

Tree Pests and Disease

Outline for Health Management Plan: Red Spruce and Balsam Fir

<http://na.fs.fed.us/spfo/pubs/fidls/sbw/budworm.htm>

<http://www.fs.fed.us/r6/nr/fid/fidls/fid118.htm>

Edmonds et al.: 165-168, 280-284, 471-473, 505-506, 561-563

- I. Consider forest management objectives:
 - A. Red spruce and balsam fir are dominant component of the Acadian Forest.
 - B. Basis for lumber and pulp industry in northern 2/3 of state
 - C. Excellent natural regeneration on poorer quality, wet sites.
- II. Understand biology for tree species (how adapted): **Red Spruce (*Picea rubens*)**
 - A. Range:
 - B. Sites:
 - C. Climate:
 - D. Biology.
 1. Germination and establishment

2. Seedlings

3. Competitors:

4. Growth:

III. Understand biology for tree species (how adapted): **Balsam Fir (*Abies balsamae*)**

A. Range:

B. Sites:

C. Climate:

D. Biology.

1. Germination and establishment

2. Seedlings

3. Competitors:

4. Growth:

IV. Understand important disease complexes: **Spruce Budworm**

A. Components.

1. Diseased tree, plant(s):

a) Susceptible species:

b) Symptom(s): **Defoliation**

c) Diseased function(s):

(i) Tissue functions initially affected: : **Leaves and photosynthesis**

(ii) Potential impact on whole Tree functioning:

(iii) Potential impact on forest functioning:

2. Primary stress(es) [pathogen(s)]: **Eastern Spruce Budworm (*Choristoneura fumiferana*)**

a) Signs:

3. Environment:

B. Development - Interaction of disease triangle over time.

1. Predisposing factors:

a) Degree of tree adaptations to stress and environment.

b) Degree of stress

(i) Life cycle:

(a) **Eggs - hatch in midsummer after 2 weeks incubation**

(b) **Larvae - 6 instars**

(c) **Pupation**

(d) **Adults**

(e) **Dispersal results in high mortality**

(ii) Natural enemies

2. Inciting conditions for disease:

3. Contributing factors: Factors detrimentally affecting the tree only after it has become diseased.
 - a) Windthrow

 - b) Stillwell's syndrome

 - c) Bark Beetles

C. Recommendations.

1. Preemptive:
 - a) What can increase tree resistance: Maintain vigorous spruce
 - b) What else can decrease stress(es) (pathogen(s)):

2. Monitor and survey.

3.

4.

5.

E. What Survived

1. Non harvested plots

2. Harvested plots

3. Balsam fir more prevalent than red spruce

F. The Future

1. What will increase future stand susceptibility to spruce budworm epidemics?

2. What will increase the balsam fir component?

VI. Disease Complex Information: **Balsam Woolly Adelgid**
(Presentation based on given by Allison Kanoti, M.S. 2006)

A. Components:

1. What is Diseased in Trees, Plants:

a) Susceptible species: **True firs (*Abies spp.*)**

b) Symptoms

(i) Crown Infestation =Gout Phase

(ii) Stem Infestation = Trunk Phase

c) Diseased Functions

(i) Tissues

(ii) Impact on Tree

(iii) Impact on Forest

2. Primary Stress: Balsam woolly adelgid (*Adelges piceae*)

a) Signs:

3. Environment

B. Development

1. Predisposing Factors

a) Degree of tree adaptations:

(i) Introduced pest: **North American firs highly susceptible**

(ii) Site Factors:

(iii) Age Factors

(iii) Population Control

(a) Climate/Weather

(b) Native natural enemies

(c) Introduced biological control

(d) Issues

(e) Ideal biological control for adelgid

(f) Food availability and Quality

2. Inciting Factors

3. Contributing Factors

