major forest insects
in northern Idaho





Erika Eidson & Tom Eckberg
Forest Health Specialist
Idaho Department of Lands

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The insects in this presentation are **native**

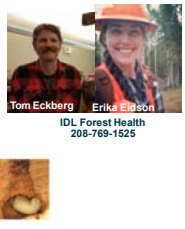
They are only called **pests** when they **interfere** directly **with our goals**

2

Forest Health Resources

A Field Guide to
Diseases & Insect Pests
of
Northern & Central
Rocky Moutain Conifers

Hagle
Gibson
Tunnock



IDL Forest Health
208-769-1525

Management Guide Index

Chapter	Agent	Num Of Pages	Size of PDF
16.1	Abiotic Diseases	1	214 KB
8.20	Alder Flea Beetle	2	94 KB
5.5	Ambrosia Beetle	3	85 KB
17.1	Animal Damage	1	54 KB
11.2	Annosum Root Disease	13	731 KB

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Today's bugs…

Defoliators
- Western hemlock looper
- Douglas-fir tussock moth

Bark Beetles
- Western pine beetle
- Mountain pine beetle
- Douglas-fir beetle
- Fir engraver
- Pine engraver
- Spruce beetle

Wood Borers

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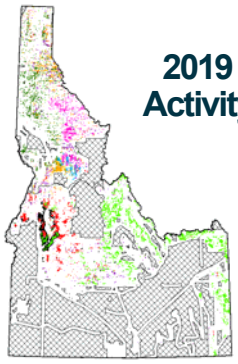

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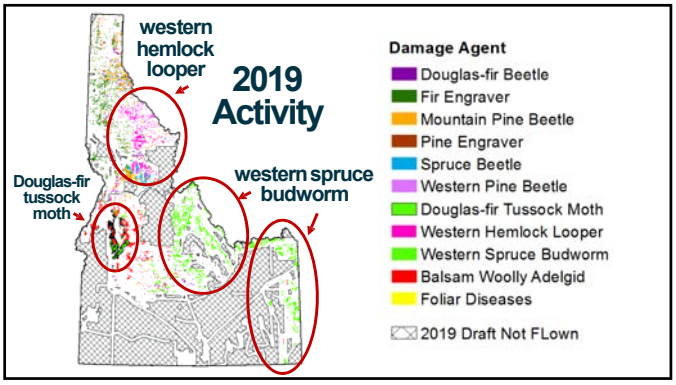

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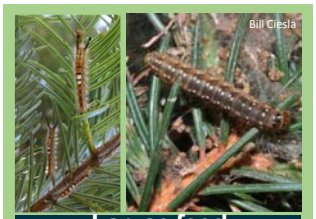
Defoliators



Larvae feed on tree foliage

Trees may survive defoliation

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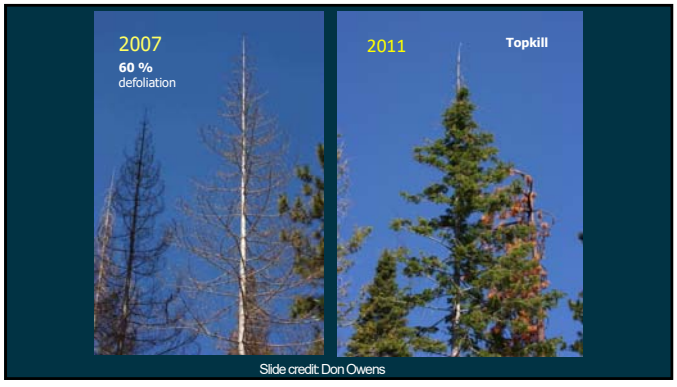

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95 %
defoliation
2007
2009
(dead 2008)
Slide credit: Don Owens

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Susceptible Stands:
• Dense; many hosts
• Multi-story
• Chronic problem areas

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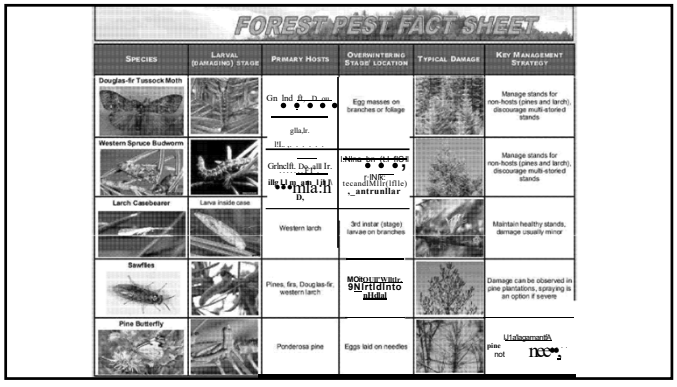
FOREST PEST FACT SHEET
SPECIES
LARVAL (FEEDING) STAGE
PRIMARY HOSTS
OVERWINTERING STAGE/ LOCATION
TYPICAL DAMAGE
KEY MANAGEMENT STRATEGY
Douglas-fir Tussock Moth
Egg masses on branches or foliage
Manage stands for non-hosts (pines and larch), discourage multi-storied stands
Western Spruce Budworm
Manage stands for non-hosts (pines and larch), discourage multi-storied stands
Larch Casebearer
Larva inside case
Western larch
3rd instar (stage) larvae on branches
Maintain healthy stands, damage usually minor
Sawflies
Pines, firs, Douglas-fir, western larch
Damage can be observed in pine plantations, spraying is an option if severe
Pine Butterfly
Ponderosa pine
Eggs laid on needles

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Specific Defoliators

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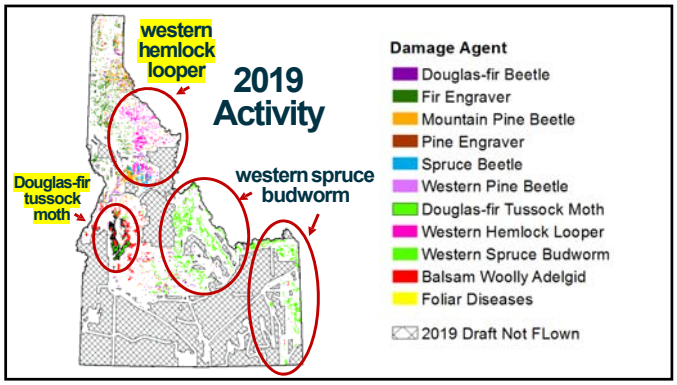

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western hemlock looper

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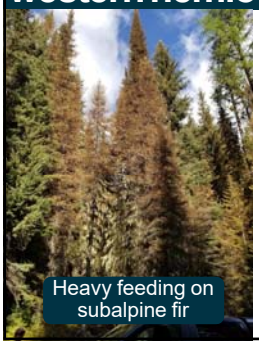
western hemlock looper: hosts



- Preferred hosts vary in different locations
- In Idaho, preferred hosts are:
  - Subalpine fir
  - Western red cedar
  - Grand fir
  - Douglas-fir
- Feeding also occurs on other tree species

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western hemlock looper: the signs

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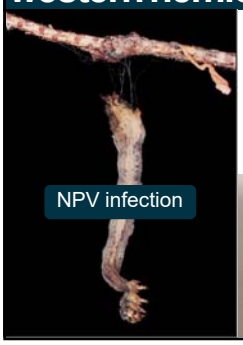
western hemlock looper: management



- Populations crash on their own due to natural enemies. Outbreaks usually last ~2 years in Idaho
- Insecticide sprays are available but proper assessment and timing are critical

- Salvage trees that are likely to die within 1-2 years
- Well-spaced, even-aged, mixed species stands = less damage

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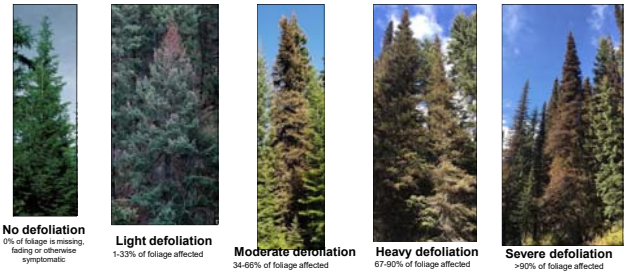
western hemlock looper: management

Assessing the defoliation severity



No defoliation
0% of foliage is missing, fading or otherwise symptomatic

Light defoliation
1-33% of foliage affected

Moderate defoliation
34-66% of foliage affected

Heavy defoliation
67-90% of foliage affected

Severe defoliation
>90% of foliage affected

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Douglas-fir tussock moth

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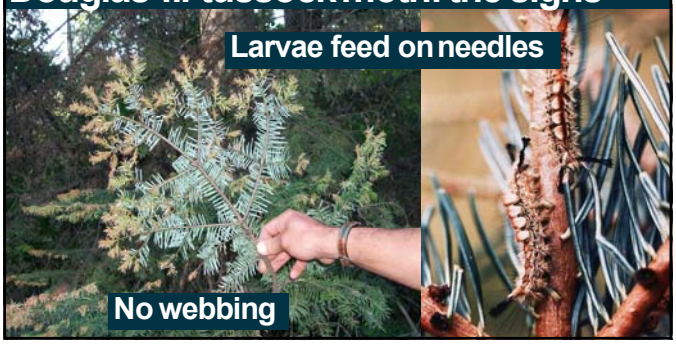
Douglas-fir tussock moth: the signs



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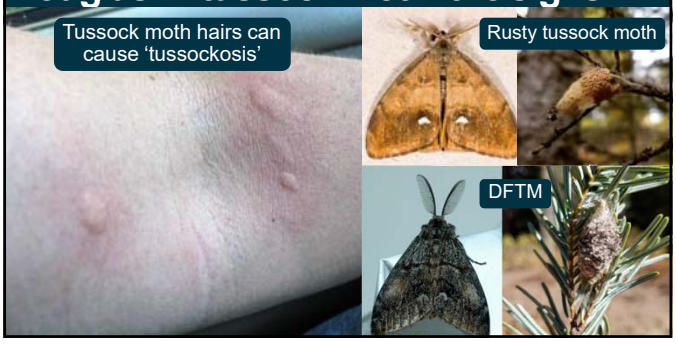
Douglas-fir tussock moth: the signs



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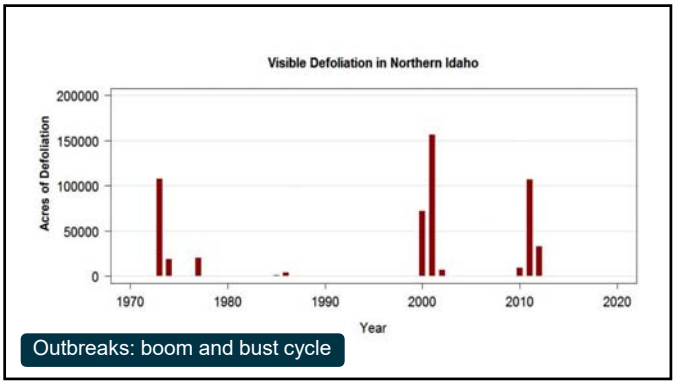
Visible Defoliation in Northern Idaho
Acres of Defoliation
200000
150000
100000
50000
0
1970
1980
1990
2000
2010
2020
Year
Outbreaks: boom and bust cycle

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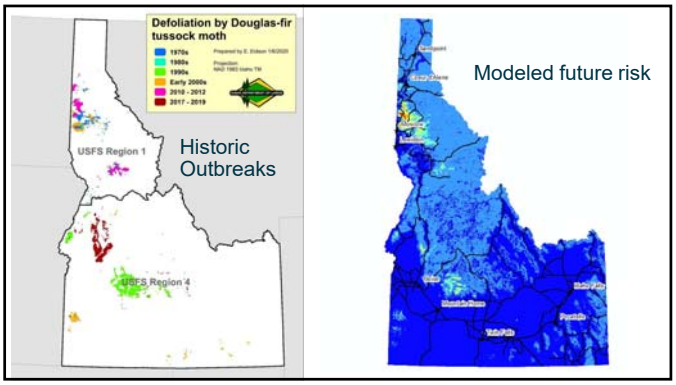
Defoliation by Douglas-fir tussock moth
1970s
1980s
1990s
Early 2000s
2010 - 2012
2017 - 2019
USFS Region 1
USFS Region 4
Historic Outbreaks
Modeled future risk

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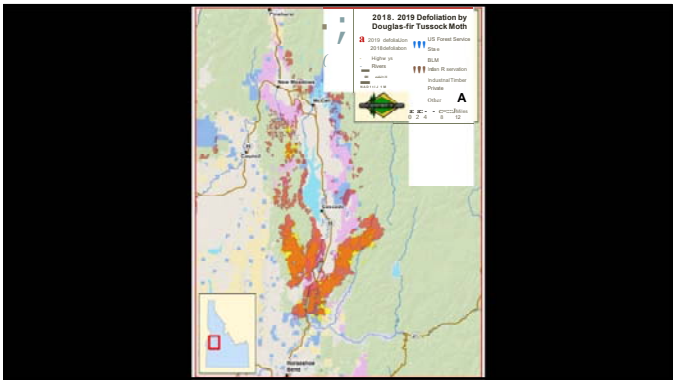
2018, 2019 Defoliation by Douglas-fir Tussock Moth

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Douglas-fir tussock moth: monitoring

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Douglas-fir tussock moth management

During an outbreak:

- Populations usually crash within a few years due to natural enemies (NPV, parasitoids, predators, starvation)
- Pesticides are sometimes used, but are not often recommended
- Salvage heavily damaged trees within 1-2 years

Pesticide spray

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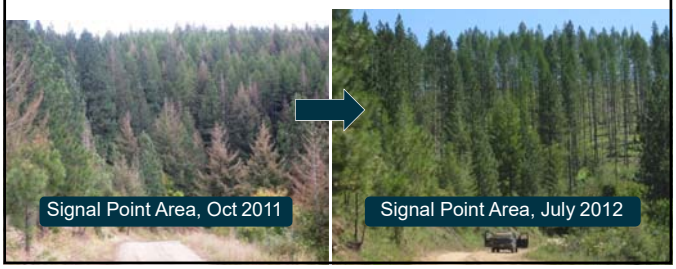
Douglas-fir tussock moth management

Prevention:

- **Silviculture-** reduce the host component, limit hosts in the understory



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Questions on defoliators?

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Bark beetles

about the size of a grain of rice

typically kill trees within one year

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Bark beetles feed & reproduce in the phloem

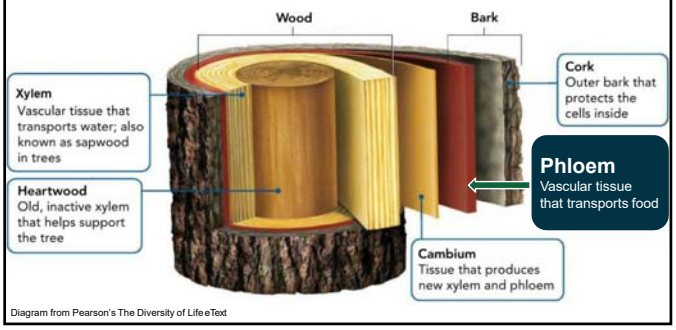

Diagram from Pearson's The Diversity of Life eText

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bark beetle life cycle

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find host

bark beetle life cycle

Erika Eidson
Videos: It's a Goopy Mess When Pines and Beetles Duke it Out | Deep Look | PBS Digital Studios [https://www.youtube.com/watch?v=wR5O48zsbnc

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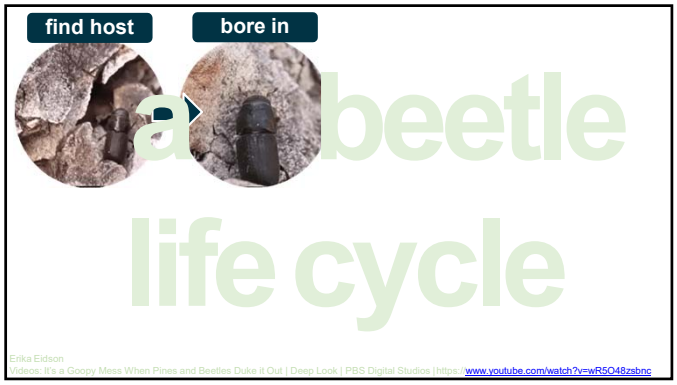
find host
bore in
a beetle
life cycle
Erika Eidson
Videos: It's a Goopy Mess When Pines and Beetles Duke it Out | Deep Look | PBS Digital Studios |https://www.youtube.com/watch?v=wR5O48zsbnc

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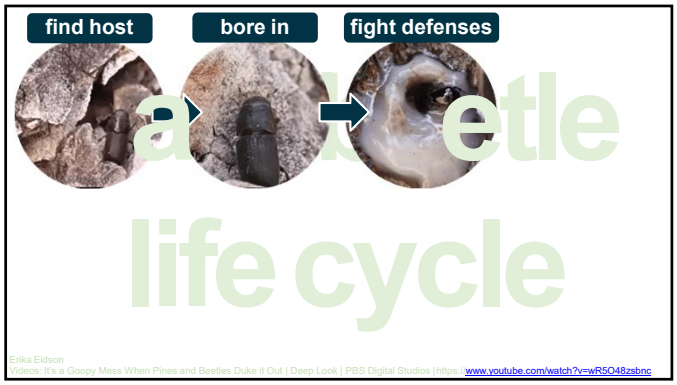
find host
bore in
fight defenses
life cycle
Erika Eidson
Videos: It's a Goopy Mess When Pines and Beetles Duke it Out | Deep Look | PBS Digital Studios |https://www.youtube.com/watch?v=wR5O48zsbnc

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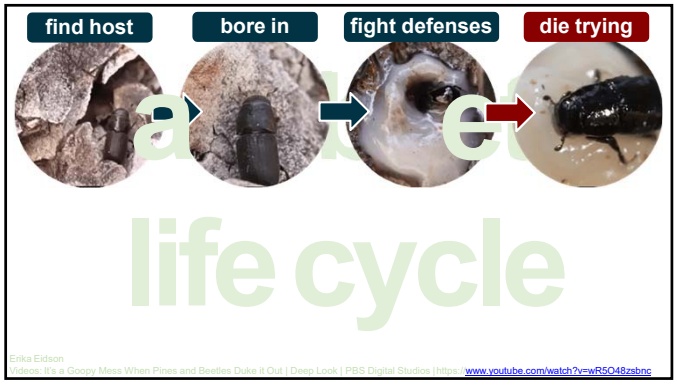
find host
bore in
fight defenses
die trying
life cycle
Erika Eidson
Videos: It's a Goopy Mess When Pines and Beetles Duke it Out | Deep Look | PBS Digital Studios |https://www.youtube.com/watch?v=wR5O48zsbnc

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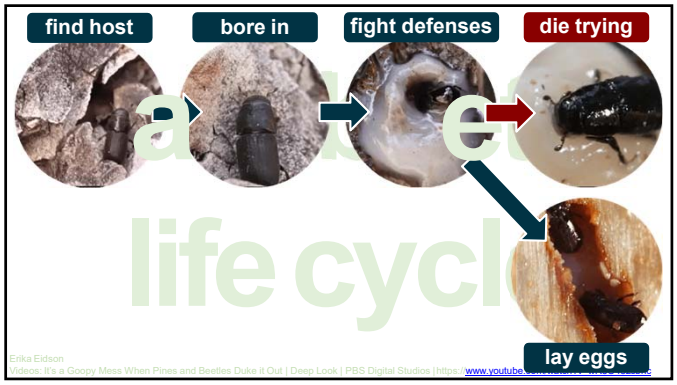
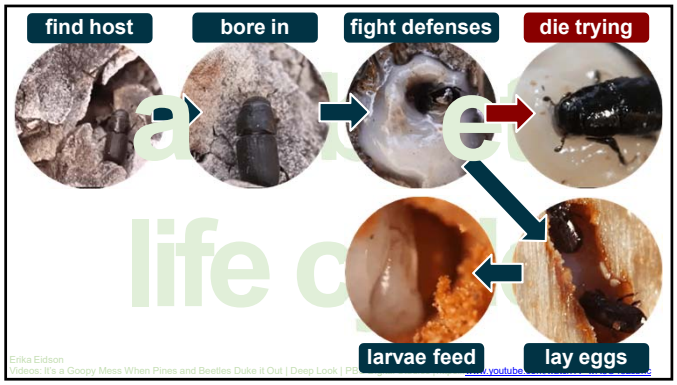

find host
bore in
fight defenses
die trying
lay eggs

40


find host
bore in
fight defenses
die trying
larvae feed
lay eggs

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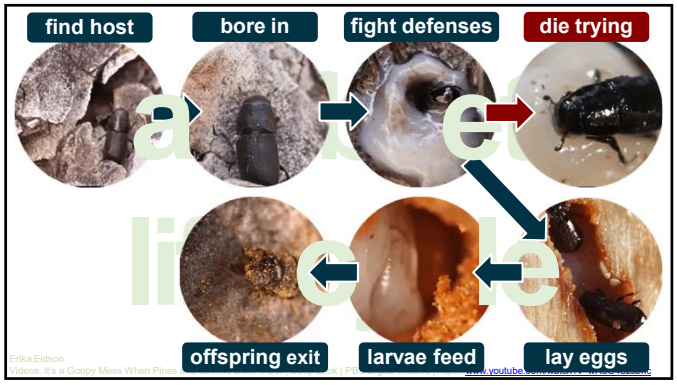
find host
bore in
fight defenses
die trying
offspring exit
larvae feed
lay eggs

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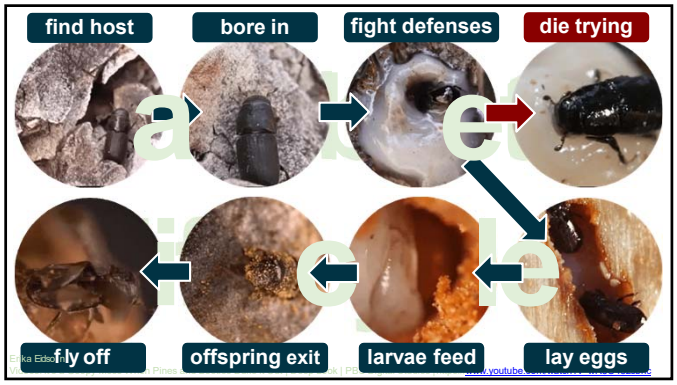
find host
bore in
fight defenses
die trying
fly off
offspring exit
larvae feed
lay eggs

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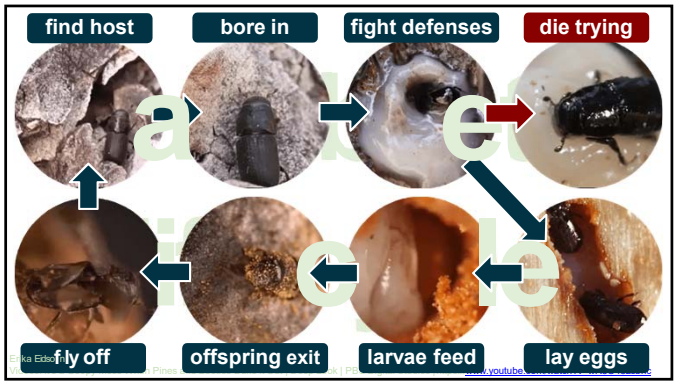
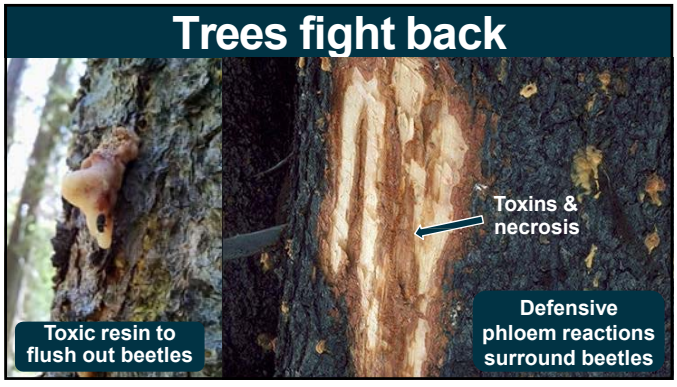

find host
bore in
fight defenses
die trying
fly off
offspring exit
larvae feed
lay eggs

44


Trees fight back
Toxins & necrosis
Toxic resin to flush out beetles
Defensive phloem reactions surround beetles

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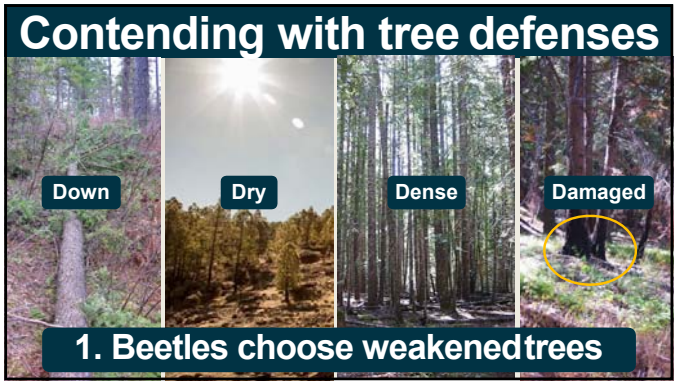
Contending with tree defenses
Down
Dry
Dense
Damaged
1. Beetles choose weakened trees

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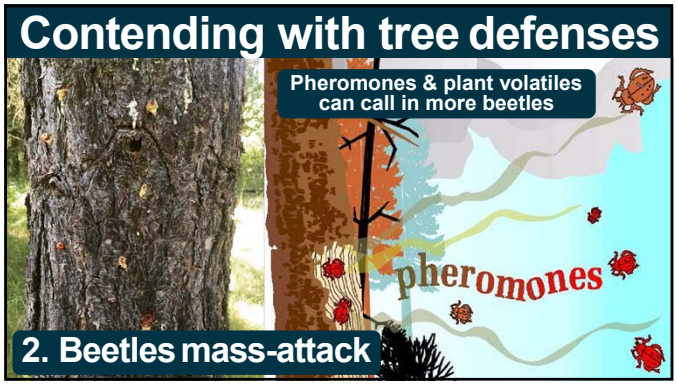
Contending with tree defenses
Pheromones & plant volatiles can call in more beetles
pheromones
2. Beetles mass-attack

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Contending with tree defenses
Adds nutrients for beetles and plugs sapwood to kill tree
Produces pouch fungus after tree is dead
3. Beetles bring in fungi

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Contending with tree defenses

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Contending with tree defenses

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Bark Beetle Identification

What is the host tree species?

What do the galleries look like under the bark?

What are the other signs and symptoms?

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Bark Beetle Identification

What is the host tree species?

What do the galleries look like under the bark?

What are the other signs and symptoms?

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Bark Beetle Identification

What is the host tree species?

What do the galleries look like under the bark?

What are the other signs and symptoms?

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Bark Beetle Identification

Beetle Species	Primary Hosts	Gallery Pattern	Signs & Symptoms
Mountain pine beetle 	All pines, especially lodgepole, ponderosa and whitebark pines		Pitch tubes, boring dust, fading crown
Western pine beetle 	Ponderosa pine only		Pitch tubes, boring dust, distinctive gallery, wood pecker damage, fading crown
Pine engraver 	Ponderosa pine, lodgepole pine, western white pine		No pitch tubes, boring dust, distinctive gallery, fading crown

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Bark Beetle Identification

Beetle Species	Primary Hosts	Gallery Pattern	Signs & Symptoms
Douglas-fir beetle 	Douglas-fir		No pitch tubes, boring dust, fading crown
Fir engraver 	Grand fir		No pitch tubes, boring dust, distinctive gallery, fading crown

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Specific Bark Beetles

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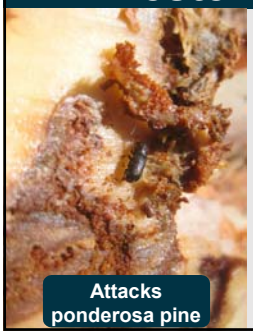
Western pine beetle pg. 56



Dendroctonus brevicomis

2 generations per year in Idaho

- 1st generation adults fly in May/June
- 2nd generation adults fly in Aug/Sept

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Western pine beetle

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Western pine beetle

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Western pine beetle

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Western pine beetle: the signs

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Western pine beetle

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Western pine beetle management

1. Sanitation & Salvage

Remove currently infested trees prior to beetle emergence

- Survey for trees that have western pine beetle signs with crowns that are still green
  - Don't just chase the red & dead trees, but remember pouch fungus degrades volume of killed trees
- Western pine beetle typically has **2** generations per year in Idaho
  - 1st generation attacks May/June
  - 2nd generation attacks Aug/Sept

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Western pine beetle management

1. Sanitation & Salvage

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- Survey for trees that have western pine beetle signs with crowns that are still green
  - Don't just chase the red & dead trees, but remember pouch fungus degrades volume of killed trees
- Western pine beetle typically has **2** generations per year in Idaho
  - 1st generation attacks May/June
  - 2nd generation attacks Aug/Sept

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Western pine beetle management

Destroy or remove infested materials from property

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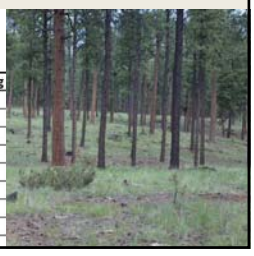
Western pine beetle management

2. Thinning

Thin to a basal area of 80-100 ft² per acre

Target Spacing for Western Pine Beetle Management (90 ft² / Acre)

Tree Diameter	Ft²/Tree	Spacing	TPA @ Spacing	Ft² @ Spacing
8	0.35	13 X 13	256	89
10	0.55	16 X 16	169	93
12	0.79	18 X 20	120	94
14	1.07	22 X 22	89	95
16	1.4	26 X 26	64	90
18	1.77	30 X 30	48	85
20	2.18	32 X 32	42	92
22	2.64	36 X 36	33	88
24	3.14	40 X 40	27	85



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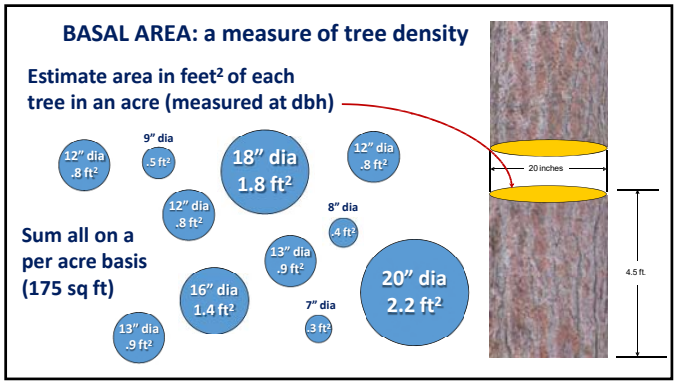

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Western pine beetle management

3. Pesticides

Can treat individual high-value trees with pesticides

- Carbaryl bark spray
  - Need complete coverage
  - Restrictions near water
  - Short-term
- Tree injections
  - May have mixed results
- **Expensive**

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Mountain pine beetle

Dendroctonus ponderosae

1 generation per year in Idaho

- Adults fly in mid to late summer
- Overwinter as larvae

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Mountain pine beetle

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Mountain pine beetle: the signs

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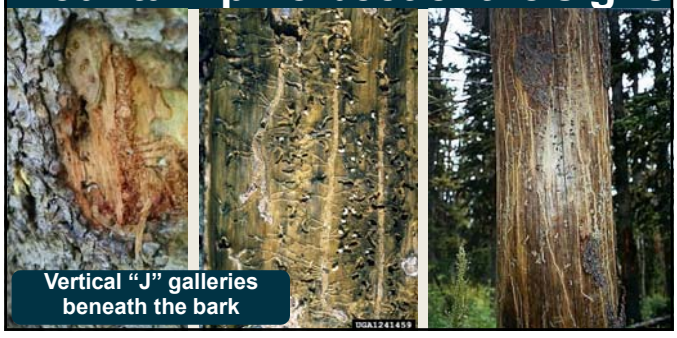
Mountain pine beetle: the signs



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Mountain pine beetle

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Mountain pine beetle

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Mountain pine beetle

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Mountain pine beetle management

1. **Sanitation & Salvage**
2. **Thinning** (BA80-100)
3. **Pesticides** (for high-value trees)

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Mountain pine beetle management

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Mountain pine beetle management

Verbenone
Anti-aggregation pheromone pouches

- Trick beetles into thinking tree is already fully occupied
- Provide protection for 1 year
- Not 100% effective
- Only works for mountain pine beetle

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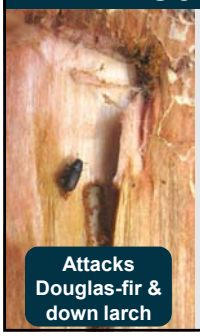
Douglas-fir beetle pg. 62



Dendroctonus pseudotsugae

1 generation per year in Idaho

- Most overwinter as adults
- Fly in mid to late spring

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Douglas-fir beetle

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Douglas-fir beetle

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Douglas-fir beetle

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Douglas-fir beetle: the signs

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Douglas-fir beetle management

During an outbreak:

- **Sanitation and salvage-** remove currently infested trees prior to beetle emergence
- **Trap trees-** create log decks during beetle flight, remove them prior to beetle emergence

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Douglas-fir beetle management

During an outbreak:

- **Sanitation and salvage-** remove currently infested trees prior to beetle emergence
- **Trap trees-** create log decks during beetle flight, remove them prior to beetle emergence

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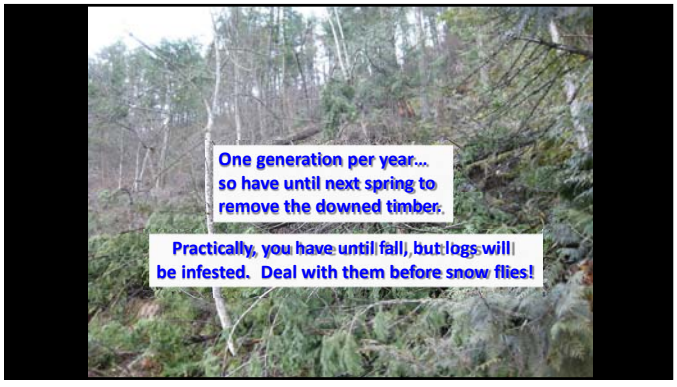

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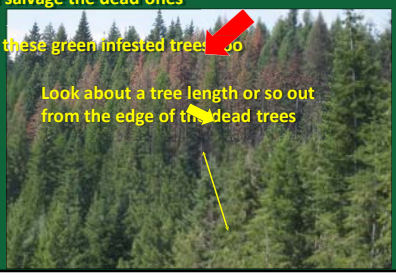
DFB Management

You can salvage the dead ones

But get these green infested trees too

Look about a tree length or so out from the edge of the dead trees



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Douglas-fir beetle management

Prevention:

- **Remove large down trees** within 1 year
- **Thinning:** reduce stand density to below 120 ft² per acre
  - Watch out for root disease
- **Reduce Douglas-fir** component to below 50%
- **MCH** can be applied in high-risk areas

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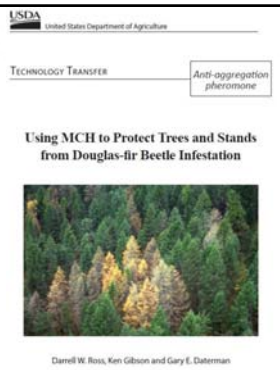
MCH Deployment

- **MCH bubble caps stapled to trees/brush/fence posts as high as you can reach on shady side**
- **Placed at roughly 40 foot spacing throughout the unit**
- **Target dosage = 30 per acre ~$60/AC + cost of application**
- **One app./ year; late March-April (prior to flight)**

90

- MCH bubble caps stapled to trees/brush/fence posts as high as you can reach on shady side
- Placed at roughly 40 foot spacing throughout the unit
- Target dosage = 30 per acre ~$60/AC + cost of application
- One app./ year; late March-April (prior to flight)


USDA United States Department of Agriculture

TECHNOLOGY TRANSFER

Anti-aggregation pheromone

Using MCH to Protect Trees and Stands from Douglas-fir Beetle Infestation

Darrell W. Ross, Ken Gibson and Gary E. Daterman

91

Fir engraver pg. 64

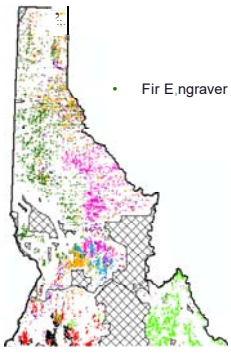
Scolytus ventralis

1 generation per year in Idaho

Attacks grand fir

- Most overwinter as larvae
- Larvae move into the bark
- Adults fly June-Sept

92



93

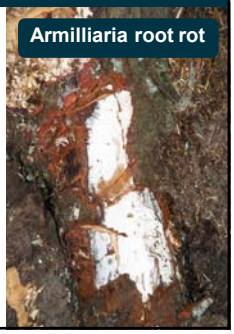
Fir engraver

94

Fir engraver

Susceptibility increased by stresses such as:

- Root disease
- Defoliation
- Drought
- Too much water



95

Fir engraver: the signs

96

Fir engraver

Don't always kill the tree, previous attacks become buried in wood

97

Fir engraver

Old attacks cause ring separation & problems at the mill

98

Fir engraver management

Thinning

- May help promote vigor, but can make root disease issues worse

Sanitation & salvage

- Surveying for current attacks is difficult
- Harvest early to limit sapwood decay from pouch fungus

Reduce the amount of grand fir

99

Pine engraver pg. 60

Ips pini

2-3 generations per year in Idaho

- Overwinter as adults
- Fly in early spring
- Next generation emerges in ~6 weeks
- 3rd generation can occur in warm and dry years

100

Pine engraver

Hosts: usually lodgepole and ponderosa pine >3 in DBH

101

102

Pine engraver

HIGHLY ATTRACTED TO GREEN PINE SLASH IN SPRING

Outbreaks are usually caused by poor slash management

103

Pine engraver

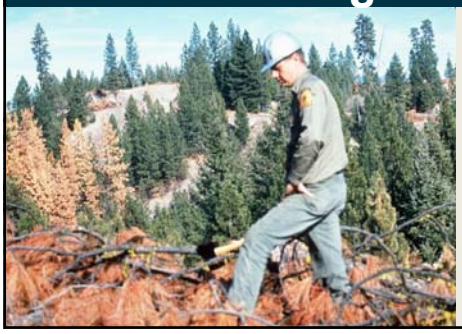
HIGHLY ATTRACTED TO GREEN PINE SLASH IN SPRING

Anything > 3" diameter

Outbreaks are usually caused by poor slash management

104

Pine engraver



Populations build in down material

Next generation can move to standing trees **in ~6 weeks**

105

Pine engraver

Populations build in down material

Next generation can move to standing trees **in ~6 weeks**

106

Pine engraver

Outbreaks are usually caused by poor slash management

107

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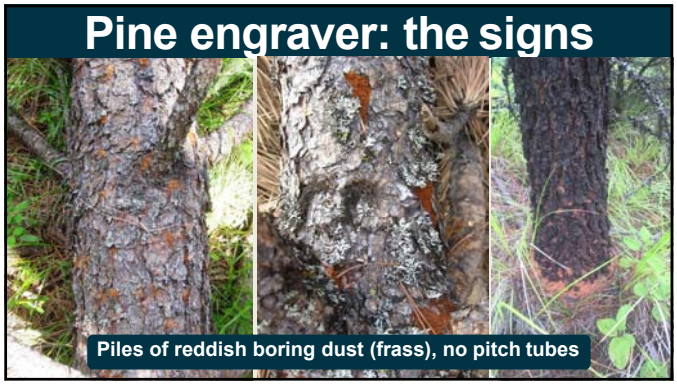
109

Pine engraver: the signs



110

Pine engraver: the signs

111

Pine engraver management

Slash management is key

- Avoid creating pine slash piles or firewood Nov-July
- Clean up winter/spring storm damage
- Dry out host material as quickly as possible
  - Lop and scatter
  - Knock off the bark
- Outbreaks usually subside if there is no fresh slash in spring

112

Pine engraver management

Slash management is key

- Best method: cut in late August, Sept, Oct, early Nov.
- Clean up winter/spring storm damage
- Dry out host material as quickly as possible
  - Lop and scatter
  - Knock off the bark
- Outbreaks usually subside if there is no fresh slash in spring

113

Pine engraver management

Large Piles

- Build slash pile large enough to continue to attract beetles deeper into the pile

114

Pine engraver management

Slash management is key

- **Avoid creating pine slash piles Nov-July**
- **Clean up wi[illegible]nage**
- **Dry out host [illegible]s possible**
  - Lop and scatter
  - Knock off the bark
- **Outbreaks usually subside if there is no fresh slash in spring**

Based on 2 generations of beetles per year

115

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Spruce beetle

Dendroctonus rufipennis

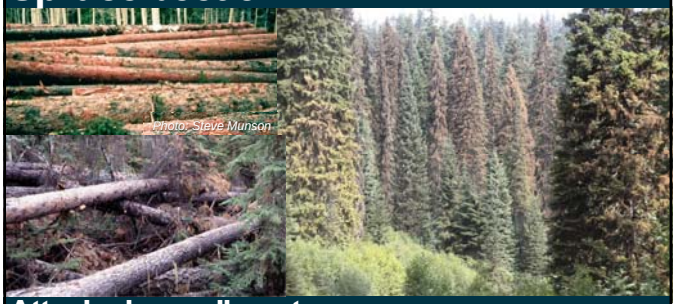
2 year lifecycle in Idaho

- Adults fly May-July

Attacks all spruce

118

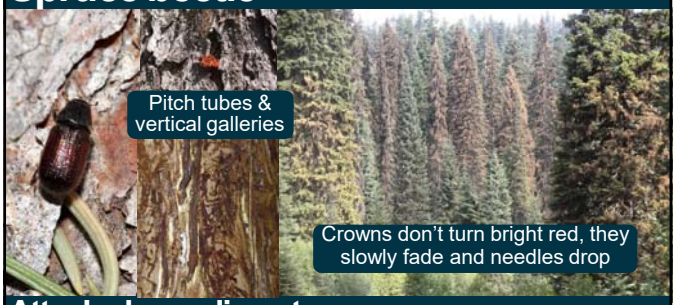
Spruce beetle



Attacks large-diameter spruce

119

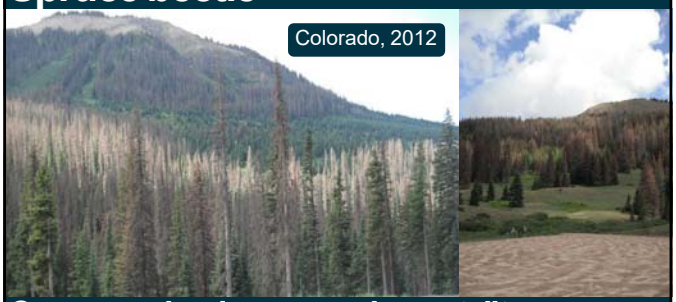
Spruce beetle



Attacks large-diameter spruce

120

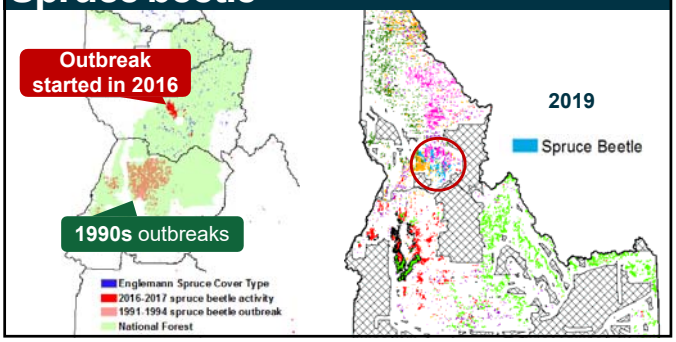
Spruce beetle



Can cause landscape-scale mortality

121

Spruce beetle



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Spruce beetle management

1. **Remove downed spruce** preventatively
2. **Sanitation & Salvage**
3. **Pesticides** (for high-value trees)
4. **Thinning** and species diversity
5. Think about **regeneration**

123

Questions on bark beetles?

124

Wood Borers

Big and loud!

Not usually primary tree killers in Idaho

125

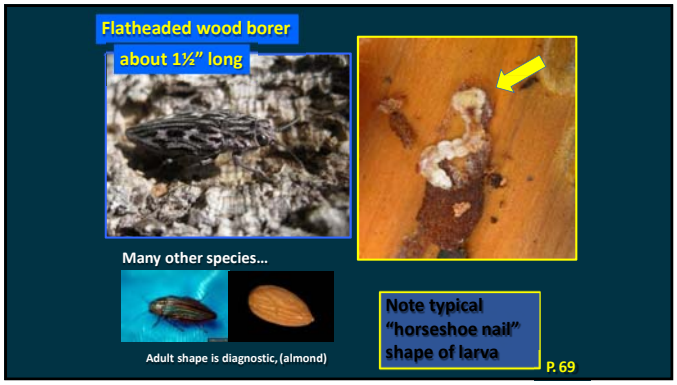
Wood Borers

Page 68-71 in field guide

Big and loud!

Not usually primary tree killers in Idaho

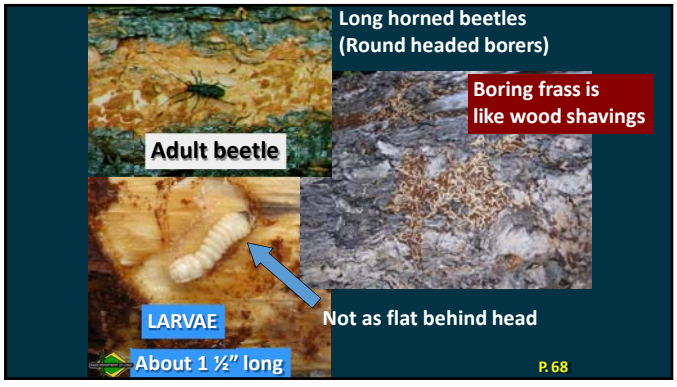
126


Flatheaded wood borer
about 1½" long
Many other species…
Adult shape is diagnostic, (almond)
Note typical "horseshoe nail" shape of larva
P. 69

127


Some species initially feed under bark, then work down into wood
Note holes

128


Long horned beetles (Round headed borers)
Boring frass is like wood shavings
Adult beetle
LARVAE
Not as flat behind head
About 1 ½" long
P. 68

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Pest management: step by step

131

Step 1:
Identify the culprit

132

Step 2:
Where are they now?

133

Step 3:
How much time do I have?

134

When will they attack again?

Beetle Species	Life Cycle	
Mountain pine beetle 	1 generation/year	Fly mid-summer
Western pine beetle 	2+ generations/ year	Fly May/June & Aug/Sept
Pine engraver 	2+ generations/ year	Fly early spring – July/Aug

135

When will they attack again?

Beetle Species	Life Cycle	
Douglas-fir beetle 	1 generation/year	Fly spring & mid-summer
Fir engraver 	1 generation/year	Fly June - Sept

136

Step 4:
Decide on treatment plan

137

Step 4:
Decide on treatment plan

- No action
- Sanitation & salvage
- Pesticides
- Pheromones
- Preventative silviculture - thinning

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Prevention is the **key**

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Erika Eidson
208-666-8625
eeidson@idl.idaho.gov

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