Atlantic Canada
Certified Crop Advisor

Performance Objectives

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(revised: October 2011)
Introduction

This booklet is intended for two purposes. First it is a guide to help you prepare for the Atlantic Canada Certified Crop Advisor Examination. Second, it describes the content appropriate for continuing education. The performance objectives outline the knowledge and skills that are needed in order to provide sound advice to crop producers.

To become a Certified Crop Advisor (CCA) in Atlantic Canada, it is necessary to pass two exams, in addition to meeting other requirements including experience, references, etc. The first is the International exam, whose performance objectives are set by the American Society of Agronomy and are available in a separate booklet. The second is the Atlantic Canada CCA Examination, whose performance objectives are described in this booklet.

The subject matter is divided into four sections. The percentage of exam questions under each section (weighting) will be as follows:

1. Nutrient Management  25%
2. Soil and Water Management  20%
3. Pest Management  25%
4. Crop Management  30%

Each of the four sections is broken down into competency areas with specific performance objectives. In preparing for the exam, you can best allocate your time by focusing on areas where your knowledge is weakest relative to what is described in the performance objectives.

These performance objectives were developed by the Ontario and Atlantic Canada Certified Crop Advisor Exam Committees and approved by the Atlantic Canada Certified Crop Advisor Board. In addition, they were reviewed by many people involved in crop advising, university faculty and government staff. The following people have contributed to the development of these performance objectives:

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We invite and encourage you to show your professionalism, integrity and pride. Agriculture - like medicine and law - relies on expertise, information and skill. The CCA designation identifies people who care about their profession and the success of their customers.
Section 1: Nutrient Management

Competency Area NM-1. Basic Soil Concepts
1. Describe the roles of nitrogen, phosphorus, potassium, calcium and magnesium in plants.
2. Define base saturation.
3. Describe the influence of soil pH, clay content and organic matter content on cation exchange capacity and base saturation.
4. Define guaranteed analysis of fertilizers from a grower’s perspective.

Competency Area NM-2. Soil Testing and Plant Analysis
5. Describe the soil sampling procedures recommended in provincial publications.
6. Describe methods used for grid soil sampling, and list their advantages and limitations.
7. Describe the tissue sampling procedures recommended in provincial publications for potatoes.
8. List advantages and disadvantages of the following three fertilizer recommendation approaches:
   a. cation saturation ratio
   b. nutrient build-up & maintenance
   c. nutrient sufficiency.
9. Distinguish between extractable amount and total amount of a nutrient in a soil.
10. Describe how nutrient credits from animal manures, biosolids and legumes influence fertilizer recommendations.
11. Interpret the information given on a soil testing laboratory report.
12. Calculate the amounts and rates of fertilizer needed to meet specific soil test recommendations.
13. Describe the role of soil testing, plant tissue testing and visual plant symptoms in a fertilization program.

Competency Area NM-3. Liming and pH
14. Identify the chemical characteristics of an acid soil.
15. Recognize how soil pH changes with topography.
16. Distinguish between soil pH and buffer pH or lime index.
17. Describe how the soil test uses soil pH and buffer pH to determine soil lime requirements.
18. Define neutralizing value and fineness rating of liming materials.
19. Calculate lime application rates using a soil testing report and the neutralizing value and fineness rating of the liming material.
20. Determine when to use dolomitic versus calcitic lime to correct soil pH.
21. List recommended soil pH ranges for: potatoes, corn, soybeans, cereals, and forage grasses and forage legumes.
Competency Area NM-4. Fertilizer Placement

22. Rank the relative toxicity of fertilizer materials to corn, wheat and soybean seedlings.
23. Identify factors affecting the amount of fertilizer that can safely be applied in a band near the seed.
24. Identify safe limits for seed placed fertilizer for corn, soybeans, and cereals.

Competency Area NM-5. Nitrogen

25. Identify how nitrogen is gained, lost and transformed in the soil.
26. Describe how nitrogen gains, losses and transformations in the soil influence nitrogen fertilization practices and nitrogen availability to plants.
27. Describe how topography can influence soil nitrate levels.
28. Recognize nitrogen deficiency symptoms on corn, soybeans, alfalfa, potatoes and cereals.
29. Describe the agronomic advantages and disadvantages of each of the following fertilizer materials in potato, corn, winter wheat, and forage production:
   - urea
   - ammonium nitrate
   - calcium ammonium nitrate
   - ammonium sulfate.

Competency Area NM-6. Phosphorus

30. Describe how soil chemical properties affect phosphorus availability and mobility in the soil.
31. Describe the advantages and disadvantages of seed-placed, banded and broadcast fertilizer phosphorus placement methods.
32. Recognize phosphorus deficiency symptoms on corn, soybeans, alfalfa, potatoes and cereals.
33. Describe the agronomic advantages and disadvantages of each of the following fertilizer materials in potato, corn, winter wheat, and forage production:
   - triple superphosphate
   - diammonium phosphate
   - monoammonium phosphate
   - liquid phosphorus (ammonium polyphosphate) fertilizers.

Competency Area NM-7. Potassium

34. Describe how soil chemical and physical properties affect potassium fertilizer availability, mobility and leaching.
35. Recognize potassium deficiency symptoms on corn, soybeans, alfalfa, potatoes and cereals.
36. Recognize potassium luxury consumption and its effects on forage quality for ruminant livestock.
37. Describe the agronomic advantages and disadvantages of each of the following fertilizer materials in potato, corn, winter wheat, and forage production:
   - muriate of potash
   - sulfate of potash magnesia.
Competency Area NM-8. Secondary and Micronutrients

38. Describe how soil chemical and physical properties affect magnesium availability, mobility and leaching.

39. Recognize magnesium deficiency symptoms on potatoes, corn, soybeans, and forages.

40. Describe the agronomic advantages and disadvantages of each of the following magnesium sources:
   - sulfate of potash magnesia
   - magnesium sulfate
   - dolomitic lime

41. Recognize the deficiency symptoms of:
   - zinc in corn
   - sulfur deficiency in potatoes
   - boron in alfalfa

42. Describe how the interaction between the following can affect crop nutrition.
   - phosphorus and zinc
   - pH and zinc
   - pH and manganese
   - potassium and magnesium
   - weather conditions and boron

43. Describe advantages and limitations of foliar and soil micronutrient applications.

44. Describe the risks associated with over application of micronutrient fertilizers.

45. Describe the role of sulfur in plants and the possible reasons why sulfur deficiency has become more prevalent over the past number of years.

46. Describe the factors that affect Calcium availability for crop uptake.

47. Describe the agronomic benefits for land application of wood ash.

Nutrient Management References


_Atlantic Soils Need Lime_. APASCC Publication No. 534-84, Agdex No. 534.


_Calcium in Soils and Crops in Atlantic Canada_. APASCC Publication No. 539-89, Agdex No. 531.

_Crop Micronutrients in Atlantic Canada_. APASCC Publication No. 537-86, Agdex No. 531.


_Manure Nutrients_. Nova Scotia Department of Agriculture and Fisheries. [monograph online]. Available
from: http://www.gov.ns.ca/nsaf/elibrary/archive/agron/manure/nutrient.htm


Nutrient Deficiency Symptoms CD-ROM. Potash and Phosphate Institute. Item No. 82-8280.


Soil and Fertilizer Nitrogen in Atlantic Canada. APASCC Publication No. 536-84, Agdex No. 530.

Soil Fertility Guide. APASCC Publication No. 535-81, Agdex No. 530.


Sulfur in Soils and Crops in Atlantic Canada. APASCC Publication No. 536-88, Agdex No. 531.

International Plant Nutrition Institute
http://ipni.net/ipniweb/portal.nsf/0/5BFE7B077DCF57FD8525721700774B7F


Section 2: Soil And Water Management

Competency Area SWM-1. Soil Hydrology

1. Describe how spacing and depth of tile drains relate to soil texture and structure, internal drainage, soil trafficability, crop type, and topography.
2. Identify the benefits of tile drainage to crop production.
3. Identify the impacts of tile drainage on the environment.
4. Define watershed.
5. Describe the importance of the Canada Drinking Water Quality Guidelines.
6. Identify the material losses from the soil resulting from crop production and their impacts on nearby aquifers, wetlands, wildlife habitat, and aquatic systems.
7. Describe how the following affect pesticide movement:
   - method of application
   - precipitation
   - soil erosion
   - soil pH
   - soil texture.

Competency Area SWM-2. Manures, Biosolids, and Wastes

8. List advantages and disadvantages of the following methods of manure applications:
   - solid spreading
   - drag hose
   - irrigation.
   - liquid spreading
   - injection
9. List advantages and disadvantages of fall versus spring applied manures.
10. Describe agronomic benefits, risks and precautions for land application of wastes, biosolids, and manure.
11. Describe manure's role in nutrient cycling of carbon, nitrogen, phosphorus, and potassium.
12. Describe the benefits of over-winter cover crops for soil quality and nitrogen management.
13. Describe factors influencing nitrogen release from decomposing organic materials and the microbial processes involved.
14. Identify environmental limitations for applying wastes and biosolids to cropland.
15. List possible methods of reducing the potential of tile and surface water contamination from biosolids and manure applications.

Competency Area SWM-3. Conservation Technology

16. List the benefits of windbreaks to crop production.
17. Identify the functions of grassed buffer strips along natural water courses.
18. Describe the objectives of an Environmental Farm Plan.
19. List the major components of a nutrient management plan.
20. Describe the importance of phosphorus in a nutrient management plan.
21. Identify the potential environmental benefits of Global Positioning Systems and Geographic Information Systems technology.
22. Describe residue and mulch management for reducing soil erosion in potato production.
23. Describe the effects of field operations on soil compaction and the resulting impact on crop growth and nutrient requirements.
24. Describe the advantages and disadvantages of maintaining wildlife habitat.
25. Define soil health/quality
26. Identify common threats to soil quality/health in Atlantic Canada
27. Identify soil quality indicators in Atlantic Canada
28. Recognize improvements to soil quality is an on-going strategy that takes time

**Soil and Water Management References**


*Farm Drainage in the Atlantic Provinces.* ACAE Publication No. 3, Agdex # 752.  


*Soil and Water Factsheets Website.* PEI Department of Agriculture and Forestry.
Soil Erosion. ACAE Publication No. 9, Agdex No.751.


D.F. Acton and L.J. Gregorich (eds.) The Health of our soils – toward sustainable agriculture in Canada. Centre for Land and Biological Resources Research, Research Branch, Agriculture and Agri-Food Canada, Ottawa, Ont.


OMAFRA Factsheet: Starting an Organic Farm (section 5 – Strategies to Improve Soil)
http://www.omafra.gov.on.ca/english/crops/facts/09-073.htm#soil
Section 3: Pest Management

Competency Area PM-1. Principles and Practices

1. List the steps of an integrated pest management process.
2. Describe the importance of each step of an integrated pest management process.
3. Describe sampling methods for monitoring pest populations.
4. Identify the scouting techniques for the following pests: Colorado potato beetle, European corn borer, potato aphids, late blight, pink rot.
5. Outline methods for submitting plant and pest material for diagnosis and laboratory analysis.
6. Describe how to use the following variables to calculate the economic injury level (EIL):
   - cost of control
   - crop value
   - effectiveness of control action
   - pest density/crop damage relationship.
7. Describe the unique characteristics of the following: Bt potatoes or corn, Verticillium resistant alfalfa, virus resistant potato, RR corn or soybeans.

Competency Area PM-2. Weed Management

Predominant weeds in Atlantic Canada:

- barnyard grass
- burdock, common
- Canada thistle
- Chickweed, common & mouse-eared
- cleavers/smooth bedstraw
- corn spurry
- crab grass, smooth
- dandelion
- fall panicum
- field horsetail
- field mint
- goldenrod
- hemp nettle
- lady’s-thumb
- lambs-quarters, common
- pigweed, redroot and smooth
- quack grass
- ragweed, common
- scentless chamomile
- shepherd’s-purse
- sow-thistle, annual and perennial
- velvetleaf
- vetch, tufted
- wild buckwheat
- wild oats
- wild radish
- yellow nut sedge

8. Identify, by common name, the predominant weeds in Atlantic Canada at the 3 to 6 leaf growth stage.
9. Describe the life cycles of:
   - summer annuals
   - winter annuals
   - biennials
   - perennials.
10. Classify predominant weeds in Atlantic Canada by life cycle (annual, biennial or perennial).
11. Describe growth habit of predominant weeds in Atlantic Canada.
12. Describe the following vegetative reproductive structures: creeping roots, rhizomes, tubers, bulbs and stolons.

13. Identify weeds that exhibit the following structures: creeping roots, rhizomes, tubers, bulbs.


15. Describe crop injury symptoms of commonly used herbicides on potatoes and cereals:

<table>
<thead>
<tr>
<th>Herbicide</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2,4-D</td>
<td>dimethenamid.</td>
</tr>
<tr>
<td>atrazine</td>
<td>metolachlor</td>
</tr>
<tr>
<td>bentazon</td>
<td>metribuzin</td>
</tr>
<tr>
<td>bromoxynil</td>
<td>nicosulfuron/rimsulfuron</td>
</tr>
<tr>
<td>dicamba</td>
<td></td>
</tr>
</tbody>
</table>

16. Describe how the following may affect pesticide retention and absorption in plant leaves:

<table>
<thead>
<tr>
<th>Factor</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>type of carrier</td>
<td>weed size</td>
</tr>
<tr>
<td>additives</td>
<td>rain-free time</td>
</tr>
<tr>
<td>spray volume</td>
<td>plant canopy</td>
</tr>
<tr>
<td>leaf orientation</td>
<td></td>
</tr>
</tbody>
</table>

17. Describe how the following factors affect cuticular penetration:

<table>
<thead>
<tr>
<th>Factor</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>herbicide solubility in water</td>
<td></td>
</tr>
<tr>
<td>moisture</td>
<td></td>
</tr>
<tr>
<td>relative humidity</td>
<td></td>
</tr>
<tr>
<td>temperature</td>
<td></td>
</tr>
</tbody>
</table>

18. Distinguish between contact and systemic herbicides.

19. Define weed competition and describe factors that influence competition.


21. Describe how herbicide chemical properties, environmental conditions, and application method influence volatilization.

**Competency Area PM-3. Disease and Nematode Management**

22. For each of the following field crop diseases (see table on page 8):  
   a) describe symptoms and plant parts affected  
   b) identify conditions that favor pathogen development  
   c) identify appropriate management responses  
   d) identify the category of the pathogen (viruses, bacteria, fungi, nematodes)
### Potatoes

<table>
<thead>
<tr>
<th>Disease</th>
<th>Cereals</th>
<th>Forage Legumes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacterial ring rot</td>
<td>Barley yellow dwarf virus (BYVD)</td>
<td>Clover cyst nematode</td>
</tr>
<tr>
<td>Bacterial soft rot</td>
<td>Ergot</td>
<td>Verticillium wilt in alfalfa</td>
</tr>
<tr>
<td>Blight, early and late</td>
<td>Fusarium head blight</td>
<td></td>
</tr>
<tr>
<td>Clover cyst nematode</td>
<td>Loose smut</td>
<td></td>
</tr>
<tr>
<td>Fusarium wilt</td>
<td>Net blotch</td>
<td></td>
</tr>
<tr>
<td>Potato cyst nematode</td>
<td>Powdery mildew</td>
<td></td>
</tr>
<tr>
<td>Potato leaf roll virus (PLRV)</td>
<td>Scald</td>
<td></td>
</tr>
<tr>
<td>Potato virus Y (PVY)</td>
<td>Septoria leaf &amp; glume blotch</td>
<td></td>
</tr>
<tr>
<td>Root knot nematode</td>
<td>Snow mould</td>
<td></td>
</tr>
<tr>
<td>Root lesion nematode</td>
<td>Spot blotch</td>
<td></td>
</tr>
<tr>
<td>Scab, common and powdery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verticillium wilt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water (pink) rot</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

23. Define mycotoxin.
24. List the mycotoxins commonly found in cereal grains, and describe how they are detected.
25. Describe the impact of mycotoxins on crop quality.
26. Describe strategies for minimizing contamination of commodities by mycotoxins.

### Competency Area PM-4. Insect and Slug Management

Important Insects Pests of Atlantic Canada:

- armyworm
- buckthorn aphid
- cereal aphids
- cereal leaf beetle
- Colorado potato beetle
- cutworm
- European corn borer
- European skipper (timothy)
- green peach aphid
- potato aphid
- potato flea beetle
- potato leafhopper
- tarnished plant bug
- white grub
- wireworm

27. Identify the pest and the crop injury symptoms for important insect pests of Atlantic Canada.
28. Identify appropriate management responses to important insect pests of Atlantic Canada.
29. Describe how heat, photoperiod, competition, and moisture influence insect populations.
30. List advantages and limitations of the following cultural controls for insect and slug crop pests:
   resistant cultivars       rotation
   sanitation               tillage
   planting date            harvest date.

**Competency Area PM-5. Pesticide Resistance Management**

31. Define pesticide resistance and cross resistance.
32. Describe how a pest population develops resistance to pesticides.
33. Distinguish among the following plant responses to pests or pesticides:
   resistance
   susceptibility
   tolerance.
34. Describe how to minimize pesticide resistance development.
35. Identify Atlantic Canada weeds, insects and fungal diseases with resistance to pesticides.

**Competency Area PM-6. Pesticide Stewardship & the Environment**

36. Describe best management practices for pesticide mixing, loading, application, transportation, disposal and storage.
37. Describe government and industry regulations and guidelines for safe handling, storage, application, transportation and disposal of pesticides.
38. Describe components of a pesticide label.
39. Distinguish between spray drift and volatilization.
40. Describe how the following factors affect spray delivery, coverage and drift:
   boom height            nozzle orifice size
   droplet size           spray pressure
   ground speed           spray viscosity
   nozzle spacing         spray volume
   nozzle type            wind speed

**Pest Management References**

*Atlantic Canada Potato Guide.* APASCC Publication 1300, Agdex #257/13.


Integrated Pest Management for Potato Production, PEI Dept of Agriculture

*Crop Factsheets Website: Pests & Pest Control.* Newfoundland Department of Forest Resources and Agrifoods. http://www.nr.gov.nl.ca/nr/publications/agrifoods/index.html#plants

*IPM Factsheets and Publications – PEI Dept of Agriculture*  

Diseases and Insect Pests of Cereals in the Atlantic Provinces. APASCC Publication 116. Agdex #600/110.


Guide to Weed Control. OMAFRA Publication 75.


Herbicide Injury Symptoms on Corn and Soybeans. Purdue University. [monograph online]. Available from: http://www.btny.purdue.edu/Extension/Weeds/Herbinj/


Identification Guide to the Weeds of Quebec. (available in French and English) - http://www.craaq.qc.ca/Publications?p=32&l=fr&IdDoc=932

Section 4: Crop Management

Competency Area CM-1. Crop Adaptation
1. Describe corn and soybean responses to a late spring or early fall frost that is severe enough to kill the above ground portion of the plants.
2. Describe how Crop Heat Units differ from Growing Degree Days (GDD).
3. Use a Crop Zone map to select areas in which corn and winter wheat varieties are adapted.
4. Factors to consider when using reduced tillage or no-till corn strategies.
5. Use the critical fall harvest period map to determine harvest management for alfalfa.
6. Describe soil and climatic factors responsible for successful winter survival of forage legumes, perennial forage grasses and winter wheat.
7. Describe the relative growing characteristics of perennial forage grass species:
   - jointing versus non-jointing
   - bunching versus spreading
   - seedling vigour
   - maturity
   - yield and regrowth
   - tolerance to close grazing
   - sensitivity to poor drainage, drought, and low soil pH.

Competency Area CM-2. Seed Quality
8. List advantages of pedigreed seed.
9. List factors used to select hybrids or varieties of corn, soybeans, wheat, barley, forage legumes, and forage grasses.
10. Describe differences between seed germination and seedling vigour.
11. Identify the factors important in determining seed potato quality.

Competency Area CM-3. Crop Growth And Development Staging
12. Describe the major growth scales commonly used to identify crop development stages of potatoes and cereals (e.g., Zadok’s).
13. Identify critical crop development stages for fertilizer application to increase protein in bread wheat.
14. Describe growth phases critical for drought tolerance for potatoes, corn, and soybeans.

Competency Area CM-4. Tillage Systems
15. Describe how the following affect feasibility of conservation tillage systems:
   - topography,
   - soil type and texture,
   - heat unit availability,
   - crop species,
   - cropping sequence
16. Describe how soil fertility management changes when adopting conservation tillage systems.
17. Describe how pest management changes when adopting conservation tillage systems.
18. List soil textures suited to fall and spring primary tillage.
19. Describe advantages and disadvantages of fall and spring primary tillage.
20. Describe advantages and disadvantages of rotary hoeing and inter-row cultivation after planting.

Competency Area CM-5. Seeding Factors
21. List factors determining seeding rates or spacings for potatoes, cereals, corn, soybeans and forages.
22. Describe the effect of plant population and row spacing on sunlight interception, weed competition, diseases, lodging and yield.
23. Describe the purposes of seed treatments.
24. Describe appropriate inoculant materials and inoculant handling methods for soybeans and forage legumes.
25. List criteria to consider when assessing whether to replant corn, soybeans or winter wheat.
26. List criteria to consider when choosing seeding depth for corn, soybeans, winter wheat, forage grasses, forage legumes, spring cereals.
27. List factors to consider when deciding whether to drill or broadcast seed for forage grasses and legumes.
28. Describe how to adjust seeding rate if environmental conditions cause a planting delay or a replant.
29. List factors that determine optimum seeding dates for potatoes, corn, soybeans, winter wheat, spring cereals, and forage legumes.
30. Describe the relationship between seeding date and yield potential for potatoes, corn, corn silage, soybeans, winter wheat, and barley.

Competency Area CM-6. Crop Utilization and Harvesting Quality
31. List optimum development stages to harvest potatoes, corn, corn silage, soybeans, winter wheat and barley.
32. List development stages for harvesting forage legumes and forage grasses at optimum forage quality (crude protein, acid detergent fibre, neutral detergent fibre) and at optimum dry matter yield.
33. Describe the unique characteristics of the following potato types:
   table, processing (French fry and chip), seed, count packed
34. Describe how to adjust a combine for optimum harvest efficiency of corn, cereals and soybeans.
35. Describe how to adjust a potato harvester to minimize bruising and prevent losses.

Competency Area CM-7. Cropping Systems
36. Describe the advantages and disadvantages of a monoculture versus a crop rotation system.
37. Describe the advantages and disadvantages of direct seeding forages compared to seeding with a companion crop.
38. Describe grazing systems that optimize livestock production on pastures.

39. List advantages and limitations of the following cultural practices with respect to control of weeds, pests and diseases:
   - crop rotation
   - planting time
   - use of tramlines.
   - cover crops
   - soil fertility
   - tillage
   - nurse crops

**Competency Area CM-8. Safe Storage And Quality**

40. List the safe moisture levels to store corn silage, haylage, wrapped bales, and cereal silage.

41. List the conditions necessary for grains to retain optimum quality in storage.

42. Describe the factors involved in evaluating grade quality of potatoes, corn, soybeans, wheat, and barley.

43. Describe the causes and the effects of silo gases.

**Competency Area CM-9. Economics**

44. Define maximum economic yield in terms of the law of diminishing returns.

45. Use Crop Budgets to estimate costs and evaluate cropping alternatives.

**Competency Area CM-10. Regulatory**

46. Recognize key components of Crop Insurance programs.

47. Recognize stipulations of the Seeds Act that pertain to crop production.

**Crop Management References**

- Agronomy Services Information Website. Nova Scotia Department of Agriculture and Fisheries. 
  http://www.gov.ns.ca/nsaf/elibrary/archive/agron/

- Atlantic Canada Potato Guide. APASCC Publication 1300, Agdex #257/13.
- APASCC Publications Website. Atlantic Provinces Agricultural Services Co-ordinating Committee. 
  http://www.apascc.org/publications.html


- Atlantic Provinces Field Crop Guide. APASCC Publication 100, Agdex # 100.32


- Crop Factsheets Website. Newfoundland Department of Forest Resources and Agrifoods. 
  http://www.gov.nf.ca/agric/pubfact/crops/cropfac.htm
Crops Website. New Brunswick Department of Agriculture, Fisheries and Aquaculture.
http://www.gnb.ca/AFA-APA/30/03/3003000e.htm

Information Centre Factsheets Library. P.E.I. Department of Agriculture and Forestry.