

Welcome to

Forest Health

for Silviculture Surveyors



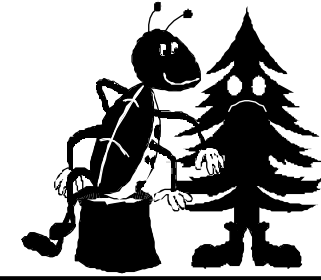


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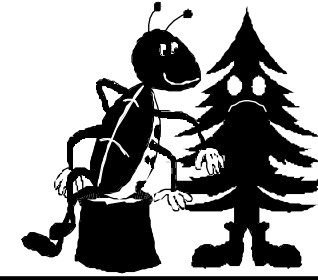
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Compact Disc



Acknowledgements

The Forest Health for Silviculture Surveyors course was originally developed and produced by Larry McCulloch and the staff at Laing and McCulloch of Smithers, in 1995. The course was presented on numerous occasions over the following few years. As time progressed, the knowledge of forest health issues grew, making the format and content of the original course less valuable.

In January of 2000, an initiative directed by John Muir, RPF, of the Ministry of Forests, was undertaken to bring these materials up-to-date. The intent was to bring the course content up to the present day's level of forest health understanding. Course materials were revised based on the collection of new ideas presented by the participants and the instructors.

In addition, the format of this course was modified so the content could more easily be updated as the knowledge of forest health issues increases in the future.

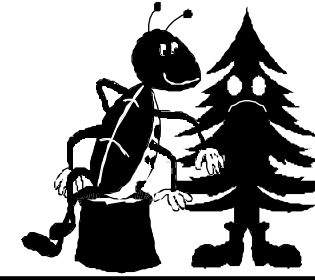
The successful restructuring of this course was possible only through the involvement of John Wallis (Wallis Environmental Consultants), and Joan Holt (Entopath Management Ltd.). This version of the course was developed by Allen & Sue Schaad and the team at Prifor Management Ltd., of Williams Lake.

Purpose

The primary purpose of this course is to provide silviculture surveyors with an opportunity to become more aware of:

- the importance of forest health issues
- methods employed in identifying major causes of mortality and growth reduction
- the host(s), symptoms and impacts of forest pests
- the use of common reference material
- approved methods for forest health data collection
- how to apply the Free Growing Damage Criteria
- common treatment methods and the creation of treatment recommendations

The course itself only provides an opportunity for participants to learn the methods of forest health identification and the options for treatment recommendations. It is expected that the participants will need to combine the knowledge gained in the course with their personal silviculture and forest health experience through field application over time to become fully proficient in the subject.



How to Use This Guide

This guide was designed to help facilitators prepare for and deliver an informative and entertaining training course. The facilitator's guide itself is designed to provide the facilitator with a framework for delivery. While the course could be presented in a "word-for-word" basis, it will be more enjoyable for you, and for the participants, to apply your own personality within the framework provided. Facilitators will have their own personal preference of presentation style. They will also have their own history of personal forest health and silviculture experience. In addition, each group of participants and each delivery location will have their own particular characteristics. For all of these reasons you are encouraged to "make this course your own". Examples, techniques and methods described in this document should be considered suggestions. Feel free to add your own examples that suit the general learning objectives.

It is true that the best learning experience can be provided through a course being delivered by several people - an experienced facilitator/instructor and/or local Ministry of Forests representatives and/or specialists. This is rarely the reality of the delivery situation. A single instructor/facilitator is more common.

The facilitator/instructor must therefore have considerable knowledge and experience in the fields of silviculture and forest health surveys and treatments. The more 'local' this knowledge, the better.

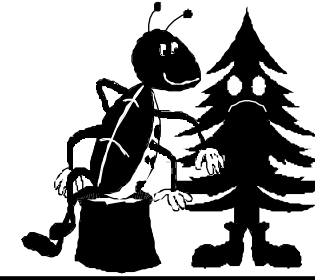
An ability to apply the principles of adult learning and "learner-centred" training approaches is definitely an asset.

For those with extensive silviculture and forest health experience, but limited instructional or facilitation experience, we recommend:

How to Teach Adults in One Hour - by William A. Draves

How Adults Learn - A series of workshops offered through the BC Forestry Continuing Studies Network by John Baker

The success of any training depends upon how well the session facilitator selects and organizes activities to communicate the purpose and objectives of the session to the participants. The care and thoroughness with which you plan and prepare each session will make the difference between a mediocre and a successful event. Please review these materials carefully, select the activities that meet the needs of your audience, and have fun being a part of the learning process.



Background

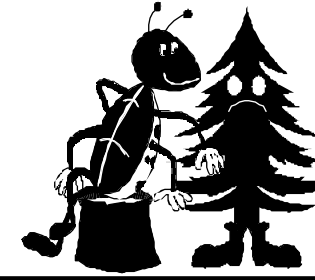
This course was originally developed in 1994 and 1995 by the Ministry of Forests, Silviculture Practices Branch, under contract with Laing and McCulloch Ltd. of Smithers. The process of course development was mixed with facilitation sessions to develop the Free Growing Damage criteria.

This version of the course and the associated materials were revised in the beginning of 2000 by Allen Schaad, RPF of Prifor Management Ltd. in Williams Lake.

Since our understanding of the individual forest pests is constantly changing, this makes it very difficult to develop a training package that is constantly up-to-date. As soon as materials are prepared, they require revision because we have learned some new facet of one or more of the pests. In addition, to the credit of the forest health professionals in the province, research is constantly increasing our understanding of treatment options and effectiveness.

Further, the collective philosophy of the forest health community is broad. There are so many 'unknowns' that a great deal of the forest health decisions are based on professional scientific judgement. The mix of quantitative and qualitative observations, combined with personalities, results in a very active forest health community.

This course is therefore designed to accommodate the ongoing growth of our understanding of forest health issues. The details and specifications are intentionally restricted to the Appendix section of the materials. As a result, lively discussion and active revision of such essential documents as the Free Growing Damage Criteria can continue as needed. As the results of these discussions are formulated into new criteria, the new document can simply replace the old one in the appendix. A date is also located on each page of the materials to assist with tracking these changes.



Introduction to the Facilitator's Guide

Target Audience

This module is one of a series that is intended to provide individuals with an opportunity to learn technical aspects necessary to conduct silviculture surveys in BC. This Module, as its name describes, contains the methods required to successfully perform the forest health components of the silviculture survey process.

This course is best suited to those with some basic understanding of silviculture survey procedures. The module entitled Basic Silviculture Surveys is a suggested prerequisite, along with some related field experience. For those individuals who have very little forest health and/or surveying experience, this course is suitable as an introductory course. Significant follow-up practice is essential.

While this course does not in itself result in becoming an accredited surveyor, the material presented is directly linked to the Silviculture Survey Accreditation Exam.

Class Size

The recommended maximum class size is 15. Above this number, an assistant or co-instructor is essential to maximize the participant's opportunity to receive personal attention.

This binder of materials has been prepared with the following sections:

Presentation Notes

Each page contains a miniature version of the overhead transparency. In addition, reference is made to the corresponding '**Overhead Number**', and the '**Participant's Workbook Page Number**'. '**Instructional Objectives**' are listed for each to assist with guiding the intent of the discussion. Finally, '**Key Points, Concepts, Examples & Facilitator's Notes**' is also intended as a reference for the instructor. It contains examples, reference material and alternate methods of presentation. Instructors may wish to highlight key words within this section to create their own personalized presentation notes.

Overhead Transparencies

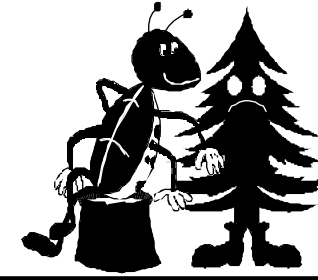
A full set of overhead transparencies is contained within each Facilitator's Guide. Multiple versions of some have been prepared to allow the facilitator to select the method he/she prefers. As well, regionally specific examples have been produced.

Slides

The Facilitator's Guide contains a set of slides showing common samples of various forest health factors. Instructors may wish to add their own locally relevant subset of slides to this collection.

Appendices

Included in this section are such things as the forest health-related Forest Practices Code Guidebooks, and the compact disc containing these materials.

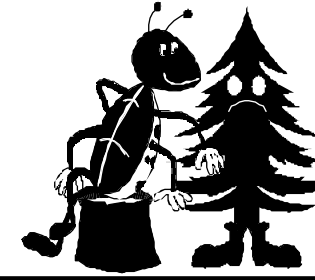


Course Objectives

The subject of forest health is broad, and can be studied in great depth. This course is much more of an introduction or an overview of the subject. The experts in the field may find it even superficial. The goal in preparing this course is to provide a working level of training for the intended target audience: silviculture surveyors. This course is intended to provide an opportunity to learn the technical methods expected of a silviculture surveyor. The course objectives are outlined as follows:

- Learn the **importance of forest health** information,
- Develop a **foundation** of terms, definitions and concepts
- Be introduced to the **identification, hosts and impacts** of the major causes of tree mortality and growth reduction,
- Use common **reference material** to learn more about forest health factors,
- Learn **data collection** methods
- Apply **free growing damage criteria**,
- Become familiar with some of the common **treatments** and recommendations.

Much can be added to the content by the experienced facilitator through the use of relevant local examples. However, there is little that can be eliminated.



Facilitator Preparation

Field Sites

While the classroom component of this course is important, the field portion is crucial. Many participants learn best from 'hands on' use of the skills they have been introduced to in the classroom. The role of the facilitator/instructor is to 'play tour guide'. This is a fine balance between 'teaching' and presenting the opportunity to learn. The facilitator's obligation is to locate sites that provide the greatest opportunity for the participants to learn.

The success of Day 2 is dependant on good field site selection and organization.

Principles to consider when selecting field sites:

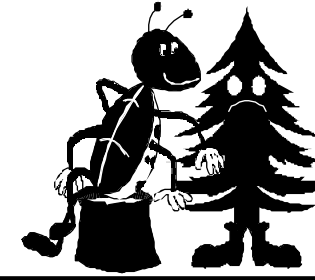
Travel distance - This must be kept to a minimum. The participants did not attend the course to sit in a vehicle for hours to travel to the "perfect" field site. One may have to accept an OK site that is close rather than endure great travel distances. Since root disease is the most difficult to recreate at a suitable demonstration site, this should be the primary criteria. Other samples are more easily collected and transported to a common spot.

Travel Logistics - Consider the need for four wheel drive, radio communications, heavy industrial vehicle traffic and parking. We suggest the lead and trailing vehicles monitor a common radio frequency in the event of some access difficulty.

Multiple Spots - Two separate locations have been successfully used in previous delivery sessions. This allows the participants to see different forest health factors under different conditions. Moving from the first to the second site provides a break, and allows some time for individual discussion. Under severe weather conditions, it also allow participants a convenient period to "warm up/cool down". Where more than two spots are selected, travel time should be considered.

Where the pre-selected field sites lack certain forest health factors, extra effort should be employed to gather these absent forest health factors from other sites. These make for good samples to be used in the classroom component. In addition, samples can be brought to a central location at one of the field sites for the participants to examine.

Plot Establishment - To ensure that the field day flows smoothly and that the desired results are achieved, the stocking and or free growing survey plots that will be tallied by the participants should be preestablished. Intentionally position the plots in locations that have forest health factors. If time permits, tally these plots yourself so you know the result to expect when the participants tally them. Locate the plots within easy walking distance and within sight of one another. Mark the plots for easy relocation by the participants. Number the plots in a logical method. Mentally plan the flow from the transportation vehicles, along the walkthrough and on to the plots. You may wish to demonstrate a plot, as well. A plot card enlarged to 400% makes a good visual impact to record the result of your demonstration plot.



Sample Collection

During the classroom practice session using the reference books, fresh samples will be required. The number of separate forest health factors will be dependant on the speed at which the participants are able to confirm their identification. We recommend two to four different forest health factors. There should be at least two samples of each forest health factor, and more samples when the class size is larger than ten.

Suggestions:

Select samples from different general types of forest health factors:

- animal damage
- abiotic injuries
- diseases
 - root disease
 - stem disease
 - mistletoe
 - foliage
- insects
 - bark beetle
 - weevil
 - leader
 - root collar
 - defoliator
- treatment damage
- vegetation problems

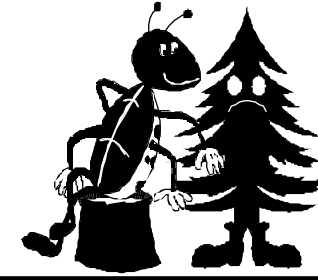
Supplies

The facilitator will have to confirm the production of a sufficient quantity of participant's workbooks. There is a file on the CD that contains this information.

A supply of field cards will be required. 1 - FS 747C, 1 - FS 657, 2 - FS 658 and 2 - FS 659 per participant should be sufficient. These are frequently updated, so ensure you have the most current versions.

A copy of the Free Growing Damage Criteria is also provided in the appendix. Again, ensure you have the most up-to-date version.

Additional copies of the reference books will be an asset.



Facilitator's Check List

TWO WEEKS (or more) BEFORE THE SCHEDULED DELIVERY DATE, CONFIRM WITH THE COURSE ORGANIZING BODY:

- ☐ course location (fax a map if required)
- ☐ course date and start time (request a copy of the materials the participants were sent)
- ☐ facility - time available for your use
- ☐ number of participants
- ☐ desired seating arrangement
- ☐ procedures for late registrants
- ☐ preparation and delivery of the Participant's Workbooks
- ☐ determine who will supply audio/visual equipment, slide projector and screen
- ☐ miscellaneous, "local logistics".....

PREPARE YOURSELF

- ☐ organize your facilitator's guide since the last time it was used
- ☐ research field sites based on the delivery location
- ☐ visit the field site to confirm access and local issues
- ☐ review the damage agent most common to the course location
- ☐ consult with local experts for recent techniques and local examples
- ☐ collect samples for classroom and field use
- ☐ copy the hand out materials (one of each for each participant, plus extras)
- ☐ assemble reference material
- ☐ review the facilitator's guide
- ☐ misc. supplies
- ☐ organize slides, ensure availability of slide projector, screen, extension cord(s)

MORNING OF DELIVERY

- ☐ arrive early
- ☐ confirm classroom layout and organization
- ☐ distribute participant's workbooks
- ☐ lay out reference materials
- ☐ test the audio/visual equipment
- ☐ set the videos to the correct start location
- ☐ test slide projector (height, focus, correct starting slide)
- ☐ find and test the lighting adjustments (lights and curtains)
- ☐ identify the location for adjusting the heat in the room
- ☐ identify the facility representative to call in case of a problem during the session
- ☐ confirm the location of the restroom facilities
- ☐ confirm arrangements for refreshments (if provided)



Participant's
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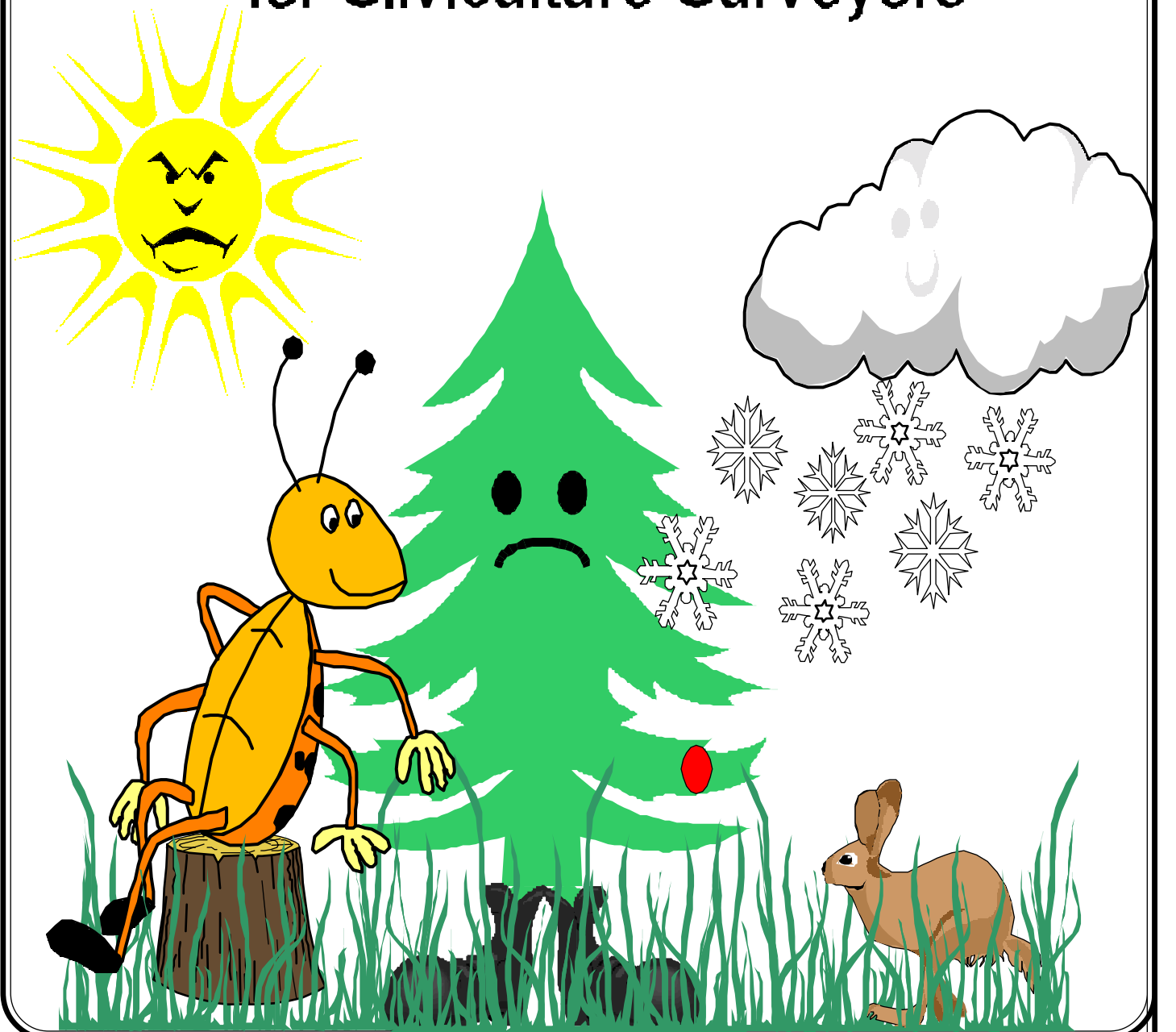
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Title:

Introduction

Welcome to Forest Health for Silviculture Surveyors



Instructional Objectives:

- Introduction to the Instructor(s)
- Awareness of the facility

Key Points, Concepts, Examples & Facilitator's Notes:

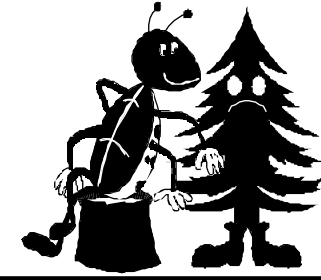
- Take the time to introduce yourself. The intent is for the participants to feel comfortable that "you are worth listening to". You have been selected as an instructor based on your knowledge and your experience in the field of forest health. In addition, you need to convey to the participants that you are friendly, and approachable. Make them comfortable and ready to learn.

Suggestions for information to include:

- Your name and company affiliation
- Your education and employment history
- Special knowledge of the subjects of silviculture and forest health
- Personal information/short amusing story (remind them you are human too)



Forest Health for Silviculture Surveyors Facilitator's Guide



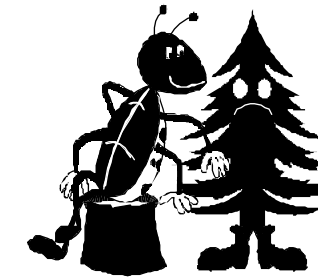
General "Housekeeping" Information

In an effort to make the participants comfortable in the facility, the instructor should pass on information to assist them. Subjects to consider:

- The location of the washrooms
- The location of the telephone
- Any methods to deal with messages received throughout the day
- Room temperature
- Any other information to assist the participants in feeling comfortable and to allow the course to proceed smoothly.
- The participant's workbook has been provided. It contains each of the overheads, and space for the participants to write notes.



Forest Health for Silviculture Surveyors Facilitator's Guide



Agenda

Today

Introduction

Importance of Forest Health

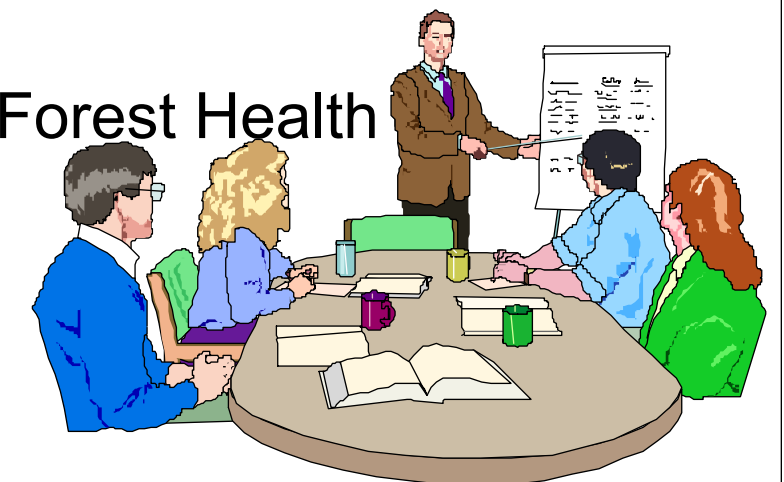
Foundation

Identification

Application

Free Growing Damage Criteria

Treatment Recommendations



Tomorrow

Field Practice



Participant's
Workbook
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2

Lesson
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Title: Introduction

Instructional Objectives:

- Aware of the plans for the duration of the course
- Comfortable with the willingness of the instructor to accept questions
- Wherever possible, to be "excited" that there are 'good things to come'

Key Points, Concepts, Examples & Facilitator's Notes:

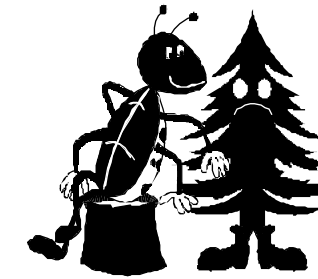
- Introduce the agenda as "The Plan". This is a general framework to the training session. There are no times provided for the individual lessons. Time will be dependant on the level of participation, discussion, questions and the prior level of understanding the participants bring with them.
- The timing of breaks and general start and stop time should be followed by the instructor.

Instructional Hint:

As the group begins a break, indicate a time to return, rather than the length of the break. "We'll begin again at 10:15", rather than, "Let's take a 15 minute break". You will find the group will often reconvene with little encouragement from you. This will assist with keeping the group motivated and moving ahead through the subject matter.



Forest Health for Silviculture Surveyors Facilitator's Guide



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Title:

Introduction



Instructional Objectives:

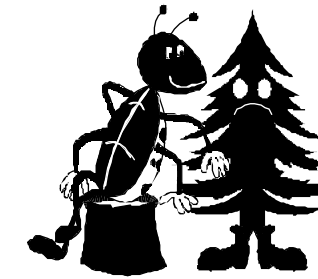
- Introduce themselves to the others attending
- Become aware of the range of experience of their co-participants

Key Points, Concepts, Examples & Facilitator's Notes:

- This is often an awkward point for many participants.
- Since this is a relatively short course, the introductions should also be short. Total time to complete, for an average class, should be between 5 and 10 minutes.
- Some instructors may wish to add a 'game' to these introductions. Three separate overheads have been prepared; any one, or none, may be used to guide the introduction of the students. Some groups and some instructors do not like this concept. They often find it embarrassing or 'juvenile'. When it works, it is a great set up for the day.



Forest Health for Silviculture Surveyors
Facilitator's Guide



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4

Lesson
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Title:

Introduction

*Forest
Health*

Your Name
Your Employer
A question you
would like
answered today?

On the "tent" cards,

Print your Name

and

forest

Draw Your Favourite Pest.



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Workbook
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5

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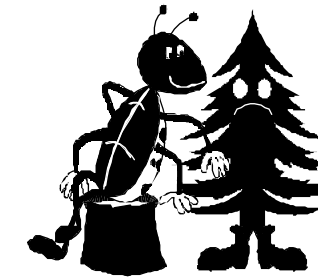
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Introduction



Forest Health for Silviculture Surveyors Facilitator's Guide



Participant's
Workbook
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6

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Title: Introduction

Principal Learning Objectives

Through this course, participants will have the opportunity to.....

Learn the **importance of forest health** information,

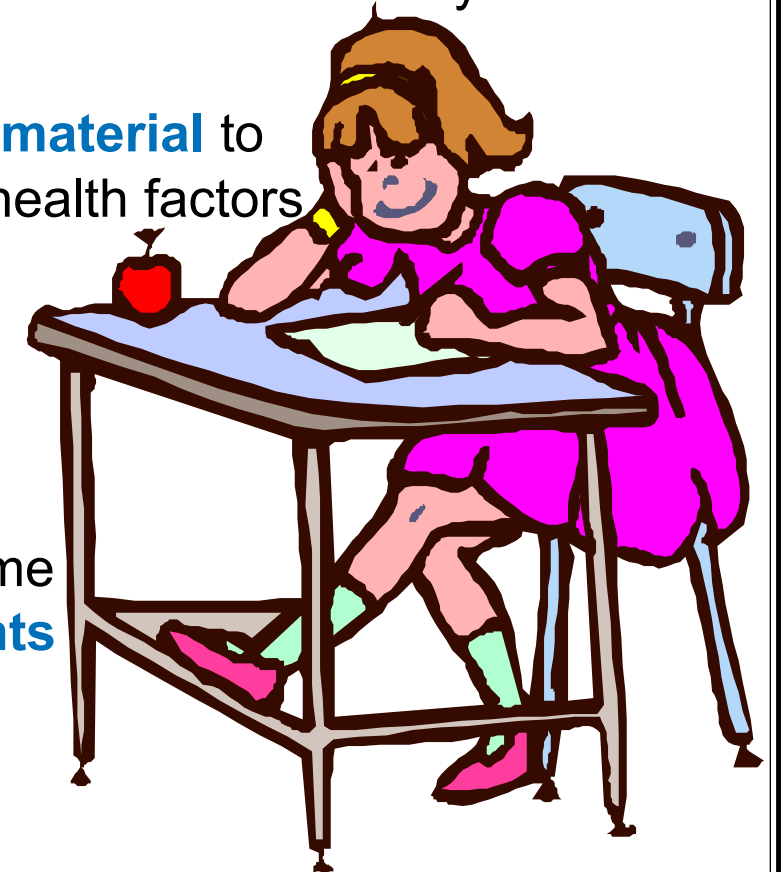
Develop a foundation of terms, definitions and concepts,

Be introduced to the **identification, hosts and impacts** of the major causes of tree mortality and growth reduction,

Use common **reference material** to learn more about forest health factors

Learn **data collection** methods and apply **free growing damage criteria**,

Become familiar with some of the common **treatments** and recommendations.

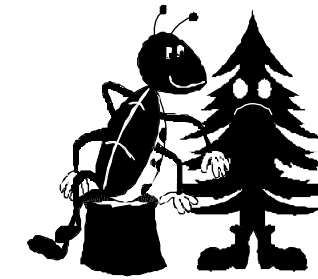


Instructional Objectives:

- Provide an overview of the course objectives

Key Points, Concepts, Examples & Facilitator's Notes:

- Remind the participants of the breadth and depth of the subject of forest health.
- This is a course on techniques, methods and process. You will not become a forest health expert in the next two days. True understanding and proficiency in the subject comes with field application, and continued learning.
- You will be introduced to the methods necessary to become competent over time.



Participant's
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Lesson
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Title:

Introduction

Silviculture Survey Accreditation Exam...

2000 Performance Objectives;

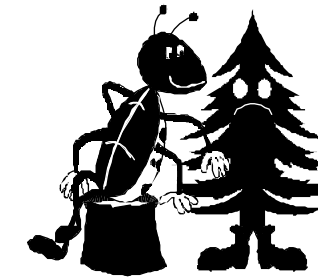
1. Understand current legal requirements as they relate to silviculture surveys and **how to stay current**.
4. List the reasons (criteria) for **stratification**, and describe why good stratification is important for a silviculture survey.
5. Choose the survey, **timing of the survey**, the type of data to collect and the sampling method to effectively address on-site critical factors.
10. Understand the purpose of the **walkthrough**.
17. Identify **critical factors** and explain how they affect the establishment, growth and development of the future stand and the achievement of stand objectives. This will include site limiting factors and management limiting factors such as:
 - Frost
 - Soil nutrients
 - Soil moisture
 - **Forest health factors**
 - Soil conservation hazards and sensitivities
 - Soil temperature
 - Non-timber management issues

Instructional Objectives:

- A conceptual understanding of how the content of this course is related to the performance objectives of the Silviculture Survey Accreditation process.

Key Points, Concepts, Examples & Facilitator's Notes:

- These points may be briefly discussed. The facilitator may suggest methods for staying current, such as visiting surveys-related web sites, attending work shops and training such as this.
- This intended to be a brief topic.



Participant's
Workbook
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8

Lesson
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1

Title:

Introduction

Silviculture Survey Accreditation Exam...

23. Collect and **record data** on MOF field form FS 657 and 658.
26. **Summarize data** on MOF forms FS 659 and FS 1138A.
27. **Use** information from **data** analysis on FS 659 and FS 1138A to make appropriate administrative recommendations (i.e., establish more plots, label as NSR, FG, etc.)
30. **Identify forest health damage, along with the major regional forest health factors (biotic and abiotic).**
31. **Describe potential impacts of major regional forest health damage factors on the future stand.**

Instructional Objectives:

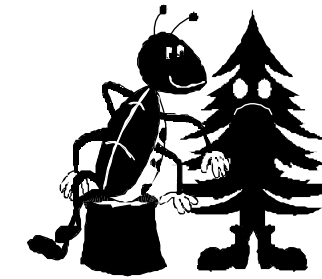
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Key Points, Concepts, Examples & Facilitator's Notes:

- As on the previous page, the goal is to give an understanding that this course is the source for developing the skills required for these Silviculture Survey Accreditation performance objectives. Performance objective 30 and 31 are the most specifically linked of them all. The 2000 version of the performance objectives identifies forest health damage to a level of 80% accuracy.
- There are 8 samples to be identified during the examination. (This is reviewed annually.) There are forest health issues to be dealt with during the written, case study and field data collection portions of the examination.
- A frequent question asked is, "If I do not get 80% on this single performance objective, do I fail the exam?". The quick answer is, "Yes". However, the examiner has a great deal of judgement in the application of the final recommendation for accreditation. Where a person fails only a single performance objective, exceptions can be made with justification by the examiner.



Forest Health for Silviculture Surveyors Facilitator's Guide



Participant's
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Overhead
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9

Lesson
Number:

1

Title:

Introduction

Forest Health Legislation

Forest Practices Code of BC Act

Silviculture Practices Regulation

Operational Planning Regulation

Administrative Remedies Regulation

plus....

17 forest health related Guidebooks



Instructional Objectives:

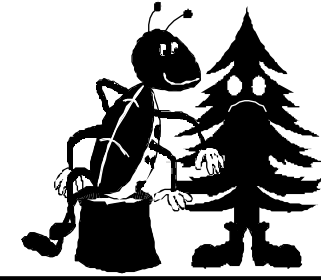
- Awareness of the availability of the various guidebooks to assist with developing an understanding of forest health.
- Awareness of the availability of guidebooks to be used as reference when you identify a certain forest health factor in a stand being surveyed.

Key Points, Concepts, Examples & Facilitator's Notes:

- It is important to evaluate forest health data because it is required by law. Sections 25. (b) (v) and 26. (b) (iii) of the Silviculture Practices Regulation requires the reporting of incidence of damage by forest health factors affecting trees.
- Accurate detection of forest health factors at the time of the free growing survey is important since there are no formally scheduled surveys after this survey. If a forest health factor is missed during the free growing survey, you may be stuck with it until the next harvest.
- Inquire if anyone knows the basic legislative requirements for collecting forest health information.



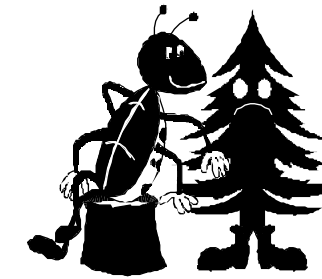
Forest Health for Silviculture Surveyors Facilitator's Guide



Key Points, Concepts, Examples & Facilitator's Notes:

• The guidebooks are no longer being distributed free of charge. They are available from the Ministry of Forests web site: WWW.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/guidetoc.htm. The list of guidebooks that contain forest health related information are:

- Bark Beetle Management
- Dwarf Mistletoe Management
- Management of Terminal Weevils in BC
- Pruning
- Silviculture Surveys
- Stand Management Prescriptions
- Establishment to Free Growing (6 - one for each Forest Region)
- Defoliator Management
- Forest Health Surveys
- Pine Stem Rust Management
- Root Disease Management
- Silviculture Prescriptions



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Title:

Importance

Annual Losses to Forest Pests....

Based on the 1994/95 Ministry of Forests Annual report
table C-2p;

	Bark Beetles	Defoliators	Dwarf Mistletoes	Root Diseases	Total
Cariboo Region	439	471	350	221	1,481
Total of All Regions	2,459	1,679	1,640	1,367	7,145

That is about 10% of the total volume harvested

EACH YEAR!

Instructional Objectives:

- A brief introduction to the level of impact forest health factors have on the amount of wood volume produced in BC.

Key Points, Concepts, Examples & Facilitator's Notes:

- The 94/95 Ministry of Forests annual report was the last year containing these figures; more recent values are not yet available. Data may be available later in 2000 for the 98/99 fiscal year. The facilitator may wish to produce a replacement table when more recent data is available.
- There may be variation in the interpretation of these values. Some of the volume indicated in the table may be from salvage harvesting.
- Figures vary greatly from year to year. Defoliators, for example, are known to be cyclic. Mistletoe, however, is rather stable on a yearly basis, but should be declining over time with the application of management practices that reduce the impact of the disease.
- Not all of the volume loss each year can be, nor should be, captured through forest management activities.



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Title: **Importance**

Annual Losses to Forest Pests....

Based on the 1994/95 Ministry of Forests Annual report
table C-2p;

	Bark Beetles	Defoliators	Dwarf Mistletoes	Root Diseases	Total
Kamloops Region	165	143	260	224	792
Total of All Regions	2,459	1,679	1,640	1,367	7,145

That is about 10% of the total volume harvested

EACH YEAR!

Annual Losses to Forest Pests....

Based on the 1994/95 Ministry of Forests Annual report
table C-2p;

	Bark Beetles	Defoliators	Dwarf Mistletoes	Root Diseases	Total
Nelson Region	57	32	98	58	245
Total of All Regions	2,459	1,679	1,640	1,367	7,145

That is about 10% of the total volume harvested

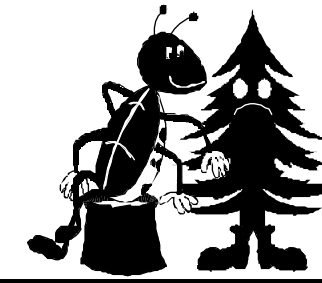
EACH YEAR!

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Title: **Importance**



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Number:

2

Title:

Importance

Annual Losses to Forest Pests....

Based on the 1994/95 Ministry of Forests Annual report
table C-2p;

	Bark Beetles	Defoliators	Dwarf Mistletoes	Root Diseases	Total
Prince George Region	1,595	1,025	262	529	3,411
Total of All Regions	2,459	1,679	1,640	1,367	7,145

That is about 10% of the total volume harvested

EACH YEAR!

Annual Losses to Forest Pests....

Based on the 1994/95 Ministry of Forests Annual report
table C-2p;

	Bark Beetles	Defoliators	Dwarf Mistletoes	Root Diseases	Total
Prince Rupert Region	162	0	315	73	550
Total of All Regions	2,459	1,679	1,640	1,367	7,145

That is about 10% of the total volume harvested

EACH YEAR!

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Title:

Importance



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Title: **Importance**

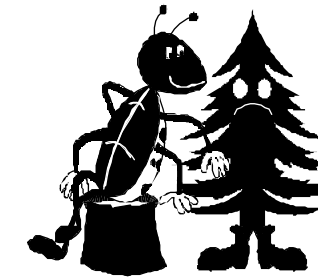
Annual Losses to Forest Pests....

Based on the 1994/95 Ministry of Forests Annual report
table C-2p;

	Bark Beetles	Defoliators	Dwarf Mistletoes	Root Diseases	Total
Vancouver Region	41	8	355	262	666
Total of All Regions	2,459	1,679	1,640	1,367	7,145

That is about 10% of the total volume harvested

EACH YEAR!



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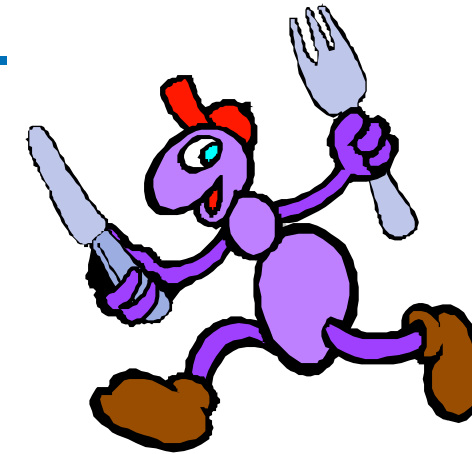
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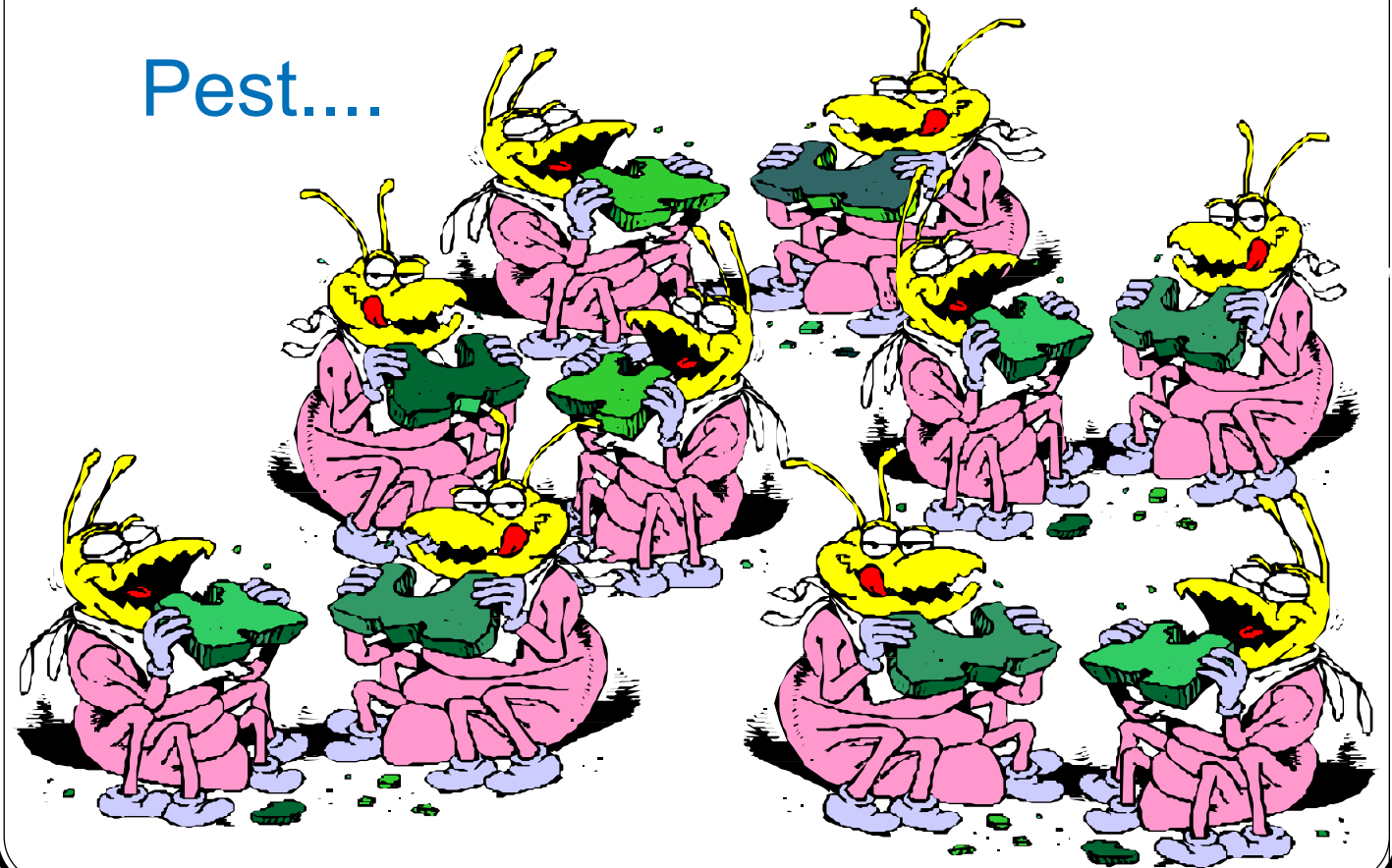
Importance

Factor....



Endemic vs Epidemic

Pest....

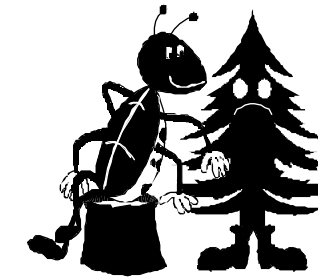


Instructional Objectives:

- An understanding of the terminology.

Key Points, Concepts, Examples & Facilitator's Notes:

- The terminology employed within forest health continues to evolve.
- A forest health *factor* is anything that can damage, slow the growth of, or kill, trees.
- These are present in every forest. They are an essential, naturally occurring component of a healthy forest ecosystem. At low levels, they are considered *endemic*.
- When their population or level of damage has a detrimental impact on the intended use of the forest, we refer to them as *pests*.
- When the damage resulting from the activities of a forest health factor puts our intended management objectives at risk, they are considered at *epidemic* levels.
- Add a local example such as Ips spp. being present in most forests at endemic levels, versus the spruce bark beetle epidemic in the Bowron valley.
- Solicit local examples of both factors and pests from the participants.



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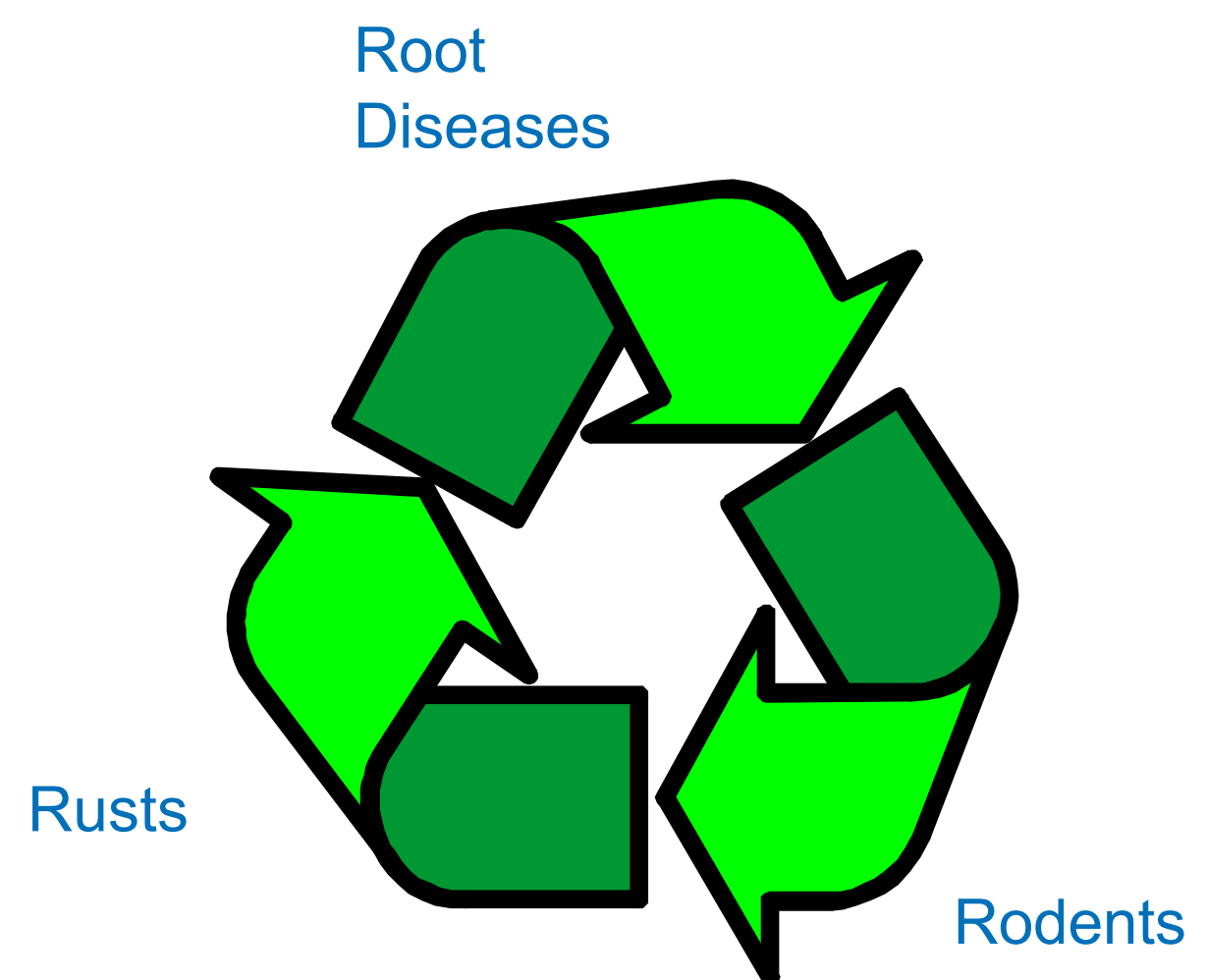
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Importance

Mother Nature's Recycling Team?

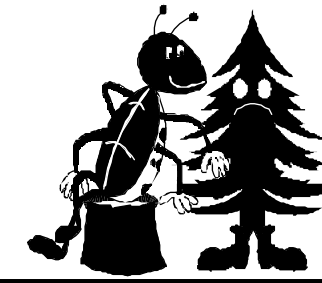


Instructional Objectives:

- A new look at forest health factors. They have both acceptable and unacceptable impacts on forests.

Key Points, Concepts, Examples & Facilitator's Notes:

- To keep a balanced view point on forest health, we introduce the beneficial aspects of forest health factors. The concept of replacing the conventional three R's of recycling (Reduce, Reuse, Recycle), is obviously not a reality. The goal is to begin thinking of forest health factors in a new way.
- Not every forest health factor requires a treatment.
- A few examples of the beneficial impacts of forest health factors can be introduced:
 - In dense young pine stands, hare populations increase with the benefits of the protective canopy. As the population increases, food becomes more scarce. They begin to feed more regularly on the cambium of the young pine. Mortality occurs in the pine. With the reduction in density (crown closure), predators reduce the hare population. The dead pine begin the decomposition process and become organic nutrients for the surviving pine. "Thinning and fertilization - Eco-friendly and free".
 - Their effects contribute to biological diversity. Small pockets of damage result in greater variation of species and ages across the landscape. With greater variation, there is a lower risk of catastrophic loss.
 - Trees killed by one organism are often used by another organism.



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Foundation

Types of Forest Health Factors

Animal

deer, rabbits, squirrels...

Abiotic = 'non-living'

sun, wind, snow...

Diseases

root disease, stem disease, mistletoe...

Insects

aphids, defoliators, weevils...

Treatments

logging, planting, thinning...

Vegetation

herbs, shrubs, trees...



Instructional Objectives:

- Continued development of the terminology.

Key Points, Concepts, Examples & Facilitator's Notes:

- The forest health factors have been grouped into 6 general types. These groupings are used in the organization of the abbreviation system we use.
- The facilitator may wish to ask the group to suggest additional examples of each type.
- A discussion of the damage each of these groups cause could be encouraged.



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Forest Health Abbreviation System

General **to** **Specific**

Disease **R**oot **A**rmillaria

General Type of Specific
Damage Damage Species
Type

The FS747 has 160 of the more common ones.
At last count there were,

210

The complete list can be found in the appendix and at:

http://www.for.gov.bc.ca/isb/datadmin/pest_species_codes

Instructional Objectives:

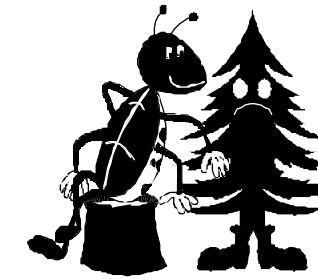
- Introduction to the three letter abbreviation system employed in BC.

Key Points, Concepts, Examples & Facilitator's Notes:

- There is no need to intentionally memorize these. The FS 747 is your field reference.
- As you work with them, the common pest codes you use will “stick” in your memory.
- 210 of them may be intimidating, but you will use a much smaller subset in your daily job.
- There are three letters, and three positions, going from general to specific. There is a logical method to the naming system. The first letter is very general. This is the general group or damage type of forest health factor: D for disease, I for insect, T for treatment, etc. The second letter is more specific. It tells us more about the location of the damage: R for root, S for stem and F for foliage. It can also describe the kind of damage: M for mistletoe, T for tree competition and H for Harvesting. The third letter signifies the particular species.
- More abbreviations may be “complicated”, but “try writing the common name or the Latin name of any one of these into the tiny little boxes on the survey field cards.....”
- Remind the participants that these codes change frequently. You may wish to use the example that “A” for animal was changed from “A” to “W” (for wildlife) and back to “A” in two years during the late 1990's.
- Surveyors should begin each field season by finding the most current version of the FS 747.
- Suggest that this is a good item to add to a prework conference checklist.



Forest Health for Silviculture Surveyors Facilitator's Guide



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TOP TEN

Most Important Forest Health Factors



...but which ten?

*See Establishment to Free Growing Guidebook

Instructional Objectives:

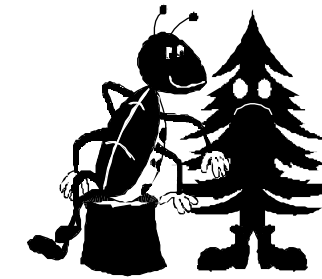
- Concentrate the learning on the most important forest health factors.

Key Points, Concepts, Examples & Facilitator's Notes:

- The premise of using the David Letterman Top Ten list may seem unusual. It is reasonably well known. It keeps a "light/fun" atmosphere and is a reasonable lead-in to the next concept: that some forest health factors are more important than others. There is a wide range of damage resulting from the various forest health factors.
- For example, the pitch twig midge (ISG) causes a right-angle deformation of the young branches on lodgepole pine. A small amount of nutrients are "stolen" from the branch by the little insect. On the other hand, root diseases "KILL" trees and make the soil "infected" for many years.
- The "Top Ten" are the forest health factors that must not be mis-identified. They also must be recorded in a plot, without fail. "You must get these right." It is never acceptable to ignore these.
- There may be more or less than ten. (The number is not important.) There is usually a small handful of very important forest health factors in a particular area.
- The list varies for each forest region, and for each biogeoclimatic subzone.
- The list changes over time. Many individual forest health factors affect trees of only certain ages.
- Individual Forest Districts have also made lists of their version of the "Top Ten" and go so far as to say "don't bother telling us about the insignificant ones like IAG or ISG unless it gets severe."



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Hints...

Establishment to Free Growing
Guidebook (1995)...

(...but be careful, watch for errors)

Hazard Maps

Silviculture Prescription

District & Region Staff

Co-workers



Instructional Objectives:

- Introduction to some resources.

Key Points, Concepts, Examples & Facilitator's Notes:

- Some participants may still be overwhelmed with their new level of responsibility to identify and record up to 210 forest health factors. The goal is to give them some reassurance that there are some hints and reference materials to assist them with what forest health factors to expect in an area.
- The most useful of the listed materials is the Establishment to Free Growing Guidebook (1995) for each Forest Region. It contains detailed tables of the forest health factors you would expect to encounter in each of the biogeoclimatic subzones within the Forest Region. An example is found on the next page.



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Prince Rupert Region SBS

Forest Health Agents

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Subzone

Tree species

Abies

Disorders

shoot-bud frost kill

cambium blister rust

lodged pine dwarf mistletoe

pine (red ring) rot

rhizina root disease

rust-red stringy rot

strobiliform blister rust

tomentosus root rot

western gall rust

Decay fungi are a concern only with partial cutting prescriptions

% occurrence

L = 1-32%

M = 33-64%

H = 65-100%

? = uncertain

i = not present

April 1995

Full Size Version
on the Next Page

Instructional Objectives:

- Introduce participants to the forest health charts.
- Be warned of the errors that may be present.

Key Points, Concepts, Examples & Facilitator's Notes:

- The forest health tables are found in the Establishment to Free Growing Guidebooks (1995) for each of the six Forest Regions. The example provided is for the Prince Rupert Forest Region. However, all of the regions have a similar format.
- The intent is excellent: to provide a "Top Ten" list for each biogeoclimatic subzone and tree species!
- The facilitator may also wish to increase the local relevance by making an overhead of the particular page, and/or copies to distribute to the participants, for the area that will be visited on Day 2.
- A warning should also be issued. The example used was selected since it has errors. These can be found where there is western gall rust on spruce. This is a typographical error. The developers are aware of it. The participants should be, as well.
- These tables will not be included in the revised version of the Establishment to Free Growing Guidebook proposed for summer 2000. Individual regions may provide similar references, however.



Forest Health for Silviculture Surveyors
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Prince Rupert Region SBS

Forest Health Agents

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Subzone	dk			mic2				wk3			
	BI	PI	Sx	BI	PI	Sw	Sx	BI	PI	Sw	Sx
Tree species											
Abiotic											
shootbud frost kill	H		H	H		H		H		H	
Diseases											
cumandra blister rust		M			M				M		
lodgepole pine dwarf mistletoe		M			M				M		
pine (red ring) rot †		L	L		L	L	L		L	L	L
trifoliate root disease		L	L		L	L	L		L	L	L
rust-red stringy rot †		M			M				M		
slabelform blister rust		M			M				M		
tomentosus root rot	M	M	M		M	M	M		M	M	M
western gall rust	M				M				M		

† Decay fungi are a concern only with partial cutting prescriptions

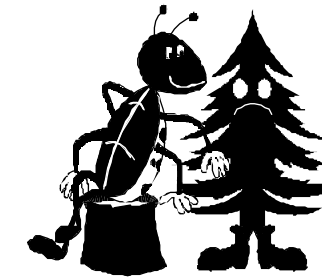
% occurrence: L = 1-32% M = 33-65% H = 66-100% ? = uncertain ! = not present

April 1995

If a listed potential pest is found on a site in the subzone, consider it important for management. The (H), (M) and (!) designations identify expected relative pest occurrence, but not pest hazard.



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Instructional Objectives:

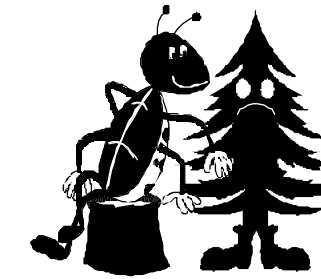
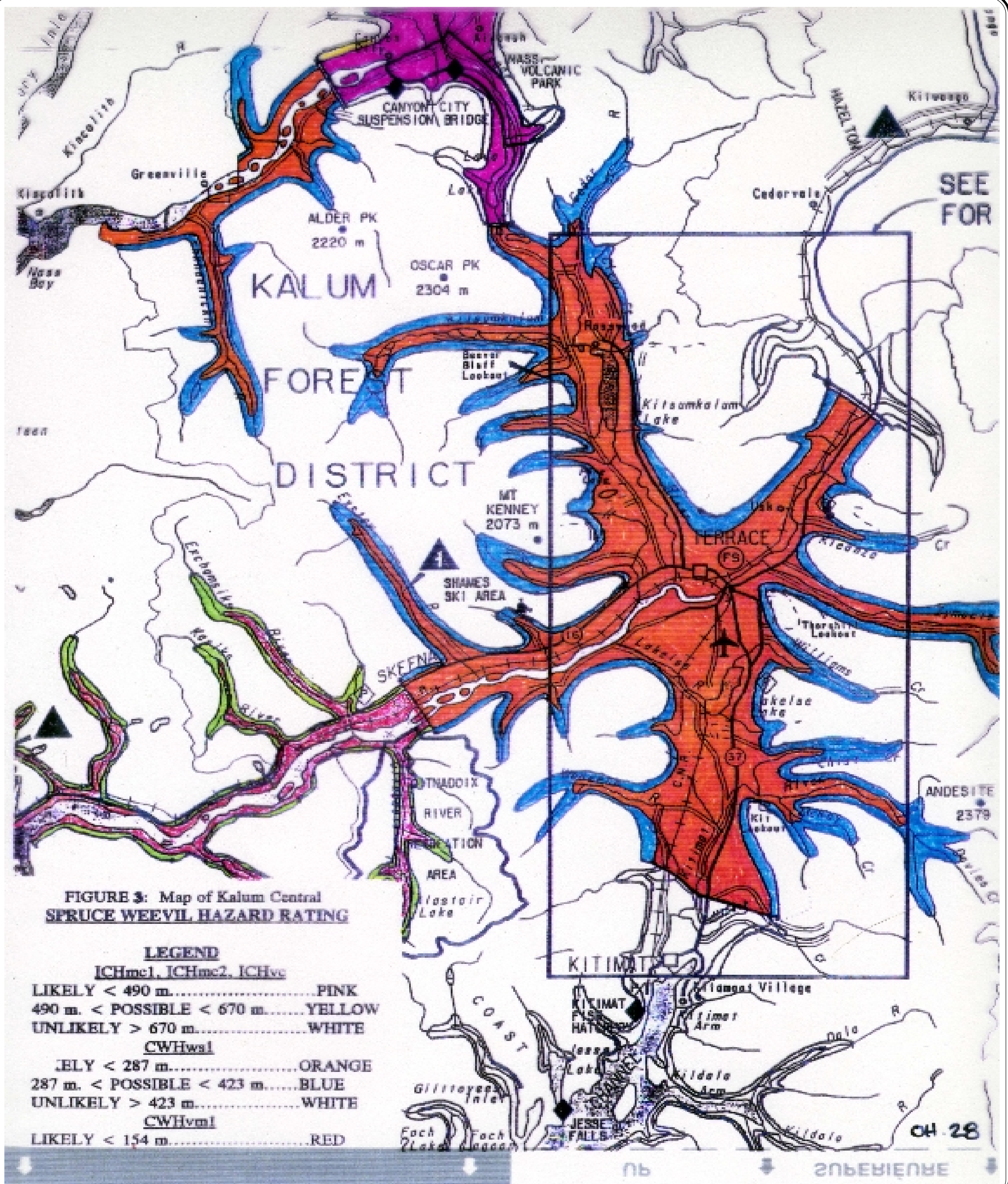
- An awareness of Hazard maps and their use.

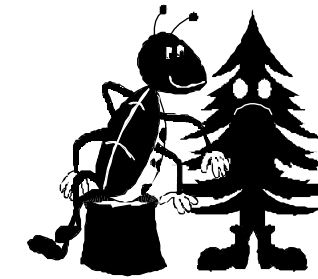
Key Points, Concepts, Examples & Facilitator's Notes:

- This is a very brief topic. The objective is to make the participants aware of the presence of such maps, what they look like, and how they might be used.
- Hazard maps are the graphical representation of the risk of a forest health factor in a geographic area. They are often cross referenced to biogeoclimatic classification.
- Hazard maps are not available for all pests in all regions of the province.
- Contact individual Forest Districts for availability.
- The sample map provided indicates a high risk of spruce leader weevil attack in the orange and pink areas. The two different colours represent two different biogeoclimatic subzones.



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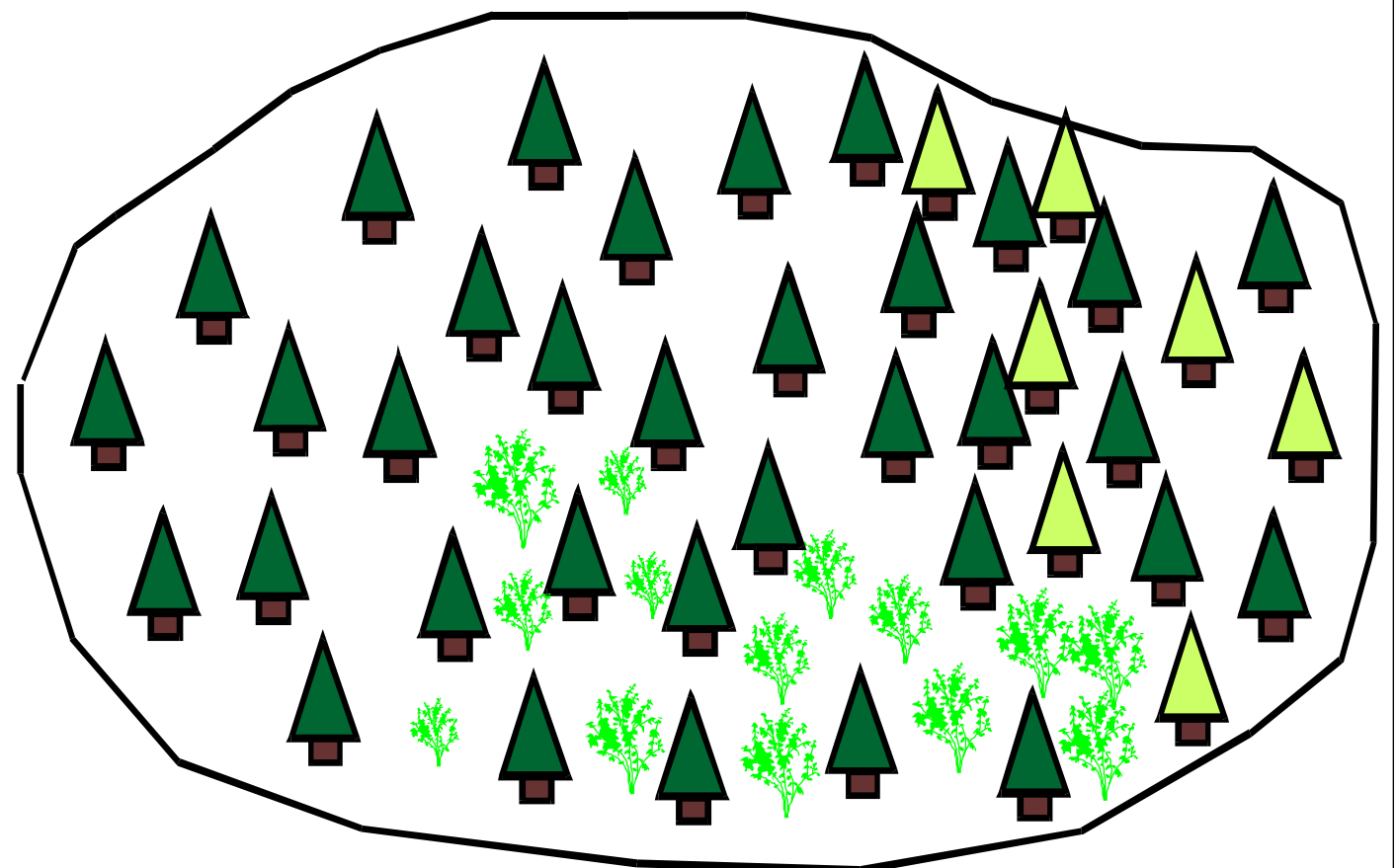
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Stratification =
Separation of Different
and
Grouping of Similar



Instructional Objectives:

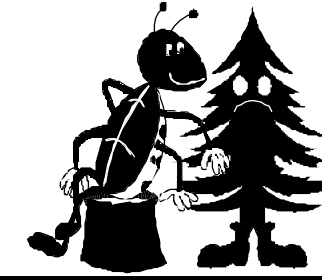
- Introduce stratification as it relates to forest health factors.

Key Points, Concepts, Examples & Facilitator's Notes:

- One of the criteria for stratification specified in the Surveys Guidebook is changes in forest health factors present.
- The goal of stratification is to separate portions of the survey area into "like populations".
- You can think of stratification as identifying portions of the survey area that are "different" than other portions.
- For example, the east side of a particular block has a high (30%) incidence of mistletoe, while the west side of the same block has no incidence of mistletoe. This would indicate that there are at least two strata.



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What about the others?

All forest health factors present
on All trees in

All plots are recorded.

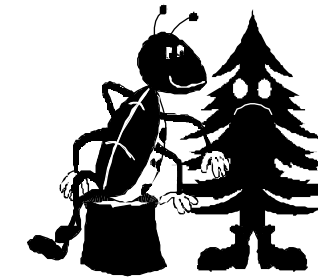
Missing one of the "TOP TEN" is a
serious error.

Instructional Objectives:

- When and where to tally which forest health factors.

Key Points, Concepts, Examples & Facilitator's Notes:

- This is often a misunderstood concept. Many believe (have been misinformed), that only trees that exceed some level of infection, or some percentage of damage, are recorded. THIS IS WRONG. All trees in every plot are assessed for the presence of any forest health factor.
- Some Forest Districts may establish their own version of the "Top Ten" and instruct surveyors to disregard others if they are at endemic levels. This is acceptable only if the Forest District has developed such a list. This list may also be included in your contract.



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Title:

Identification

The **#1** Key to effective forest health
identification....



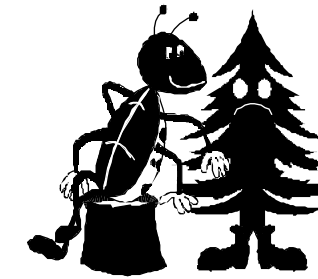
Observational Skills!

Instructional Objectives:

- As the overhead indicates, the importance of observational skills.

Key Points, Concepts, Examples & Facilitator's Notes:

- What else can we say here? "If you don't see it, you can't record it." The key is in strengthening the personal 'mental link' between the eyes and the forest health database in the brain. There is a very important distinction between 'looking' and 'SEEING'.
- You may wish to pass on a short story similar to this one. A young man taking the surveys accreditation exam says to the examiner, "I don't think I did very well on the forest health section of the exam. I've never seen any of those things before. You see, we don't have any forest health in _____." The point is, forest health factors are everywhere. Beginners, like the person in the story, often overlook them. Or, they may not be making the link between seeing them and recognizing their significance.
- A walkthrough is the perfect time to practice this. Walk over to every funny looking, odd-coloured tree you see. Chances are there is some forest health factor present.
- You may even be so bold as to issue a challenge. Offer a reward to anyone who can find a block with no forest health factors present.
- Our forests have more forest health factors than we often "SEE".



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Title:

Identification



Instructional Objectives:

- Develop a familiarity with the evidence (signs and symptoms) of forest health factors.

Key Points, Concepts, Examples & Facilitator's Notes:

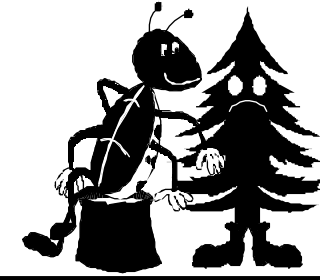
- To encourage group participation, pose the question, "What evidence should we look for?" As answers are offered, write them on a flip chart or white board.
- You may also wish to ask the person offering a response to provide a description of the term. For example, someone will suggest 'frass' is evidence of insect attack. You may want to ask them, "What is frass?" or, "Where will we find it?", "How is it produced?" and, "What does it indicate?"

Participants should be encouraged to record the signs and symptoms, and the responses to the facilitator's questions, in their workbook.

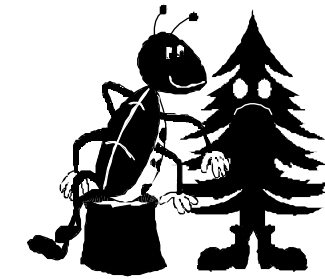
- You may wish to organize the suggestions by requesting the evidence in relation to the groups of forest health factors.
- Some of the evidence suggested may be:
 - **animal damage**
 - teeth marks, droppings, multiple vertical scratches from antlers, hair stuck to resin on scars, history or use, foot prints, tunnels at ground level, large sections of bark removed high in the tree
 - **abiotic injuries**
 - widespread damage, results evident early in the spring or following a known weather event



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- **diseases**
- discoloration of the foliage, distress cone crops, resinosis, fruiting bodies, swelling, apparent shrinkage
- **insects**
- frass, entrance and exit holes, blue stain, black stain, the insect itself, signs of chewing
- **treatment damage**
- saw marks, scars from machinery
- **vegetation problems**
- young trees crushed under grass or herbs, foliage abraded or battered off, poor vigour and/or mortality resulting from extremely high density



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Title: Identification

Survey Timing

AGENT	HOST	STAGE EVIDENT*	SEASON EVIDENT**	DURATION EVIDENT
ANIMALS				
Hare	All	up to 6 cm dbh	◆	several years (clipped seedlings evident ~1 yr)
Squirrel	PI (others)		◆ caused in spring & summer	several years
Vole	All		◆ caused in fall or winter	2 years with mortality several years without
Porcupine	PI, Spruce, Lw (Hw)		◆	several years
Ungulates	All (Ss)		◆	1 to several years
DISEASES				
Rusts	PI (other pines)		◆ gall rust other rusts	several years (stem rusts most easily seen in June)
Mistletoes	Hw, PI, Fd, Lw			several years to several decades
Root Rots - annosus - armillaria - black stain - phellinus - tomentosus	Hw (True Firs, Ss) All Fd, PI (Hw) Fd, True Firs, (Lw) Sx (PI)	armillaria = all	when snow free	several years to several decades
* STAGES				
Seedling 0 - 2 Yrs Regen. 3 - 10 Yrs Sapling 11 - 20 Yrs Pole 21 - 80 Yrs Mature 80+ Yrs All Ages				
** SEASONS				
Spring Summer Fall Winter ◆ All				

Instructional Objectives:

- Introduction to the Survey Timing Table

Key Points, Concepts, Examples & Facilitator's Notes:

- This table is found on page 18 and 19 of the Silviculture Survey Guidebook.
- It is intended to assist with the scheduling of surveys where forest health factors are known to be present. If the surveyor knows the time of year when the best evidence for the forest health factor is most evident, they can then collect the most accurate information about the presence of that factor.
- It is also beneficial to know the best time of year to see the forest health factors for scheduling treatments such as stem disease eradication treatments or leader pruning treatments.
- It also assists with developing the understanding that certain forest health factors affect trees within specific age classes.
- Survey timing is especially important with defoliators, since the damage increases over the summer, and may be more difficult to detect by the following spring.



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Title: Identification

Survey Timing

AGENT	HOST	STAGE EVIDENT*	SEASON EVIDENT**	DURATION EVIDENT
INSECTS				
Balsam Woolly Adelgid	True Firs		◆	1 year to several years
Warren's Root Collar Weevil	Sx, Pl		◆	several years
Lodgepole Pine Terminal Weevil	Pl		◆ most obvious in summer & fall of year attacked	several years
White Pine Weevil	Ss, Sx		◆ most obvious in summer & fall of year attacked	several years
ABIOTIC				
Frost	All			1 to 2 years
Snow	All		◆	several years to several decades

* STAGES

Seedling 0 - 2 Yrs Regen. 3 - 10 Yrs Sapling 11 - 20 Yrs Pole 21 - 80 Yrs Mature 80+ Yrs All Ages

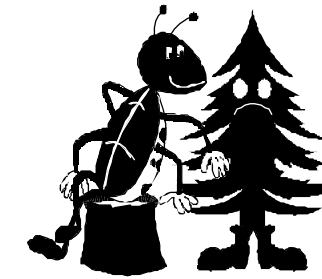
** SEASONS

Spring Summer Fall Winter All

Instructional Objectives:

- continued

Key Points, Concepts, Examples & Facilitator’s Notes:



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X

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Title:

Identification

Let's try one...

In two groups;

Field Guide to Forest
Damage in BC

Field Guide to Pests of Managed
Forests in BC

replaced in 1999 by above publication

Instructional Objectives:

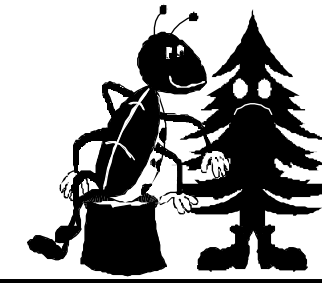
- Application of the Reference material.

Key Points, Concepts, Examples & Facilitator's Notes:

- The class will now have an opportunity to put some of the new concepts into practice.
- Break the participants into groups of three to five people.
- You may wish to group those with the two different books into separate groups.
- Issue each group a forest health sample. Ask them to use the reference books to determine the common name, the pest code and the list of hosts for the sample.
- The wrong answers can be useful in the form of a question back to the class, "Why is this sample not...".
- This concept can be continued with the slides and additional fresh samples, as time permits.
- Option: turn it into a game:
- Write the group's answer on a scrap piece of paper and place it into the "hat" (box, bowl or other).
- This process can be repeated as many times as desired, given the time allocation.
- Prizes may be given to the group with the correct answer.



Forest Health for Silviculture Surveyors Facilitator's Guide



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Title:

Identification

Did you say slide show?



Instructional Objectives:

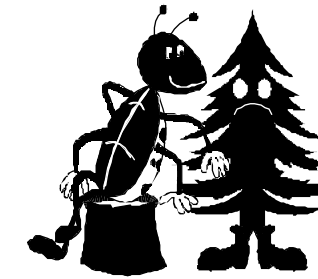
- Provide an opportunity to view some common forest health factors in a slide show format.
- Give participants the opportunity to view forest health factors which they otherwise may not have the opportunity to see in the field.

Key Points, Concepts, Examples & Facilitator's Notes:

- The Facilitator's Guide contains a collection of over 100 slides from all over the province. These slides show different forest health factors as they appear in the field.
- The facilitator should create a locally relevant subset of slides. You may choose to provide fresh samples in addition to the ones shown on the slides.
- The slide presentations have been known to "put people to sleep", so be creative, and keep it as short and as exciting as you can. We suggest a few slides, followed by a fresh sample; more slides, then a break.



Forest Health for Silviculture Surveyors Facilitator's Guide



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Title:

Identification

Other sources of help...

Co-workers
Supervisors
Internet

A few good ones are:

http://www.fcmr.forestry.ca/fhn/ma/insect_e.htm

<http://www.pfc.forestry.ca/nursery/>

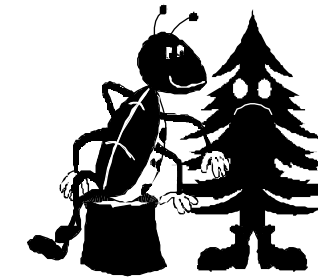
Ministry of Forests District Staff
Ministry of Forests Region Staff
Universities and Colleges
Canadian Forestry Service

Instructional Objectives:

- Point out other sources of identification assistance.

Key Points, Concepts, Examples & Facilitator's Notes:

- When you find a forest health factor and you are having difficulty identifying it, start with local sources. Ask your co-workers and your supervisor. It can be a positive learning experience for the entire crew/company.



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Appendix

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33, 34, 35

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Title:

Identification

Hints for sending a specimen to Canadian Forestry Service

Read the instructions on the back of the form.

Include good, clear photographs from various angles.

Package moist samples in paper rather than plastic.

Whole samples are better than fragments (where practical).

Film containers with a tissue are good for insect samples.

Animal droppings and debris from suspected animal damage is also useful.

Ship the samples as soon as they are collected.

Expect three weeks or more for a reply.

A sample form is located in the Appendix.

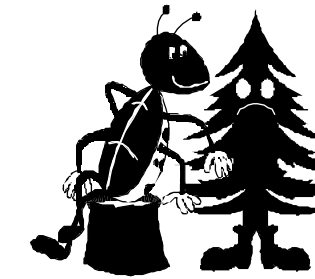


Instructional Objectives:

- There is expert help available.
- These experts have a preferred format for delivery of the samples.

Key Points, Concepts, Examples & Facilitator's Notes:

- The Canadian Forestry Service offers a forest health identification service. For difficult issues, we do have the option to send a sample for professional verification.
- The service is free. But try not to abuse it.
- On the back of the form, see "Specimens Accepted".
- The Canadian Forestry Service (CFS) is especially interested in receiving samples of species found outside the generally known range.
- Try pointing out a few of the important points within the list of hints, such as packaging moist samples in paper rather than plastic. If the sample arrives mouldy, the accuracy of the identification may be reduced.
- The sample form is included on overhead 32 and 33.



FOREST INSECT AND DISEASE COLLECTION AND IDENTIFICATION

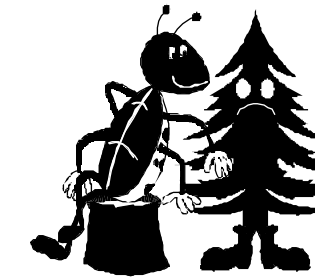
FOR SUBMISSION TO THE CANADIAN FOREST SERVICE (see reverse for Procedures.)

FS 466 HSP 96/8 33232 18784

DISTRIBUTION: WHITE - CANADIAN FOREST SERVICE; CANARY - REGIONAL FOREST HEALTH SPECIALIST; PINK - ORIGINATOR'S FILE



Forest Health for Silviculture Surveyors Facilitator's Guide



Collection and identification of forest insects and fungi are essential for effective forest management. Legal, scientific and historical benefits of expert identification and archiving include records for quarantine and regulatory issues, substantiation of current outbreaks and previously undetected pests, and documentation of research results.

SPECIMENS ACCEPTED

Please submit only the following types of specimens:

- insects, diseases and fungi from forest habitats or wood products (not from agricultural, garden or ornamental plants, or stored products);
- pests causing new or major outbreaks;
- field identifications by contractors, only by prior arrangement by Ministry regional or district staff;
- materials to document special studies, surveys, research and publications;
- unusually severe damage by known or unknown factors, for future reference.

REPORT INFORMATION

All specimens sent to the Canadian Forest Service (CFS) must include a FS 466 form or equivalent with the following minimum data (letters correspond to those on front of this form):

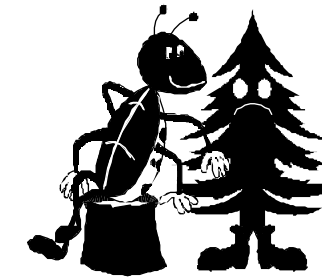
- A** Geographic location of collection (reference the collection location to a recognized locality on 1:100 000 or 1:250 000 map sheet), and either UTM grid or latitude/longitude.
- B** Date of collection (year-month-day, e.g., 96 06 04).
- C** Name, affiliation, mailing address, telephone and fax numbers, and e-mail address of collector. Give name, affiliation, mailing address, telephone and fax numbers, and e-mail address of individual requesting identification, under "Remarks", if different from "C".
- D** Host/substrate information (host species, age, condition, number of hosts similarly affected, location of damage on host, or type of substrate, if not a plant).
- E** Description of area (e.g., non-forest, natural forest, plantation, bog, urban).
- F** Damage intensity and occurrence.
- G** Note unusual conditions/contributing factors, e.g., heavy frost, drought, chemical applications, proximity to roads, etc. Attach extra sheet if needed for remarks.

SPECIMENS AND SHIPMENT

Special care must be taken to collect an adequate specimen and to prevent deterioration of material in transit. Inadequate or spoiled material cannot be processed. Ship live material by Priority Post or courier, and use crush-resistant containers (e.g., mailing tins). For labels on vials, notes and enclosures, use HB pencil or India ink to ensure permanency. Except for shipping defoliating insects, **NEVER USE PLASTIC BAGS OR WRAP**, and do not moisten specimens. For fresh disease or fleshy fungi collections, prevent mould contamination by using paper envelopes, paper wrapping and cardboard boxes for shipping.

- **Larvae of defoliators:** Ship 10-20 live larvae in a tied plastic bag with sufficient foliage for 3-5 days of feeding. Ship additional larvae in small screw-top vials containing 70-80% ethanol (preferred) or isopropyl (rubbing) alcohol. Vials must be well sealed and packaged with sufficient absorbent material and a waterproof wrap to prevent contamination or leakage if a container should break.
- **Larvae of bark beetles or woodborers:** Collect borers in small-diameter (<10 cm) stems or shoots. Ship larvae from larger material in alcohol, as above. Enclose a sample of typical damage, packaged separately.
- **Pupae and hard-bodied insects:** Ship live material in small containers with packing to protect during shipping. Place dead adult specimens between layers of tissue paper (no cotton) in a rigid container with sufficient packing to prevent any movement of material within the container.
- **Foliar diseases:** Collect 20 cm-length branches with leaves. Press flat between newsprint or, for bushy specimens, wrap in a paper bag. Include a cutting of healthy foliage (labelled) for comparison, and flowers or fruit of host plant, if identity unknown. For spring collections, include overwintered, old foliage from ground litter or on tree for possible mature fruiting bodies.
- **Stem and branch diseases:** For small-diameter material, cut a 20 cm-length of affected and adjacent healthy stem material. For larger material, cut a section of at least 10 x 10 cm from the edge of a canker. Include affected and healthy-appearing tissue. Include a section of bark with any apparent fruiting bodies.
- **Decay in wood, root disease and blowdown trees:** Determine tree species. Collect any conk or mushrooms closely associated with decay. At any fungal conks, areas of breakage or suspect decay, including decayed or diseased roots, cut a wood section of at least 15 cm x 15 cm x 15 cm that includes decayed, stained and apparently sound wood. Describe decay. For suspect root disease, select trees that were recently killed, fallen or declining (symptomatic), and avoid trees or roots that have been dead for one or more years. Sample fresh roots with disease features such as pitching, mycelia and/or stain. Package wood samples and conks separately. Label and wrap in newsprint.
- **Fleshy Fungi:** Collect several specimens, especially of varying maturity. For ground specimens, pry as much of the mushroom as possible out of the ground with a knife. For specimens on wood, also collect a specimen of any underlying wood decay, as described above. Dry all fleshy fungi before shipping. Air-dry small fragile specimens in a warm dry place, and for larger fungi, heat-dry at 50°C. Spore prints from fresh collections can be submitted with dried specimens. Package in dry material to protect in transit.

SEND SPECIMENS WITH WHITE COPY OF THIS FORM TO: CANADIAN FOREST SERVICE
Pacific Forestry Centre
506 West Burnside Road
Victoria, B.C. V8Z 1M5
Attention: Insectary/Herbarium
Tel.: 363-0600 Fax: 363-6005



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Title:

Identification

What if I still don't know what it is?

General to Specific

Disease Root ? Unknown

General
Damage
Type

Type of
Damage

Specific
Species

Use this with care.

It tells others about your ability to identify forest health factors.

It can not be entered into computer compilation systems.

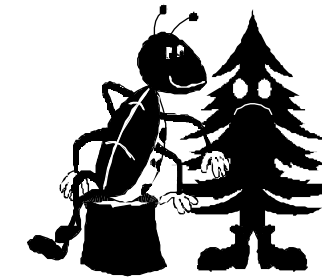
It should be used only until you have correctly identified the forest health factors.

Instructional Objectives:

- Coding methods for unknown forest health factors.

Key Points, Concepts, Examples & Facilitator's Notes:

- Even after the careful observation of a forest health factor, research about the factor using available reference material, and consultation with co-workers and supervisors, there may still be some uncertainty as to the positive identification of the sample.
- Special emphasis should be given to the fact that this is an interim measure. Positive identification is still required.
- You may also wish to point out the "impressions" you will be giving your client and/or your supervisor. "If all of your pest codes end in a ?, do we really want you doing our surveys?".



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Title: Application

Forest Health Data Collection

When and where does it apply?

Forest health data collection and analysis is an integral part of every silviculture survey.

**All the time,
every tree,
in every plot,
for every survey.**



Instructional Objectives:

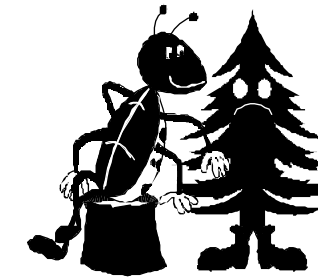
- Introduction to data collection.

Key Points, Concepts, Examples & Facilitator's Notes:

- It is a common misunderstanding that we only record forest health factors when they exceed some threshold level, and become pests. This MUST be corrected. There are no damage thresholds for recording the presence of a forest health factor in a plot.
- Where a single tree has multiple forest health factors, "record them ALL".
- The Silviculture Surveys Guidebook (page 17) makes reference to the "forest health survey" being an integral component of every survey.
- This is a similar misunderstanding to the recording of total trees. "We count ALL of them."



Forest Health for Silviculture Surveyors Facilitator's Guide



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Application

Field Descriptions for the FS 658

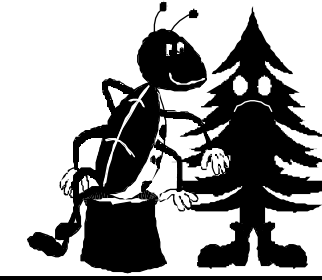
Field	Description
1	Total trees are recorded as usual. These values will be used in the subsequent calculations.
2	Total conifers are recorded as usual. These values will be used in the subsequent calculations.
3	Record the three letter pest code for each forest health factor found in the plot. Multiple rows will be required for multiple forest health factors in a single plot.
4	Record the number of trees that are alive and affected by the forest health factor.
5	Record the number of trees that are dead as a result of the forest health factor.
6	This space is left for comments related to the general health of the survey area. The comments here are not summarized. The comments are usually qualitative and based on visual observation.

Instructional Objectives:

- Provide a reference to assist with identifying the source for each data item.

Key Points, Concepts, Examples & Facilitator's Notes:

- The individual steps are reasonably simple.
- Emphasis should be that if positive identification of the cause of a particular symptom or specific damage is unknown, the "?" should be applied during field data collection. Following field data collection, continued research should be carried out in order to identify the specific forest health factor. When the positive identification is confirmed, the "?" can be replaced with the correct full three letter pest code.



Title: Application

Province of British Columbia		Ministry of Forests		SILVATURE SURVEY PLOT										PAGE								
REPORT NO. Fg 82L056-38 A		POINT OF COMMENCEMENT										LICENCE NO.		C.P.	BLOCK							
SURVEY TYPE OPENING NO. STRATUM		☐ WELL-SPACED ☒ FREE-GROWING PREFERRED AND ACCEPTABLE SPECIES										☒ PLANTABLE NUMBER "N" ☒ PREPARABLE MODAL "DA"		COMPETING VEGETATION			FOREST HEALTH					
BEARING & DISTANCE		LOT NO.	LAYER	TOTAL TREES	TOTAL CONIFERS	COUNT CONIFERS	COUNT HEIGHT	P	P	a	a	TOTAL W	TOTAL FG	TOTAL HEIGHT (cm)	AGE (year)	SPECIES	% COVER	HEIGHT (cm)	PEST CODE	LIVE TREES	DEAD TREES	
POC								Fd	Lw	Pl	Sx											
N 200m		1		16	9	8	20	6	1				M	175	9							
		Fd5Lw3Ac1At1-9-1.8m-10%																				
N 200m		2		6	5	4	40	3		1	1		5	230	9	1				W	1	0
E 200m		3		11	7	7	20	3		2			5									
S 200m		4		16	11	9	20	6	2				M	180	9							
		Fd5Lw3Ac1At1-9-2.0m-15%																				
S 200m		5		8	4	4	40	1	1		2		4	220	9	2	1					
		Fd6Lw2Ac1At1-8-1.6m-12%																				
Total		57	36																			

COMMENTS: deer browse found only on the fir branches



Forest Health for Silviculture Surveyors
Facilitator's Guide



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Title: Application

FS 659 - Front Side

BRITISH COLUMBIA SILVICULTURE SURVEY SUMMARY

USE THIS FORM TO SUMMARIZE INFORMATION FROM THE FS 657, FS 658, THEN USE THESE VALUES TO DETERMINE STOCKING STATUS AND SILVICULTURAL TREATMENTS REQUIRED.

PAGE OF

PROJECT IDENTIFICATION

LICENCE NO. LICENCEE NAME C.P. NO. BLOCK NO. MAPSHEET / OPENING NO.

STRATUM NO. STRATUM AREA PLOT MULTIPLIER TARGET MW MFG MAXIMUM PLOT PLANTING MP

BOG ZONE, SUBZONE, SITE SERIES

NO. PLOTS (n) EA / LAYER TOTAL TREES (T) TOTAL CONIFERS (TC) COUNT CONIFERS (CC) TOTAL (W) TOTAL (CP) TOTAL (FG) TOTAL (FP) TOTAL HEIGHT (Avg. cm) AGE (year) PLANTABLE (P) PRE-PARABLE (PR)

PLOT DATA (Transfer TOTALS from FS 658a for one stratum)

TARGET STOCKING STANDARD MINIMUM STOCKING STANDARD (p + a) MINIMUM STOCKING STANDARD (p) SILVICULTURAL COMPONENT

ha MSSp + a ha MSSp ha

SPECIES %

TOTAL TREES / ha

TOTAL CONIFERS / ha

COUNTABLE CONIFERS / ha (Maximum Density)

x pm + n =

x pm + n =

x pm + n =

x pm + n =

x pm + n =

x pm + n =

POTENTIALLY PREPARABLE / ha

SUM SILV. COMP. PREFERRED SP % x p + a WELL-SPACED / ha = TOTAL PREFERRED WELL-SPACED / ha

SUM SILV. COMP. PREFERRED SP % x p + a FG / ha = TOTAL PREFERRED FG / ha

SURVEY CONFIDENCE LIMITS FOR STOCKING FREE-GROWING

STANDARD DEVIATION STANDARD ERROR OF THE MEAN L90 CONFIDENCE INTERVAL LOWER CONFIDENCE LIMIT

± WELL-SPACED / ha ± WELL-SPACED / ha

FG SR NSR LAND STATUS NP (Unnatural) NP (Natural)

ha ha ha ha ha ha

INVENTORY COMPONENT

COMPILED BY DATE COMPILED Y M D ON-SITE COST / ha SOURCE OF FUNDS R

SP % SP % SP % SP % SP % SP % AGE (years) HEIGHT (m) SITE INDEX

3 → Fd 50 LW 30 At 10 Ac 10 9 1.8

FS 659-1 HSP 98/8 (Prior)

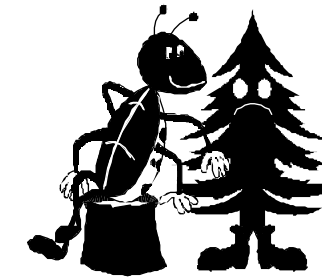
FILE ORIGINAL IN DISTRICT OFFICE ON OPENING FILE.

Instructional Objectives:

- Introduction to the front of the FS 659

Key Points, Concepts, Examples & Facilitator's Notes:

- The purpose of this card is for the manual compilation of the silviculture survey.
- There are no forest health specific components to this field card.
- All of the fields are completed as for normal silviculture surveys.



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Application

Field Descriptions for the FS 659 - Front Side

Field

Description

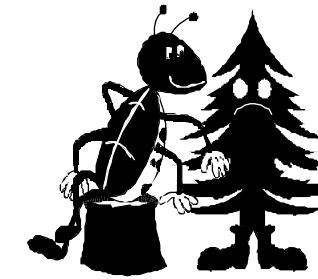
- 1 The total tree value in this field is transferred to column 2 on the back of the FS 659.
- 2 The total conifer value in this field is transferred to column 3 on the back of the FS 659.
- 3 The percentages for each forest health factor will be used in column 6 on the back of the FS 659.

Instructional Objectives:

- Provide a reference to assist with identifying the source for each data item.

Key Points, Concepts, Examples & Facilitator's Notes:

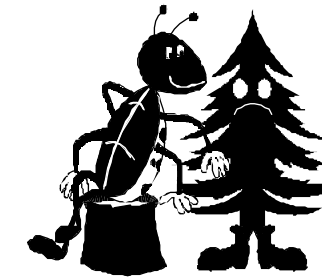
- The total trees (T) and total conifers (TC) are marked with numbers 1 and 2. The values in these fields are transferred to fields 1 and 2 on the back of the FS 659.



Title: Application



Forest Health for Silviculture Surveyors Facilitator's Guide



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Title:

Application

Field Descriptions for the FS 659 - Back Side

Field	Description
1	The three letter pest code recorded on the FS 657. One row per forest health factor.
2	The total tree value in this field is transferred from field 1 on the front of the FS 659
3	The total conifer value in this field is transferred from field 2 on the front of the FS 659
4	The total number of live trees affected by that forest health factor from each of the plots in the stratum.
5	The total number of dead trees killed by that forest health factor from each of the plots in the stratum.
6	Based on the inventory label
7	The sum of column 4 plus column 5, divided by the sum of column 2 plus column 5, then multiplied by 100
8	The sum of column 4 plus column 5, divided by the sum of column 3 plus column 5, then multiplied by 100
9	Column 4, divided by column 2 multiplied by column 6, then multiplied by 100
10	Where a treatment is required to reduce the impact of a forest health factor, descriptions should be entered here.
11	Alternate treatments should also be considered.

Instructional Objectives:

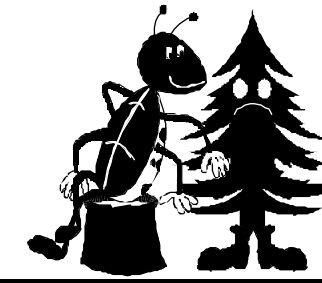
- Provide a reference to assist with identifying the source for each data item.

Key Points, Concepts, Examples & Facilitator's Notes:

- Allow the participants time to complete the calculations. Make yourself available for additional personal assistance.



Forest Health for Silviculture Surveyors Facilitator's Guide



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Application

Incidence =

the proportion (0 to 1) or percentage (0 to 100%) of entities (trees affected by forest health factors within a sample unit.)

Example:

the percentage of trees found with mistletoe

Severity =

the quantity of damage or damaging forest health factors affecting sample entities within a sampling unit. It is a damage rating measure.

Instructional Objectives:

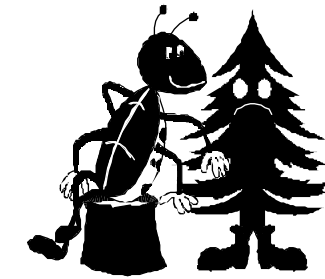
- Confirmation of terminology

Key Points, Concepts, Examples & Facilitator's Notes:

- It may not be clear to everyone the difference between the two terms:
- *Incidence* is a measure of “how many” are affected.
- *Severity* is a measure of “how bad” are they affected.
- Incidence is the value calculated in column 9 on the FS 659 and is the value used most commonly in the guidebooks.



Forest Health for Silviculture Surveyors
Facilitator's Guide



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Title: Free Growing
Damage Criteria

LOCATION OF DAMAGE	TYPE OF DAMAGE	TREE BEING ASSESSED IS UNACCEPTABLE IF:	HOST SPECIES	LIKELY DAMAGE AGENTS & DAMAGE AGENT CODES	COMMENTS
STEM	Wound (including sunscald and girdling)	<ul style="list-style-type: none">the tree has any wound which is greater than 33% of the stem circumference, orthe tree has a wound which is greater than 20% of the total length of the stem, orthe tree has a wound centred around an infection caused by a stem rust or dwarf mistletoe (See Note under Stem: Infection).	All	squirrel AS, beaver AZ, vole AV, porcupine AP, hare AH, Warrens root collar weevil IWW, fire NB, windthrow NW, sunscald NZ, logging TL, mechanical TT.	A wound is defined as an injury in which the cambium is dead (e.g., sunscald) or completely removed from the tree exposing the sapwood. Measure the wound across the widest point of the exposed sapwood (or dead cambium when the tree is damaged by sunscald). Healed over wounds (=scars) are acceptable. See Figure 1.
STEM	Deformation (including crook, fork, browse, and dead or broken top)	<ul style="list-style-type: none">after five years growth the pith is horizontally displaced more than 15 cm from the point of defect.	All	defoliators ID, white pine (spruce) weevil IWS, lodgepole weevil IWL, collar weevil IWW, beetle AC, deer D, elk AE, moose M, frost NG, hail NH, snow NY, drought ND, logging TL, mechanical TT.	For horizontal displacement see Figure 2.
STEM	Infection (including cankers and galls)	<ul style="list-style-type: none">the tree has forked 3 or more times in the last 5 years.the tree has two or more leaders with no dominance expressed after five years growth.the tree has a dead or broken top at a point that is >2 cm (>3 cm for the coast) in diameter.any infection occurs on the stem.	All	comandra blister rust DSC, stalactiform blister rust DSS, white pine blister rust DSB, western gall rust DSG, atropellis canker DSA.	Leader dominance occurs when the tallest leader is at least 15 cm taller than the second tallest leader.
BRANCH	Infection (cankers)	<ul style="list-style-type: none">a infection occurs on a live branch less than 60 cm from the stem.	Pw, Pl, Py	white pine blister rust DSB, comandra blister rust DSC, stalactiform blister rust DSS	See Figure 3.
BRANCH	Galls	<ul style="list-style-type: none">a gall rust infection occurs on a live branch less than 5 cm from the stem.	Pl, Py	western gall rust DSG.	See Figure 3.
BRANCH	Gouting	<ul style="list-style-type: none">any adelgid gouting occurs on a branch.	Ba, Bg, Bl	balsam woolly adelgid IAB.	Gouting is defined as excessive swelling of a branch or shoot caused by balsam woolly adelgid, and is often accompanied by misshapen needles and buds. It is most common on branch tips and at nodes near the ends of branches. Consult a recent distribution map to identify the geographic extent of this pest.
FOLIAGE	Defoliation	<ul style="list-style-type: none">>80% of tree foliage has been removed due to defoliating insects or foliage disease.	All	defoliators ID, foliage diseases DF	

Instructional Objectives:

- Introduction to the Free Growing Damage Criteria
- Provide explanation of the individual criteria.

Key Points, Concepts, Examples & Facilitator's Notes:

- The methods and specifications contained in the Free Growing Damage Criteria are in constant flux. Modification to these criteria is the norm rather than the exception. Participants should be encouraged to regularly consult Ministry of Forests staff, employers, clients and co-workers to ensure they have the most current version of this and other survey-related materials.
- The Free Growing Damage Criteria were formulated and are periodically updated by a group of District, Region and Branch forest health specialists.
- This section is included as an appendix in the participant's workbook to assist with the replacement of this version as others are produced.
- Each of the individual criteria are described in detailed graphics on the following pages.
- As time passes and the criteria change, this section will also require updates. The CD contained in the facilitator's guide contains a "view and print only" of the materials. An "edit-able" version of the file is stored at Forest Practices Branch; as well, a backup copy is stored at Prifor Management Ltd.
- Proceed through each section of the Free Growing Damage Criteria. Participants should be encouraged to remove the Free Growing Damage Criteria from their binder so that it can be seen next to the individual graphics.
- Remind them these two pages will be required in the field for Day 2.



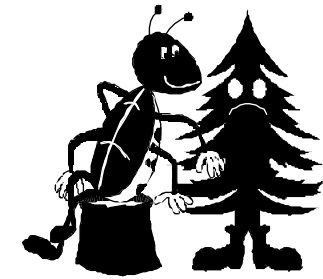
Forest Health for Silviculture Surveyors
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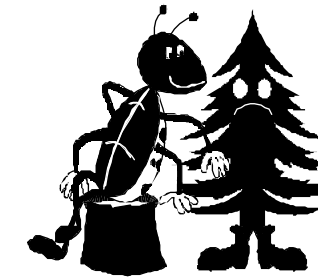
LOCATION OF DAMAGE	TYPE OF DAMAGE	TREE BEING ASSESSED IS UNACCEPTABLE IF:	HOST SPECIES	LIKELY AGENTS
STEM	Wound (including sunscald and girdling)	<ul style="list-style-type: none">the tree has any wound which is greater than 33% of the stem circumference, orthe tree has a wound which is greater than 20% of the total length of the stem, orthe tree has a wound centred around an infection caused by a stem rust or dwarf mistletoe (See Note under Stem: Infection).	All	squirr vole / hare , collar NB, w sunsc mech
STEM	Deformation (including crook, fork, browse, and dead or broken top)	<ul style="list-style-type: none">after five years growth the pith is horizontally displaced more than 15 cm from the point of defect.	All	defoli (spruce lodge weev deer , AM, f snow ND,IL mech
		<ul style="list-style-type: none">the tree has forked 3 or more times in the last five years.	All	
		<ul style="list-style-type: none">the tree has two or more leaders with no dominance expressed after five years growth.	All	
		<ul style="list-style-type: none">the tree has a dead or broken top at a point that is >2 cm (>3 cm for the coast) in diameter.	All	
STEM	Infection (including cankers and galls)	<ul style="list-style-type: none">any infection occurs on the stem.	All	coma DSC, stalac DSS white DSB, weste atrop
BRANCH	Infection (cankers)	<ul style="list-style-type: none">an infection occurs on a live branch less than 60 cm from the stem	Pw, Pl, Py	white DSB, coma



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LOCATION OF DAMAGE	TYPE OF DAMAGE	TREE BEING ASSESSED IS UNACCEPTABLE IF:	HOST SPECIES	LIKELY AGENT
STEM OR BRANCH	Dwarf mistletoe infection	<ul style="list-style-type: none">any infection occurs on the stem or a live branch, ora susceptible tree is located within 10 m of an overtopping tree which is infected with dwarf mistletoe.	Hw, Pl, Lw, Fd	hemlock DMH, larch dwarf mistletoe DML, larch dwarf mistletoe
ROOTS	Root disease	<ul style="list-style-type: none">sign(s) or a definitive combination of symptoms of root disease are observed.	All	armillaria DRA, larch root rot DR, root disease root dis
		<ul style="list-style-type: none">infected tree found in plot. See comments for well-spaced tree net down calculation. The multiplier for DRA is two, except in BEC zones PPdh1&2, IDFxh1, IDFd1&2, MSdk1 and MSdm1 where the multiplier is one.	All	armillaria DRA.



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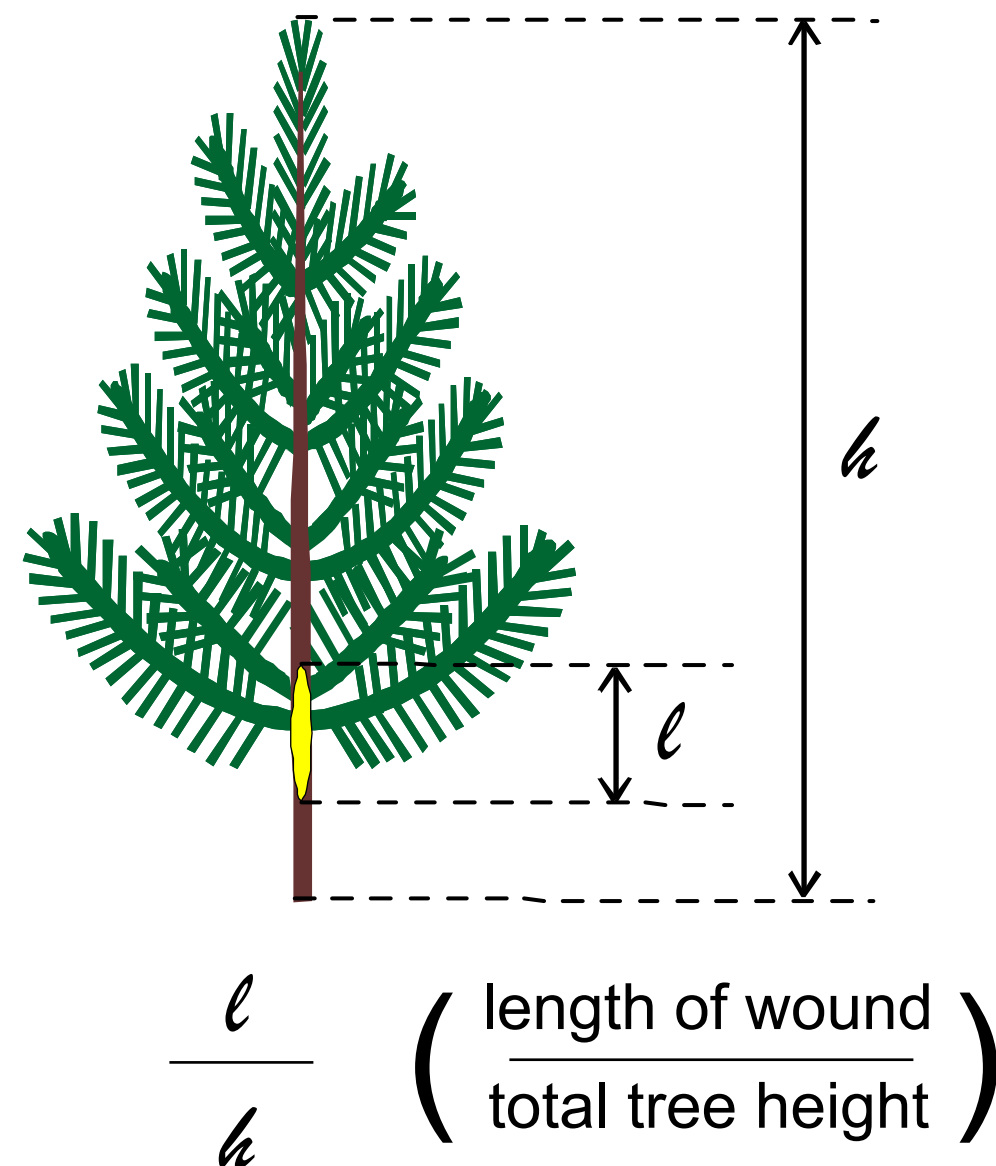
Lesson
Number:

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Title:

Free Growing
Damage Criteria

Figure 1. Calculation of wound along
stem length.

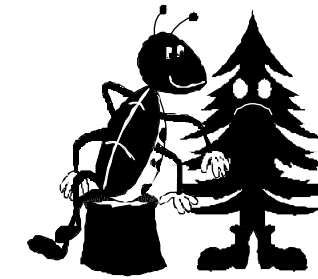


Instructional Objectives:

- Describe the details of wound acceptability

Key Points, Concepts, Examples & Facilitator's Notes:

- The title "Figure 1" refers to the reference in the Free Growing Damage Criteria.
- There are two wound-related criteria: one for the circumference of the wound and the other for wounds along the length of the stem.
- A wound that encircles the stem in excess of the specified amount is unacceptable.
- A wound that stretches along the length of the stem more than the specified amount is unacceptable.
- The procedures for dealing with multiple small wounds that, when combined, exceed the allowable ratio has not yet been defined. However, it is realistic to assume the wounds should be evaluated with their combined effect in mind.



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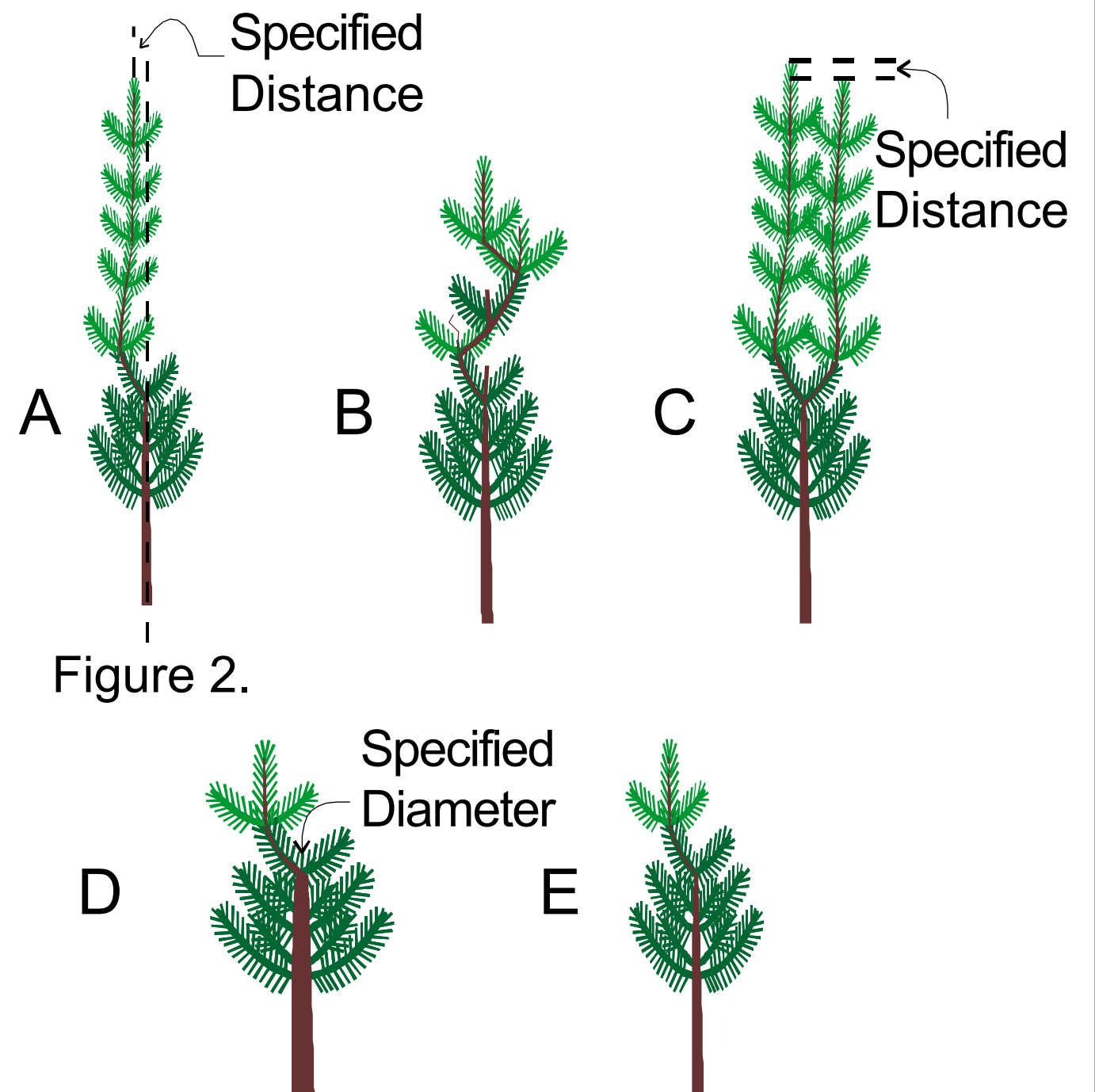
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Title:

Free Growing
Damage Criteria

Deformation



Instructional Objectives:

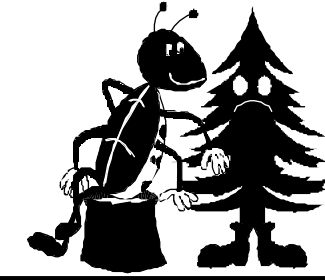
- Describe the details of deformation acceptability

Key Points, Concepts, Examples & Facilitator's Notes:

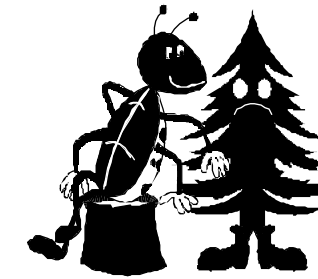
- "Figure 2" refers to the figure number indicated in the Free Growing Damage Criteria.
- Each of the five sample trees have been affected by some forest health factor. The actual cause is not relative to the criteria being applied.
- The trees are not labelled on the overhead.
- Tree A - the leader has a 'crook' that is displaced more than the specified distance from the centerline of the undamaged portion of the stem. It may have corrected itself since the original damage, in that the new leaders are in alignment. If some portion of the stem has exceeded the specified distance, the tree is unacceptable.
- Following an injury that results in leader damage, we allow the tree a period of 5 years to correct itself. If less than 5 years have passed since the damage, the tree is considered acceptable. If more than 5 years have passed, the criteria described on trees B and C are applied.
- Tree B - Where one or more forest health factors have caused a tree to be forked multiple times, the tree is considered unacceptable. The number of forks is defined in the Free Growing Damage Criteria.



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- Tree C - Where forest health factors have caused a tree to have more than one leader, we allow the tree 5 years to recover from the damage. After the 5 year period, one of the leaders must be significantly taller than the other. We refer to this as 'dominance'. The Free Growing Damage Criteria defines how much taller one leader must be, compared to the other.
- Tree D - The breakage or damage has occurred at a relatively thick portion of the stem. As a result, it is unlikely that a tree with such significant damage to the stem will grow to produce an acceptable crop tree. This wound is also a possible centre for infection.
- Tree E - As a reminder, emphasis should be placed on the need for 5 years to pass. This tree is considered acceptable.



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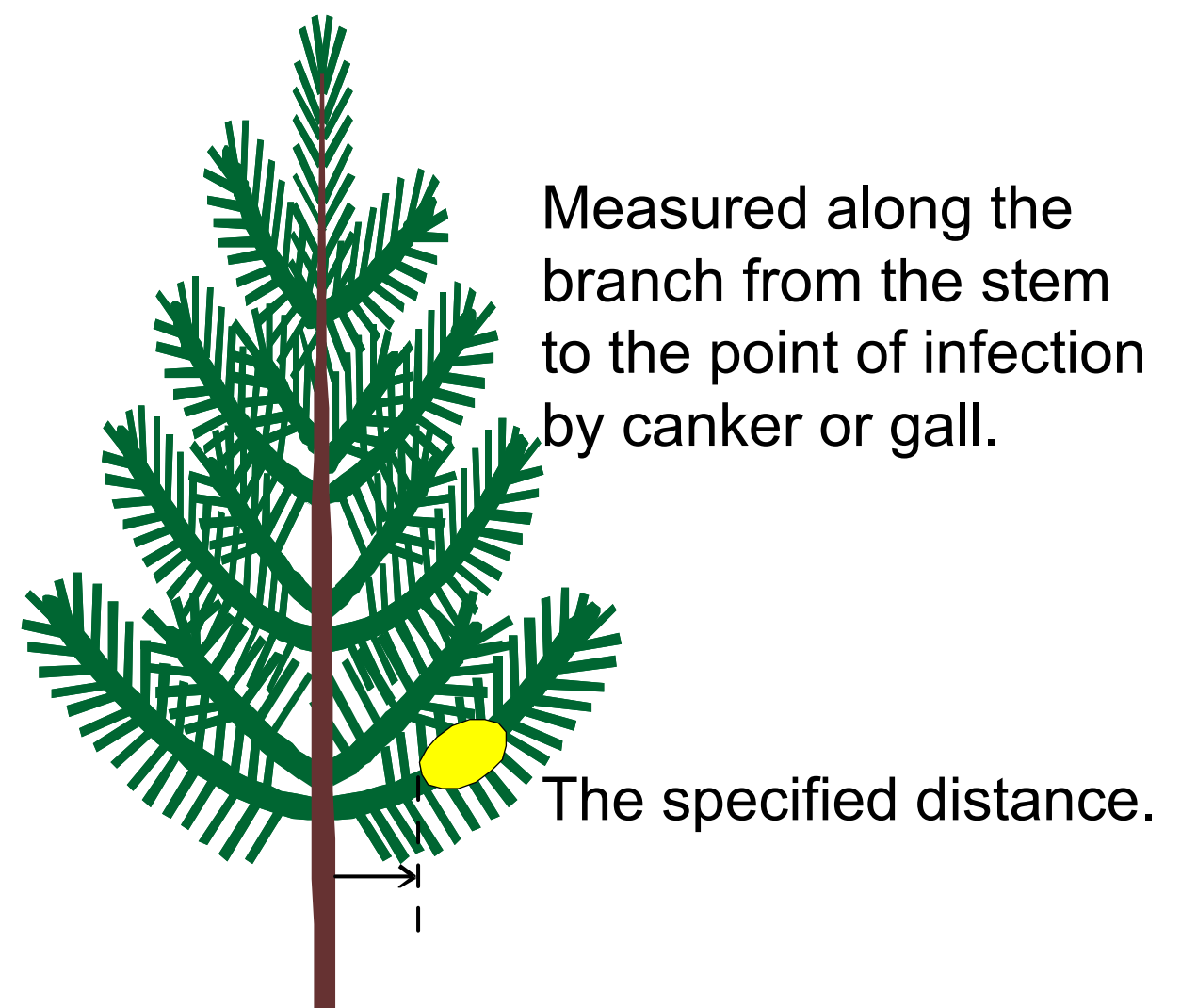
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Free Growing
Damage Criteria

Figure 3. Branch Infections

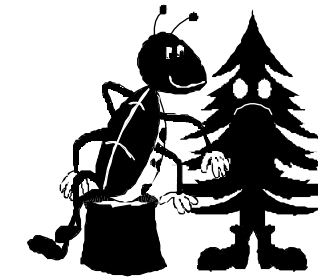


Instructional Objectives:

- Describe the details of gall and canker acceptability

Key Points, Concepts, Examples & Facilitator's Notes:

- "Figure 3" refers to the figure number indicated in the Free Growing Damage Criteria.
- The Free Growing Damage Criteria apply two separate specifications for the two primary types of stem disease. DSG has a separate specification from the group of DSB, DSC and DSS.
- The criteria for stem diseases is relatively simple. Measure along the branch from the stem to the closest visible signs of infection. Compare this measurement to the specified distance for the particular species of stem disease. If the measurement from the tree to the infection is less than the distance specified in the Free Growing Damage Criteria, the tree is unacceptable.
- Some may question why the measurement is not based on a distance along the branch. The disease grows along the length of the branch and therefore that distance is also potentially valid. The right angle method can be more consistently reproduced.



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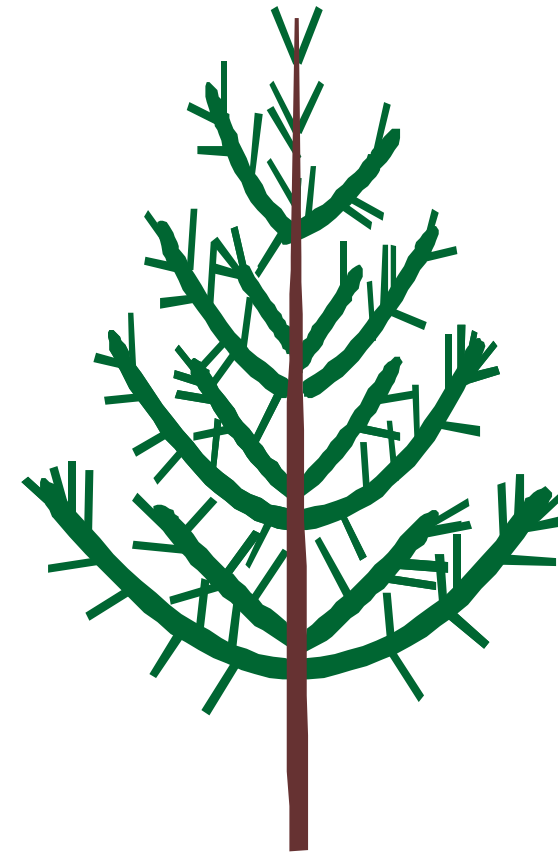
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Title:

Free Growing
Damage Criteria

Defoliation



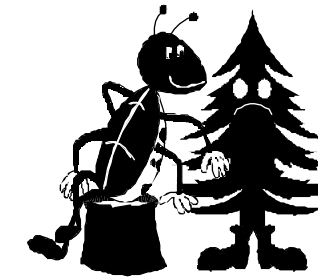
x % of the "normal" foliage is missing.

Instructional Objectives:

- Describe the details of defoliation acceptability

Key Points, Concepts, Examples & Facilitator's Notes:

- With all the effort to be evaluate free growing trees in a quantifiable manner, no one has been able to quickly and simply quantify defoliation levels. The process requires a surveyor to make a visual estimate of the percentage of foliage that is missing. One must consider the volume of foliage that you would expect the tree to have, given the conditions in which it is growing. If the tree would normally have 1000 needles, but now has only about 250 left, this tree has been 75% defoliated.



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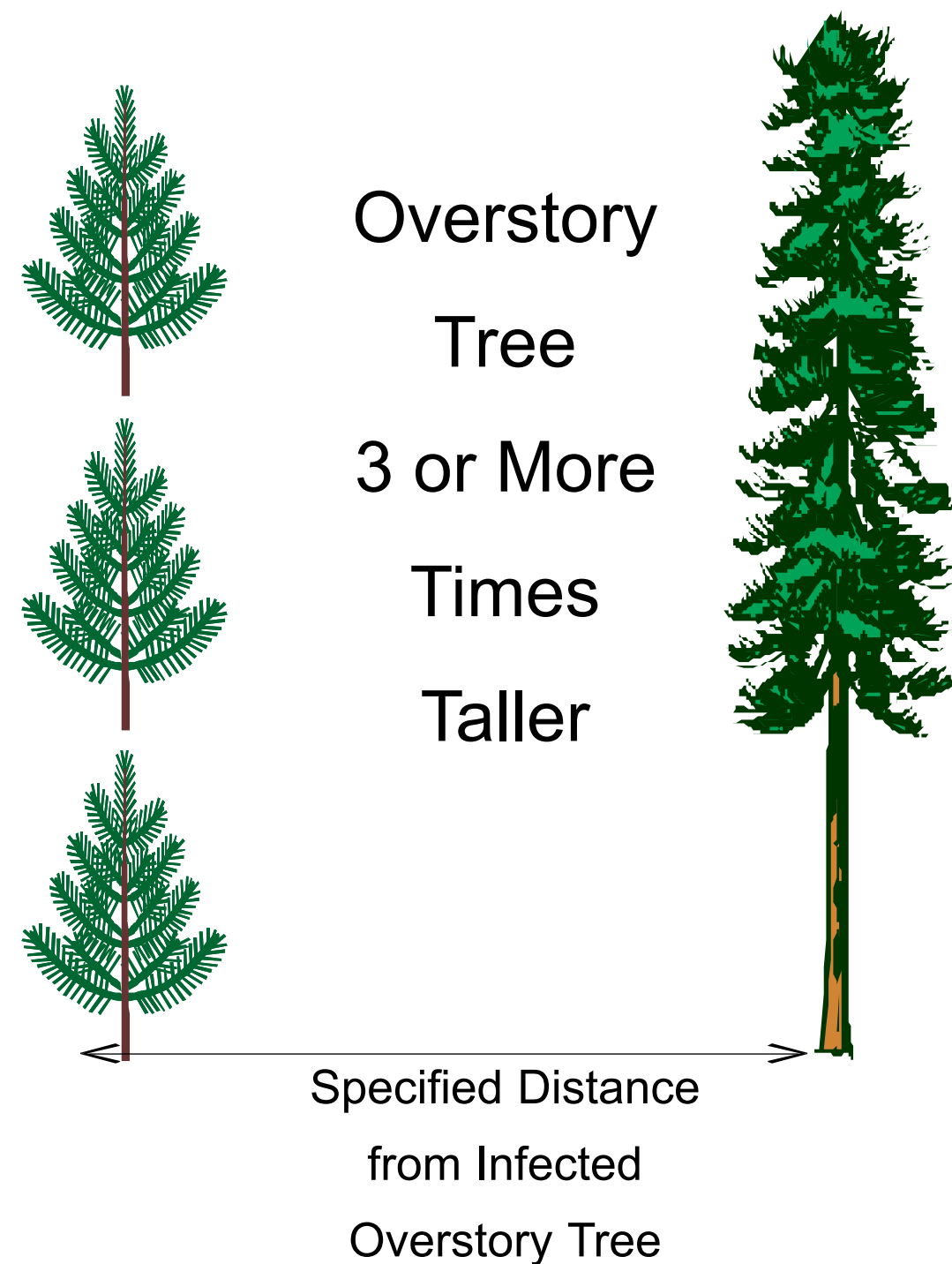
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Title:

Free Growing
Damage Criteria

Dwarf Mistletoe Infection

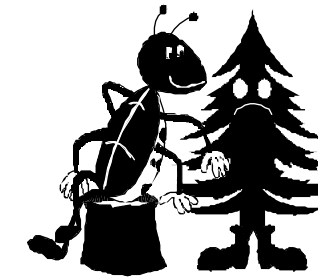


Instructional Objectives:

- Describe the details of dwarf mistletoe infection acceptability

Key Points, Concepts, Examples & Facilitator's Notes:

- Mistletoe infection on the branches or on the stem results in the tree being unacceptable as a free growing tree.
- Where tall mistletoe-infected trees are close to small trees of the same species, these small trees are at risk of being infected by the overstory trees. The Free Growing Damage Criteria specifies three criteria:
 - the small trees (trees at risk) are the same species as the overstory trees
 - the overstory tree is greater than or equal to three times the height of the small trees
 - trees closer than the specified distance are not acceptable
- The height of the infection on the overstory tree is not considered significant.



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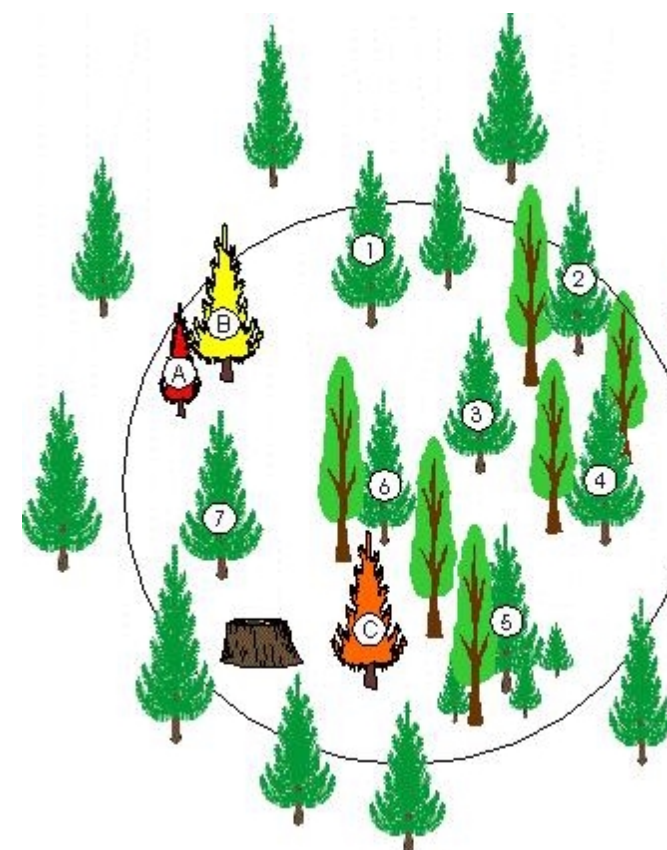
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6

Title:

Free Growing
Damage Criteria

Root Disease



Step

- 1 Tree A, B and C are infected with root disease. However tree A and B are less than the minimum inter tree distance apart. **Count 2 infected trees with sufficient spacing.**
- 2 The "root disease multiplier" in this plot is assumed to be 2, therefore 2 infected trees times the root disease multiplier of 2 = 4.
- 3 Trees 1 to 7 are greater than the minimum inter tree distance from each other. **Count 7 well spaced trees.**
- 4 7 well spaced trees minus 4 from Step 2 = 3. Therefore, we can not accept any more than 3 free growing trees in this plot. These are likely to be tree 1, 7 and maybe 3.

Instructional Objectives:

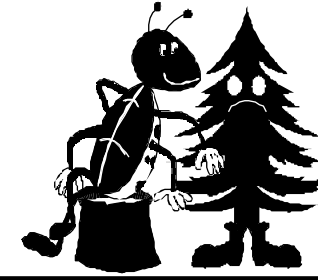
- Describe the details of root disease acceptability

Key Points, Concepts, Examples & Facilitator's Notes:

- The root disease criteria is the most complex of all of the criteria discussed.
- The purpose of this process is to establish a maximum (cap) on the number of free growing trees that can be selected. The process for calculating the maximum recognizes the dynamics of root disease spread.
- You may wish to begin by letting the participants know that this process is only required when a root disease-infected tree is found in a plot. (It also includes stumps infected with Tomentosus.) There is no longer a requirement to search for root disease outside the plot. Only root disease found in the plot is considered in this process.
- It will become apparent that where the level of infection (number of infected trees) is low, the calculation may not be necessary. Also, where conifer densities are high (many well spaced trees to choose from), it may not be necessary.
- The process has four steps. The wording in the Free Growing Damage Criteria may be misleading. It is recommended that participants listen to this description before reading the text.



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- Step 1 - Count the number of infected trees that are at least the minimum inter-tree distance apart. (This is referred to as well spaced infected trees.)
 - Step 2 - Take this value, multiplied by the 'root disease multiplier' for the root disease species and the biogeoclimatic subzone you are in, and subtract it from the first value.
 - Step 3 - Count the number of conifers (preferred or acceptable species) that are at least the minimum inter-tree distance apart, disregarding the 'M' value. This is similar to counting the number of well spaced trees.
 - Step 4 - Subtract the number found in step 2 from the number of well spaced trees found in step 4.
- The result is the maximum number of free growing trees that may be accepted in this plot. Subsequent plots must be re-evaluated for root disease and the process repeated.
- The "normal" vegetation and forest health considerations are still applied to the free growing tree determination. In the example, tree 1 and 7 are clearly free of vegetation. Tree 3 may not meet the conifer to brush ratio, or other vegetation considerations. As a result, there may only be 2 free growing trees in this plot.



Forest Health for Silviculture Surveyors Facilitator's Guide



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Lesson
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Title:

Recommendation

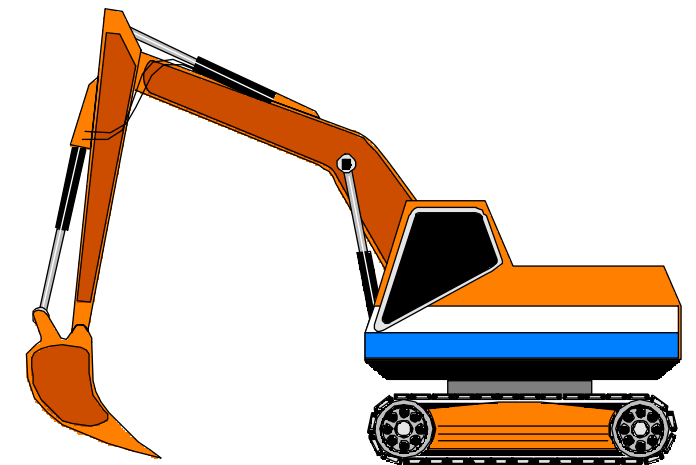
A Good Recommendation MUST...

effectively address deficiencies
be directed toward "Target", not minimum
meet the requirements of the SP where
possible and practical
consider the management objectives



It Would be Nice if the recommendation...

encouraged biodiversity
limited "intrusiveness"
was cost effective

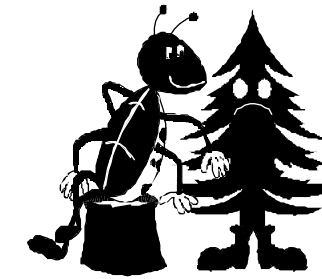


Instructional Objectives:

- Introduction to the process of creating a forest health treatment recommendation

Key Points, Concepts, Examples & Facilitator's Notes:

- While cost is a factor, good biologically based treatments are more important than cost.
- Treatments can have a huge range of costs, from the low hundreds per hectare for mistletoe sanitation, to thousands per hectare for stumping of root disease areas.
- Recommendations may include suggestions for silviculture prescription amendments. However, other options should be exhausted first.



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Title:

Recommendation

For Good Recommendations you need...

Accurately collected data,
Accurately compiled data,
General Management Objectives,
Silviculture Prescription,
Local Land Use Planning,
Treatment Thresholds,
Guidebooks,
Treatment Options

Instructional Objectives:

- Introduction to the process of creating a forest health treatment recommendation

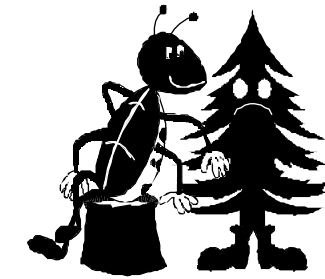
Key Points, Concepts, Examples & Facilitator's Notes:

• Good recommendations require the careful consideration of the items listed. Most of all, the experience of having seen forest health problems resolved through treatments is invaluable. Where experience is lacking, one can compensate for it, and at the same time gain some experience with a methodical process.

- 1 Gather the existing base of known information.
- 2 Compare it to the desired outcome (usually the silviculture prescription).
- 3 Identify the problems, issues or shortcomings (forest health factors).
- 4 Research these problems (learn more about the forest health factors).
- 5 Formulate a treatment recommendation, or combination of treatments to reduce or overcome the problem (forest health factor).
- 6 Fine-tune the treatment recommendation by adding details like seasons, and methods.
- 7 Include multiple options, (this is not a detailed prescription; it should be a discussion/summary of the possible solutions).



Forest Health for Silviculture Surveyors
Facilitator’s Guide



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Lesson
Number: 7

Title: Recommendation

Silviculture Surveys Guidebook
Table 5-1. Forest health factor, code, incidence, and recommended treatment

Forest health Factor	Code	Incidence	Recommended treatment
Armillaria root disease	DRA	>1 to 5% of host species	Formal root disease survey
		>5% of host species	Intensive control treatment
Phellinus root disease	DRL	>1 to 5% of host species	Formal root disease survey
		25% of host species	Intensive control treatment
Tomentosus root dis.	DRT	any presence	Formal root disease survey
		215% of host species	Intensive control treatment
Rhizina root disease	DRR	Any incidence and replanting is required	Delay planting 2 growing seasons after the broadcast burn
		Any incidence and replanting not required	Resurvey in year 2-3
Coastal hemlock dwarf mistletoe	DMH	Any	Eradicate infected trees <3 m in height
			Eradicate infected trees that are <10 m from and/or overtopping new regeneration
			Eradicate infected trees >3 m in height on low or poor sites
Interior lodgepole pine, Douglas-fir and larch dwarf mistletoes	DMP DMF DML	Any	Eradicate infected trees >3 m in height where the infection is in the top half of the tree
			Eradicate infected trees that are <15 m from and/or overtopping new regeneration
Comandra blister rust, Stalactiform blister rust, and Western gall rust	DSC DSS DSG	<10% all three stem rusts combined	Eradicate infected stems and prescribe a post-treatment target density equal to the target stocking standard
		10-20% all three stem rusts combined	Eradicate infected stems and prescribe a post-treatment target using the formula below
		>20% all three stem rusts combined	Delay spacing 3 to 5 years, resurvey and evaluate using these rules
White pine blister rust	DSB	Any	Eradicate infected stems and those with branch infections closer than 60 cm to the stem, and prune all other infections

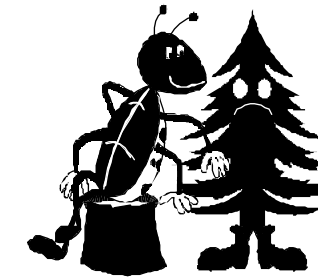
* Incidence referred to in the above table is calculated as described in column 9 on the back of the FS 659 card.

Instructional Objectives:

- Introduction to the threshold values found in the Silviculture Surveys Guidebook.

Key Points, Concepts, Examples & Facilitator’s Notes:

- Page 84 of the Silviculture Surveys Guidebook contains a series of threshold values for many of the common forest health factors. The values are intended as a guide to trigger a thought process.
- A few of the thresholds relevant to the region in which the course is being held should be pointed out.



Case Study #1

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Overhead
Number:

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Lesson
Number:

7

Title: Recommendation

Description:

SBS dw1 04

clearcut silviculture system

harvested 20 years ago

natural lodgepole pine regeneration was very effective

Survey Results:

Inventory Label: PI10 17-4.7-20-64-14,340/0

Silviculture Label: PI100-17-5.8-20-1070

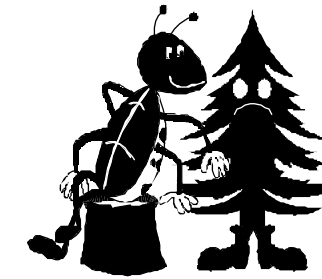
DSG is measured at 21%

Instructional Objectives:

- Case Study #1

Key Points, Concepts, Examples & Facilitator's Notes:

- The high conifer density is suggesting the need for juvenile spacing. The guidebooks suggest that, given the high level of DSG, the stand should not be spaced. DSG requires thin young bark to successfully infect a tree. With consideration for the age and height of this stand, it is unlikely that the level of DSG will rise significantly. New branch infections may continue to occur, but their occurrence will slow as the trees grow taller.
- There is no reason to postpone the juvenile spacing treatment any longer. Schedule the treatment for early summer when the spores allow for easy visibility of the infections. Branch infections may be pruned, but the techniques prescribed in the Pruning Guidebook must be considered.
- It may not be operationally practical to conduct all of the juvenile spacing operations on all of the stands with high levels of infection during the peak visibility season. A crew could be used in a "mark-to-cut" strategy. That is, mark the infected trees when they are easiest to identify, employing crews that require little training and no power tools. The economic viability is questionable, but it is operationally feasible.
- Some individuals may wish to argue for no juvenile spacing at present ,and to conduct a commercial thinning treatment in the future. This option has merit.
- Spacing to a high density is also an option.



Case Study #2

Participant's
Workbook
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Reference:

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Overhead
Number:

58

Lesson
Number:

7

Title:

Recommendation

Description:

ICH mk1/01

clearcut silviculture system

harvested 3 years ago

broadcast burned in the fall of the year harvested

planted with a mix of Douglas fir and spruce 2 years ago

Survey Results:

Inventory Label: NSR-Fd6Sx4-3-0.3-25-1-445/0

Silviculture Label: NSR-Fd6Sx4-3-0.3-25-410

Mortality from DRR measures 25%.

35% unknown cause of mortality of planted seedlings.

Weather through the first year following planting was exceptionally good for seedling development.

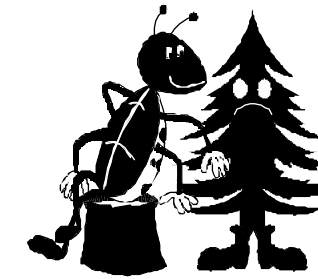
Vegetation competition is moderate but increasing.

Instructional Objectives:

- Case Study #2

Key Points, Concepts, Examples & Facilitator's Notes:

- This area has been severely impacted by *Rhizina undulata*. *Rhizina* has adapted to take advantage of the conditions resulting from broadcast burning. The ICH is particularly susceptible. It is realistic to suspect that the mortality related to the unknown cause is also from *Rhizina* since the mortality occurred shortly after planting. The signs of *Rhizina* are easily visible in the year in which they cause the mortality but the fruiting body, being mostly water, quickly decomposes.
- Rhizina* quickly invades the soil, causing mortality of all conifer species native to the ICH zone. The root disease is short lived. 3 years following the broadcast burning, the root disease is dramatically less likely to cause additional mortality.
- Replant the area as soon as possible with the preferred and/or acceptable species specified in the silviculture prescription.
- This ecosystem is prone to high vegetation competition. The longer the planting is postponed, the more likely the need for brush control treatments later.



Case Study #3

Participant's
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Reference:

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Overhead
Number:

59

Lesson
Number:

7

Title:

Recommendation

Description:

IDF dk3/01

Single tree selection harvesting 15 years ago

Survey Results:

Inventory Label: L1-Fdi6Pli4-98-23.0-19-15-260/4

L2-Fdi10-85-14.0-19-6-175/3

L3-Fdi10-35-5.8-19-35-8450/2

L4-Pli100-7-1.1-21-30-6930/1

Silviculture Label: L1-Fdi60Pli40-98-23-19-260

L2-Fdi100-89-16.0-19-45

L3-Fdi100-42-6.7-19-160

L4-Pli100-7-1.2-21-340

The survey indicates the area is sufficiently regenerated.

All of the well spaced trees in layers 1, 2 and 3 meet the free growing criteria. None of the layer 4 trees are free growing.

Vegetation is minimal, restricted to low herbs and grass.

Layer 1 has 18% and layer 4 has 2% DMP

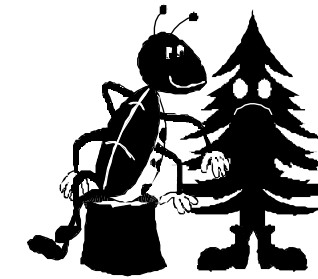
Layer 4 has 7% DSG

Instructional Objectives:

- Case Study #3

Key Points, Concepts, Examples & Facilitator's Notes:

- Heavy natural regeneration of Pli on the areas with more historic disturbance and less crown closure is common. It is also worth noting that the layer 4 trees are nearly tall enough to become layer 3. The need for spacing may be essential, depending on the distribution of the density.
- It is clear that the overtopping DMP-infected Pli must be removed. Their presence eliminates the ability to consider the layer 4 Pli as free growing.
- The debate may centre around the cost/benefit analysis and the operational considerations to salvaging the layer 1 Pli. Falling the layer 1 Pli will cause some damage to the other layers. Salvage harvesting will cause additional damage. Based on the high densities, the stand can likely withstand the higher levels of damage. Juvenile spacing should be scheduled two or more years after the salvage harvesting to allow the damaged stems to express their inferiority, and consequently removed at the time of spacing.
- The low levels of DSG can be reduced during the juvenile spacing.



Case Study #4

Participant's
Workbook
Page
Reference:

X

Overhead
Number:

60

Lesson
Number:

7

Title:

Recommendation

Description:

CWH xm 04

Clearcut 10 years ago

Broadcast burned the year following the harvest

Planted with Douglas fir 9 years ago with 2 year old stock

A survey 2 years and 4 years after planting indicated an excellent looking new crop.

The late free growing date is 11 years

Fdc is the only preferred or acceptable species listed in the silviculture prescription.

Establishment to Free Growing Guidebook indicates;

Primary	Secondary	Tertiary
Fd	none	Cw, Lw, Pw

Survey Results:

Inventory Label: NSR-Hw7Fdc3-5-0.6-26-16-5850/0

Silviculture Label: NSR-Fdc100-11-4.5-28-257

DRL found to have caused 23% mortality, and an additional 12% have been found infected.

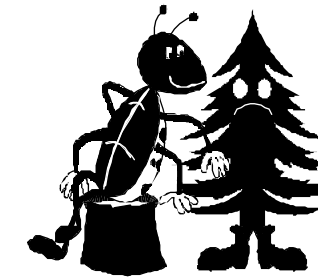
Competing vegetation is surprisingly low.

Instructional Objectives:

- Case Study #4

Key Points, Concepts, Examples & Facilitator's Notes:

- The licensee in this case is in a very serious situation. The block is NSR, heavily infected with DRL and one year away from the end of the free growing assessment period.
- The groups may also discuss "how this could happen". Possible answers could be poor observational skills of the previous surveyor and the 7 year gap without additional surveys.
- Undoubtedly, the consideration of an amendment to the silviculture prescription will come up. Any amendments must be biologically appropriate for the site. Some may wish to accept the Hw. The Hw is no less susceptible to the DRL than the Fdc and is growing very slowly. It is not biologically suited to a CWH xm / 04.
- You may wish to question the biogeoclimatic classification. This is reasonable, but the completed survey should have already confirmed this.
- Very few options are available. The licensee is likely near the end of the free growing period. The block is NSR. An amendment is required under the Operational Planning Regulation. An administrative penalty is likely.



Participant's
Workbook
Page
Reference:

X

Overhead
Number:

61

Lesson
Number:

n/a

Title:

Preparation for
Day 2

So where are we going?

How are we getting there?

When will we be back?

What are we doing when we get
there?

- practice pest identification
- practice the use of the reference material
- practice recording and summarizing data
- collect specimens
- discuss recommendations

Instructional Objectives:

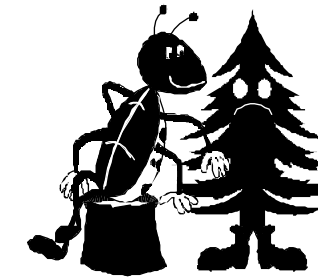
- Provide guidance for the participants to prepare for the field day.

Key Points, Concepts, Examples & Facilitator's Notes:

- Before the participants gather their belongings and proceed home for the evening, the details related to Day 2 must be communicated. The questions posed on the overhead transparency should be anticipated. These and others related to the logistics of the field trip must be pre-planned by the facilitator. You may find it useful to mentally walk through the plans for the day in an effort to foresee, and prepare for, potential issues that could arise.
- It is always desirable to share transportation; not just for the reduced cost, but for the additional opportunity to share ideas while travelling to the field sites.
- The answers to the questions listed can be written directly on the overhead transparency.
- It may also be necessary to plan a meeting place.
- Participants familiar with the area may choose to meet at the site.
- Be sure to be firm with the planned departure time.



Forest Health for Silviculture Surveyors Facilitator's Guide



Participant's
Workbook
Page
Reference:

X

Overhead
Number:

62

Lesson
Number:

n/a

Title: Preparation for
Day 2

So where are we going?

How are we getting there?

What should we bring?

Lunch
Appropriate clothing for the weather
Sturdy knife
Calculator
Reference books
Reference card (FS 747)
Plot cards (FS 658 and FS 659)
Free Growing Damage Criteria
Shovel/Polaski/Ax
Small folding saw
Measuring tape
3.99m plot cord
Field note book & pencil

* We will be in small groups, so we can share.



Instructional Objectives:

- Provide guidance for the participants to prepare for the field day.

Key Points, Concepts, Examples & Facilitator's Notes:

- Emphasis should be placed on the ability to share equipment, since the tasks will be completed in small groups. The lack of any of the listed equipment will not dramatically reduce the value of the learning experience of the field day.



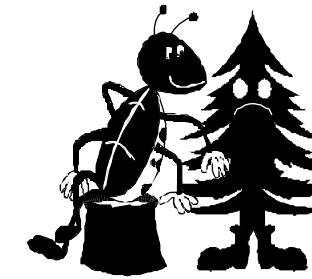
Day 2

There are as many different way to organize the field portion of this training course as there are different instructors. There are no right or wrong ways to conduct this portion as long as:

- it is conducted safely
- provides numerous opportunities to practice the skills and techniques described during the classroom session

The following is a suggested agenda:

- Meet at a central location at a specified time.
- Travel to the first site (less than 1 hour; as short as possible is best).
- As a single group, (or two smaller groups where a second facilitator is available), conduct a walkthrough of the block. Be sure to encourage observational skills. Encourage the deviation from any pre-planned route for the purpose of conducting a closer inspection of any tree that "doesn't look right". Encourage the use of the reference books to determine the cause of any damage. Use the Free Growing Damage Criteria to determine the acceptability of the damaged tree. An hour or more is usually easy to fill. The completion of this segment is a logical time for a break.
- The next stage is to put our identification skills to more precise application. Divide the participants into manageable groups of two to five. Three seems to provide the best group dynamics. Instruct the groups to designate at least one person to record the data for their plots on an FS 658 card. You will have to provide the details that would normally be found in the silviculture prescription. For this purpose, it would be acceptable for the facilitator to simply provide the data. It is beneficial to acquire the silviculture prescription for the site but it is not essential, especially where the facilitator has a good knowledge of the Establishment to Free Growing Guidebook, silviculture prescriptions and silviculture surveys. They will need:
 - preferred and acceptable species
 - minimum inter-tree distance
 - target and minimum stocking standards
 - conifer to brush ratio
 - minimum free growing height
- Encourage the participants to disperse and proceed to the preestablished plots to complete the type of survey appropriate for the age of the block; stocking or free growing. Ask that they complete as many plots as they can by a specified time. 11:30 is often a logical time to reconvene for a debriefing of results. Suggest that they take "short cuts" for today. Concentrate on the forest health aspects of the plots. Suggest it is OK, for today, to estimate values that are not crucial to the forest health components.



•When the group comes back together, assist them with completing the final stage; summarizing the data. Verbally “walk” the participants through the tasks to determine the three incidence values. All of the values are entered on the back of the FS 659 field card. These steps are:

Field

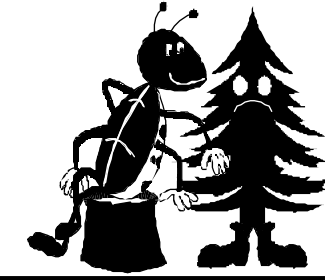
- 1 Enter each different three letter pest code recorded on the FS 657. One row per forest health factor.
- 2 Add the total number of trees in all of the plots combined and enter this value into column 2.
- 3 Add the total number of conifers in all of the plots combined and enter this value into column 3.
- 4 Separately, add the number of live trees affected by each of the forest health factors. Record each of these values in column 4 for each of the pest codes.
- 5 Separately, add the number of dead trees affected by each of the forest health factors. Record each of these values in column 5 for each of the pest codes.
- 6 Consider the hosts for each of the forest health factors present, in relation to the inventory label data collected. Where a forest health factor exists on a tree species that is rare on the site, the calculations will result in 0%.
- 7 Complete the mathematical calculations shown in the column headings: the sum of column 4 plus column 5, divided by the sum of column 2 plus column 5, then multiplied by 100
- 8 The sum of column 4 plus column 5, divided by the sum of column 3 plus column 5, then multiplied by 100
- 9 Column 4, divided by column 2 multiplied by column 6, then multiplied by 100

•The debriefing can proceed with group representatives sharing their results. The discussions that often result may require the entire group to revisit a plot to discuss the acceptability of one or more trees. This should be encouraged.

•The process is repeated on a second site. It is desirable for the second site to have different forest health factors present. A different biogeoclimatic zone and year of harvest will usually accomplish the desired site diversity. If the first site was at the stocking survey age, the second site should be at the free growing survey age.



Forest Health for Silviculture Surveyors Facilitator's Guide



•A “mock exam” may be offered at the end of the day for those who wish to do so. This may be of more interest to those preparing for the Silviculture Survey Accreditation exam. This can be as simple as a collection of samples with numbered pieces of flagging tied to them. Individuals take a few minutes to assess the samples and record their determination of the correct pest code on a scrap piece of paper or corner of a plot card. Upon completion, the facilitator reviews the correct answers. The participants can be reminded that this is a loose simulation of the accreditation exam. “Did you get more than 80% correct?”