly on frozen ground	Harvesting avoided during wet periods	Harvesting sometimes occurs during wet periods	Harvesting often takes place during wet periods
7 Buffer zone	More than 100 m (330 ft) along all watercourses (streams, rivers, ponds, lakes) and wetlands	More than 50 m (165 ft) along all watercourses (streams, rivers, ponds, lakes) and wetlands	More than 20 m (65 ft) along all watercourses (streams, rivers, ponds, lakes) and wetlands	Less than 20 m (65 ft) along all watercourses; **or**
	Necessary permits obtained prior to wood harvest in buffer zone	Necessary permits obtained prior to wood harvest in buffer zone	Necessary permits obtained prior to wood harvest in buffer zone	Wood harvested without permit

Risk Rating	1 (Low)	2	3	4 (High)
Woodlot Management (cont'd)				
8 Safety	All proper safety equipment worn: • helmet and visor • ear protectors • safety boots & gloves • leg protectors Chainsaw has emergency brake and anti-vibration handle Only forestry equipment used in woodlot	All proper safety equipment worn: • helmet and visor • ear protectors • safety boots & gloves • leg protectors Chainsaw has emergency brake and anti-vibration handle Farm tractor adapted to operate in woodlot	Not all proper safety equipment worn Farm tractor adapted to operate in woodlot	Safety equipment not worn or used regularly Farm tractor not adapted to operate in woodlot
Diversity				
9 Woodlot diversity	Woodlot consists of several hardwood and softwood stands of various ages and sizes Highly diverse ground cover Woodlot directly connected to other natural habitats (e.g. large forests, wetlands, riparian buffer zones)	Woodlot consists of several stands of either hardwood or softwood of various ages and sizes Highly diverse ground cover Woodlot connected to other natural habitats (e.g. large forests, wetlands, riparian buffer zones) through wide travel corridors without interruption	Woodlot consists of 2 or 3 stands of trees Low levels of ground cover diversity Woodlot connected to other natural habitats (e.g. large forests, wetlands, riparian buffer zones) through narrow travel corridors; or Distance between woodlot and other natural habitats less than 100 m (330 ft)	Woodlot consists of one tree species only Low levels of ground cover diversity Woodlot not connected or further than 100 m (330 ft) from other natural habitats

Risk Rating	1 *(Low)*	2	3	4 *(High)*
Diversity (cont'd)				
10 Buffer between cultivated field and woodlot	Buffer of 5 m (15 ft) between cultivated field and woodlot Buffer consists of shrubs, grasses, and natural vegetation	Buffer of 3 m (10 ft) between cultivated field and woodlot Buffer consists of grasses and natural vegetation	No buffer between cultivated field and woodlot; field used for forage production	No buffer between cultivated field and woodlot; field used for row crop or grain production
Livestock				
11 Livestock access	No livestock access to woodlot; **or** No evidence of damage due to trampling; regeneration of woodlot not hampered by livestock	Controlled seasonal access to a section of the woodlot No evidence of damage due to trampling; regeneration not hampered by livestock on most of woodlot	Controlled seasonal access to woodlot Evidence of damage due to trampling; limited regeneration due to livestock	Free access to woodlot at all times Severe trampling and evidence of erosion; regeneration not occurring
Land Clearing				
12 Land clearing considerations	No land being cleared	Land only cleared to facilitate the establishment of soil conservation practices in adjacent field Only class 2 land is cleared	Land cleared to improve field operation efficiencies; **or** Land cleared to increase the area available for crop production Class 2 and 3 land is cleared	Land cleared to increase the area available for crop production No consideration given to wildlife or the amount of forested land within the watershed

Risk Rating	1 (Low)	2	3	4 (High)
Land Clearing				
13 Land clearing practices	Performed by an experienced land clearing contractor	Performed by an experienced land clearing contractor	Performed by a general contractor with limited land clearing experience	Performed by a general contractor with limited land clearing experience
	All wood harvested and branches converted to wood chips	All wood harvested and branches converted to wood chips	All wood harvested	No wood harvested
	Roots and debris burned in a controlled, hot non-smouldering fire	Roots and debris placed in piles or windrows with less than 10% topsoil	Roots, debris, branches placed in windrows running across the slope; windrows contain significant amounts of topsoil	Roots and trees placed in windrows running up and down the slope; windrows contain significant amounts of topsoil; **or**
	Soil conservation measures put in place to minimize risk of erosion	Location of piles or windrows allows for efficient cross slope farming without interfering with surface drainage		Roots and trees shoved to the edge of a wooded area or wetland
		Materials in piles and windrows eventually burned in a controlled, hot non-smouldering fire	Windrows left in the field for extended periods of time	Windrows left in the field for extended periods of time
	Burning permits or permission obtained	Burning permits or permission obtained		

Species at Risk

Canada is fortunate to have a rich diversity of flora and fauna. Experiences with wildlife enrich Canadians lives and enhance their emotional, spiritual, and social well being. In addition, wildlife plays a vital role in essential ecological and biological processes, is important for the preservation of genetic diversity, and boosts Canada's economy. However, in the past century, many changes to the land have taken place which have an impact on wildlife. Human activities are threatening the survival of many species by disrupting their habitat, contaminating their environment, introducing invasive species, and by excessive hunting and trapping.

What should you be aware of?

The Committee on the Status of Endangered Species in Canada (COSEWIC) is responsible for the assessment of the status of wildlife in Canada. It has identified over 400 species that are at Risk. These species include mammals, birds, reptiles, amphibians, insects, molluscs, fish, and plants. Species at Risk may be designated as Extinct, Extirpated, Endangered, Threatened, or of Special Concern. Examples of Species at Risk in Atlantic Canada include the American Marten, the Piping Plover, the Wood Turtle, the Atlantic Salmon, and the Gulf of St. Lawrence Aster.

There is hope for these species to recover. In the early 1900s beavers were an endangered species because of the popularity of beaver hats for men. Luckily, the fashion changed before the beaver became extinct. The Canadian government closed the trapping season and reintroduced beavers in areas where they had been completely trapped out. The beaver can now be found across Canada. Through reintroduction and stewardship programs, other species formerly considered at risk are re-establishing.

It is important to protect sensitive wildlife areas which are consistently used for breeding, feeding, birthing, or nesting. White-tailed Deer, for example, return to the same wintering grounds year after year. Since any destruction or disruption of these grounds could negatively impact the health of the herd, great care must be taken to ensure that these areas are protected.

Species at Risk are present on landowners land because of their good management of natural resources. Canada's Species at Risk Act acknowledges this fact and provides funding from Government agencies for programs such as the Habitat Stewardship Program, Endangered Species Recovery Fund, and the Interdepartmental Recovery Fund. These programs help defer costs associated with habitat management for Species At Risk by private landowners.

Federal and provincial legislation is in place to assist in conserving and recovering wildlife. The Species at Risk Act primarily applies to federally managed lands and will act only as a safety net on private/provincial land if deemed that provincial legislation is not doing enough to protect Species at Risk. Stiff penalties are used as a last resort for people who wilfully destroy habitat, kill, harm, capture, take, or harass listed Species at Risk. Provincial and federal governments prefer to work with landowners through stewardship initiatives and partnerships to prevent habitat destruction and care for wildlife.

In addition, many management tools for species recovery are also beneficial to livestock production. It is in everyone's best interest to protect Species at Risk.

How do you rate?

Risk Rating	1 (Low)	2	3	4 (High)
1 **Knowledge of Species at Risk**	Good knowledge of all laws and regulations regarding Species at Risk Good knowledge of the Species at Risk in the area and can identify them Conducted a personal survey of the property to identify these species	Read the provincial and federal acts regarding Species at Risk Good knowledge of the Species at Risk in the area	Broadly familiar with the provincial and federal acts Familiar with some of the Species at Risk	Unaware of any provincial or federal acts Unaware which species are at risk
2 **Agricultural practices modification for Species at Risk**	Personal records of Species at Risk spotted on the property Modified practices to ensure Species at Risk on land are not harmed or harassed and habitat is managed according to the needs of the species	Personal records of Species at Risk spotted on the property Modified practices to minimize disturbance	No personal records of Species at Risk spotted on the property Practices not modified to minimize disturbance	Unaware of the biodiversity of wildlife on the property
3 **Habitat conservation**	Natural habitats on the farm managed according to wildlife needs Wildlife habitat increased by converting or allowing marginal and sensitive lands to revert towards their natural condition	Natural habitats on the farm managed according to wildlife needs Unproductive and highly erodible crop land seeded to forage Poorest land fenced out and allowed to revert toward natural condition	Natural habitats poorly managed Sensitive land (e.g. highly erodible land, wetlands) drained and improved for annual cropping Poorest land left out of production	Natural habitats actively degraded through bush clearing, drainage, and excessive grazing pressure without consideration for sustaining natural resources