IS YOUR FOREST “HEALTHY”?

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EXTENSION FORESTER
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Parts and functions of a tree

Terminal bud (leader)

Crown (leaves)

Bole (or trunk)

Stem

Root collar

Fine roots

Heartwood (storage)

Sapwood (water transport)

Cambium (new growth)

Phloem (sugar transport)

Bark (protection)
Parts and functions of a tree

- **Water/Nutrients**
- **Sugars**

**Forest Stand Development**

Describes structural changes in a forest over time

Four seres (stages)
Stand Initiation

Establishment of a new cohort
Occurs after a disturbance
Pioneer species
Typically shade intolerant

Stem Exclusion

High stand density
Canopy closure
Significant competition and mortality
Self-thinning
Maturation/Understory Reinitiation

- Less mortality and competition
- Relatively uninhibited growth in first cohort
- Establishment of a second, shade tolerant cohort (i.e. succession)

Old Growth

- Pioneer cohort starts to die
- Multiple age classes
- Large trees and downed wood
- Gap dynamics
What does forest health mean?

Different than tree health
Dying trees move along forest succession
What does forest health mean?

Different than tree health
Dying trees move along forest succession
Dead wood is very important to forest functions

When do we worry?
- When your management goals are affected
- When ecosystem services are lost
- When normal forest development is disrupted
- Lack of resilience
The Forest Health Triangle
A way to describe individual agents of tree mortality or damage

Host

Environment

Agent

Moist, coastal climate

Swiss needle cast fungus

Douglas-Fir
Common Culprits in Western Washington

Root Rots
Most common biotic “tree-killer” in western WA forests
Fungal pathogens, destroy roots
Three common species:
1. Laminated
2. Armillaria
3. Anosus
Tree killing agent? Yes
Forest health problem? That’s up to you . . .
Root rot serves an important ecological purpose in western WA forests
Root Rots
Identification
- Reduced terminal growth
- Yellowing, sparse foliage
- Stress cone crop

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- "jack-strawed" downed trees
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Gradient of symptoms across trees
Spreading outward

Identifying the species? Call a forester!
To manage? Or not to manage?

Stop the spread with tree removal
- Include a buffer (two tree widths)
- Removing the host from the triangle
Root Rots

Management
To manage? Or not to manage?
Stop the spread with tree removal
  • Include a buffer (two tree widths)
Removing the host from the triangle
Plant (or promote) resistant species
  • Resistant species depend on the type of root rot

Heart and Butt Rots
Not a concern for spreading
Makes for great wildlife trees
Avoid by not wounding and pruning when trees are dormant
Bark Beetles

First things first: bark beetles (and other insects) are almost always secondary pests.

Attack weakened trees (drought, root rot, competition, etc.)

Different beetles attack different species and sizes.

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Girdle trees by eating the cambium.

Trees can defend themselves.

Generally only a concern after major blowdown events.
Bark Beetles

Identification

Pitching
Exit/entry holes
Boring dust
Quick death (red)
Bark Beetles

Identification

Pitching
Exit/entry holes
Boring dust
Quick death (red)
Egg galleries

Note: Once a tree is dead, lots of things move in (nothing to worry about!)
Look at freshly dead or dying trees
Bark Beetles
Management
Maintain tree vigor!
Manage large inputs of fresh dead trees
Removal of green attacked trees

Pesticides? Not really an option
Pheromones for DFB
Bark Beetles

Common Species
Douglas-Fir beetle
Fir engraver beetle
Douglas-fir pole beetle
Pine bark beetles
Spruce beetles
California five-spined ips

Quick Note on Wood Borers
Only attack dead or highly stressed trees
Defoliating Diseases and Insects

- Swiss Needle Cast
- Tent Caterpillar
- Silver Spotted Tiger Moth
- Rhizoctonia

Typically not mature tree killers, but often cause growth losses. Some fungi may also damage stems. Strongly influenced by local weather.

And others . . .

- Tip weevils
- Pitch moths
- Borers
- Cankers
- Wet rots
- Rusts
- Needle casts
- Etc.
Animal Damage

- Bears
- Sapsuckers
- Deer/Elk
  - Protect your cedar!
- Porcupine
- Mice
- Voles
Abiotic Stressors

Drought
Top-down/outside-in
Lack of water getting to extremities
Affects all species (some more than others)
Stress is cumulative
Often occurs on trees along edges, in yards or pastures, near roads and developed areas
Certain soil types also susceptible

Bigleaf Maple Decline
Invasive Plants

Shade tolerant
- English Ivy
- English Holly

Shade intolerant
- Himalayan/Evergreen
- Blackberry
- Scotch Broom

Exotic Pests on the Horizon

Gypsy Moth
Sudden Oak Death
Emerald Ash Borer
Elongate Hemlock Scale

Existing:
White Pine Blister Rust
Other Concerns

Overstocking

Very common issue
Trees are "unhappy"
Stand stagnation

How to tell?
Other Concerns

Overstocking

Very common issue
Trees are “unhappy”
Stand stagnation
Stem codependence
How to tell?
• Height/Diameter ratios
• Live crown ratios
• Understory growth

What to do when you’ve waited too long?

In this neck of the woods . . .

Legend

Forest Disturbance Activity

- Douglas-fir beetle
- fir bark beetles
- spruce beetle
- pine bark beetles
- hemlock mortality
- bear/root disease complex
- western spruce budworm
- balsam woolly adelgid
- cedar mortality
- 2018 Fires

Areas Not Flown

- forested
- non-forested
- Major Freshwater Bodies

Major Landowners

- DNR - Managed Lands
- Tribal Lands
- Federal Lands

- Drought
- Fir engraver beetle
- Doug-fir beetle
- Bear damage
- Swiss Needle Cast
  (Wahkiakum)

https://fmanfire.dnr.wa.gov/default.aspx #
## Washington Fire Ecology

<table>
<thead>
<tr>
<th>WEST – WET FORESTS</th>
<th>EAST – DRY FORESTS</th>
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### WEST – WET FORESTS

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- Fires provided disturbance to “reset” succession, open-up large gaps
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### EAST – DRY FORESTS

- Frequent, low-severity fires every 5-50 years
- Fires maintained fire tolerant overstory by killing understory shade-tolerant species
- Prone to severe fires when fuel is present
- Fires are fuel-driven
- Fuel treatments and prescribed fire effective restoration tools
Wildfire Adaptation in Western WA

Management should encourage stand-scale structural and compositional diversity
  ◦ Present the full spectrum of forest succession and structure
  ◦ Promote genetic and species diversity

Avoid overstocking and other stressors
Hardwoods are okay!
Gaps are okay!

Use fuel treatments near structures
  ◦ National Fire Protection Association

“This diversity is more likely in landscapes where multiple landowners with different management objectives are managing adjacent lands, thereby creating different sets of forest structures”

~ Halofsky et al., 2018

Recap

1. A forest is considered healthy when it is resilient, vigorous, and providing a suite of ecosystem services
2. Tree mortality is often natural and beneficial
3. Resilience is rooted in diversity
4. Manage stand density
5. Insects are rarely the primary cause of tree death
6. Products are almost never the answer
7. You have resources at your disposal
Your Resources

WSU Extension

Educational programming
- Forest Stewardship Coached Planning
- Family Forest Field Days
- Topical workshops

Research
Publications
Newsletters
One-on-one assistance
DNR Small Forest Landowner Office

Forest Stewardship
- Matt Provencher, Stewardship Forester
  - matt.provencher@wa.dnr.gov
  - 360-902-1494
- Ken Bevis, Wildlife Biologist
  - ken.bevis@dnr.wa.gov
  - 360-489-4802

Forest Riparian Easement Program
Family Forest Fish Passage Program
Forest health services
https://www.dnr.wa.gov/sflo

Conservation Districts

Foresters
- Mason, Thurston – Mark Mead
- Grays Harbor, Pacific – Dave Houk
- Clark, Cowlitz, Wahkiakum – Jeff Paulson
  - jpaulson@clarkcd.org
  - (360) 859-4783

On-site assistance
Writing stewardship plans
Plant sales
Other programs (including agriculture)
Natural Resources Conservation Service (NRCS)

Cost-share funding to complete management activities
- Pre-commercial thinning, planting, road maintenance, etc.
- Plan required

Other services offered (mostly agricultural)

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Washington Farm Forestry Association

Multiple local chapters
- South sound, Lewis, Grays Harbor, Pacific, Clark, Cowlitz

Great resource, wealth of experience available
Twilight tours and other educational programs
Plant sales (occasionally)
Forest Practices – Additional Info

OLYMPIC REGION
olympic.region@dnr.wa.gov
360-374-2800, Fax: 360-374-5446
411 Tillicum Lane, Forks, WA 98331-9271

SOUTH PUGET SOUND REGION
southpuget.region@dnr.wa.gov
360-825-1631, Fax: 360-825-1672
950 Farman Ave. N., Enumclaw, WA 98022-9282

PACIFIC CASCADE REGION
pacific-cascade.region@dnr.wa.gov
360-577-2025, Fax: 360-274-4196
601 Bond Road, PO Box 280, Castle Rock, WA 98611-0280

Other Resources

County noxious weed boards
Land trusts
Annual DNR forest health survey
  ◦ http://www.dnr.wa.gov/ForestHealth
Books
  ◦ Common Tree Diseases of British Columbia
  ◦ Field Guide to the Common Diseases and Insect Pests of Oregon and Washington Conifers
Staying in touch . . .

Website: forestry.wsu.edu/sw
Facebook: @WSUForestrySW
Email list-serve
Forest Stewardship Notes

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