This Hazard Tree Recognition Training is dedicated to
Gwen Saltis Trail Crew Leader, Inyo National Forest.
July 19, 2003
"Think about the future but don't forget about the present".

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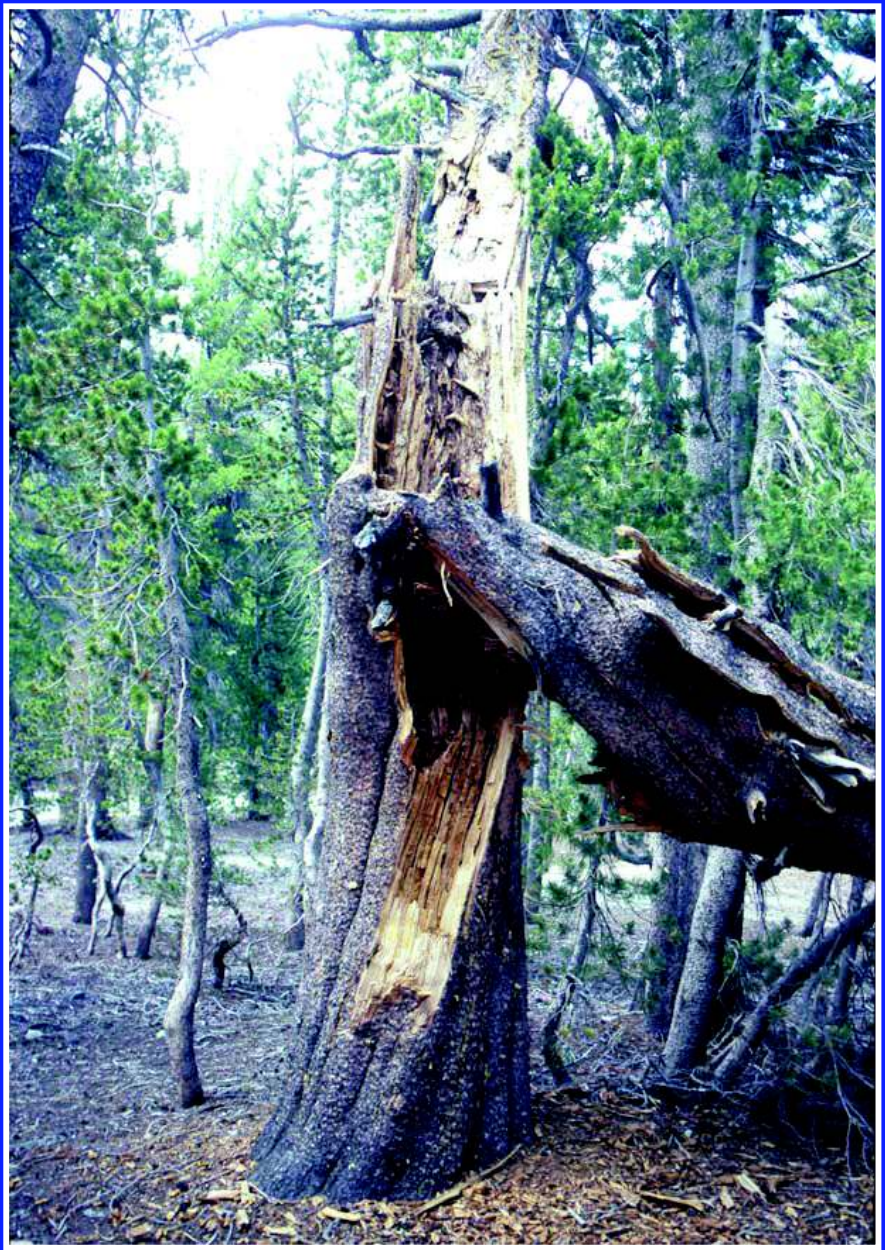


Hazard Tree Awareness

USDA Forest Service, Pacific Southwest Region

Objectives

To learn about tree structural weaknesses that may be a cause for concern.

We are looking for the clues that an individual tree displays that would tell us we need to be aware of a potential tree failure.

Awareness

Very basic – you don’t need to know the scientific names of diseases, insects, fungi, rots or parasites.

The intent is to provide you with enough information so that when you come across something in the woods, you are able recognize it and understand the potential hazard.

DEFINITION:

A tree is considered hazardous if it has defects that may cause a failure resulting in property damage, personal injury or death.

In other words, in order for a tree to be considered hazardous it must have a structural weakness and something to hit (target) if it falls.

Defective Tree Categories

All parts of a suspected hazardous tree, from top to bottom, should be examined for defects. Potentially hazardous trees can be classified based on what part of the tree is defective.

Categories of Tree Defects

1. Root
2. Butt and bole
3. Branches
4. Top
5. Whole tree
6. Multiple defects

1. Root Defects

Defects occurring in the roots can be especially difficult to detect because they are usually below ground. Trees with root disease can fall over even when the crown is green.

1. Root Defects

- Root disease/rot
- Undermined roots
- Severed roots
- Loosened, cracked or broken roots

Signs and Symptoms of Root Disease

Loss of Needles & Thinning Crowns

Loss of foliage and thinning crowns are two visible indicators that a tree is not healthy and could have some sort of root problem.

Be aware that other insect and disease agents produce similar symptoms. It is very important to look for additional clues that will help you determine what the actual problem is. Gather as much information as you can.

Discoloration of Tree Crown

Trees that have been weakened by root diseases are prime targets for attacks by insects, particularly bark beetles. If bark beetle attacks are successful, the crown will discolor (fade) as the tree dies.

Large fading sugar pine in center with older dead trees on either side.

Bark Beetle Attacks

The most common bark beetles in California include the western and mountain pine beetles and the red turpentine beetle. These beetles will attack trees with root disease as well as trees weakened by fire, drought and overstocked conditions. When you see beetle attacks it is important to look for other clues that may indicate root disease is present.

Other Symptoms of Root Disease

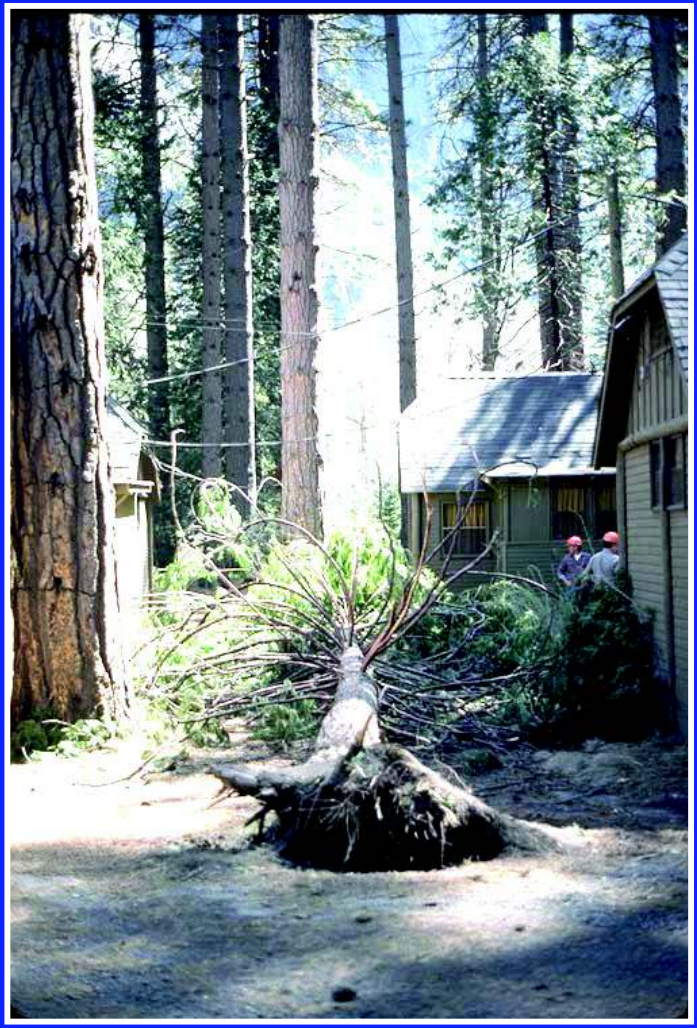
Trees dying around an opening in a stand with older down material in opening (left); and sap bleeding from lower bole.

Mushrooms or Conks at Base of Tree

Fruiting bodies of root disease fungi are a sure sign that decay is present in the roots and may extend up into the butt log.

Windthrow

Trees blown down within the past few years with advanced rot in the structural roots or no roots present means root disease is probably active on the site.



Windthrow Without Root Disease

Sometimes trees with healthy root systems are uprooted, especially during storms, because the soil is shallow or there is a high water table. In these cases, the exposed roots show no evidence of rot

There was no decay in this white fir that uprooted be-cause of a wet, shallow soil

1. Root Defects
- Undermined Roots

Anything that causes soil erosion and exposes roots will reduce tree stability.

Soil erosion along road cut bank

Soil erosion along river

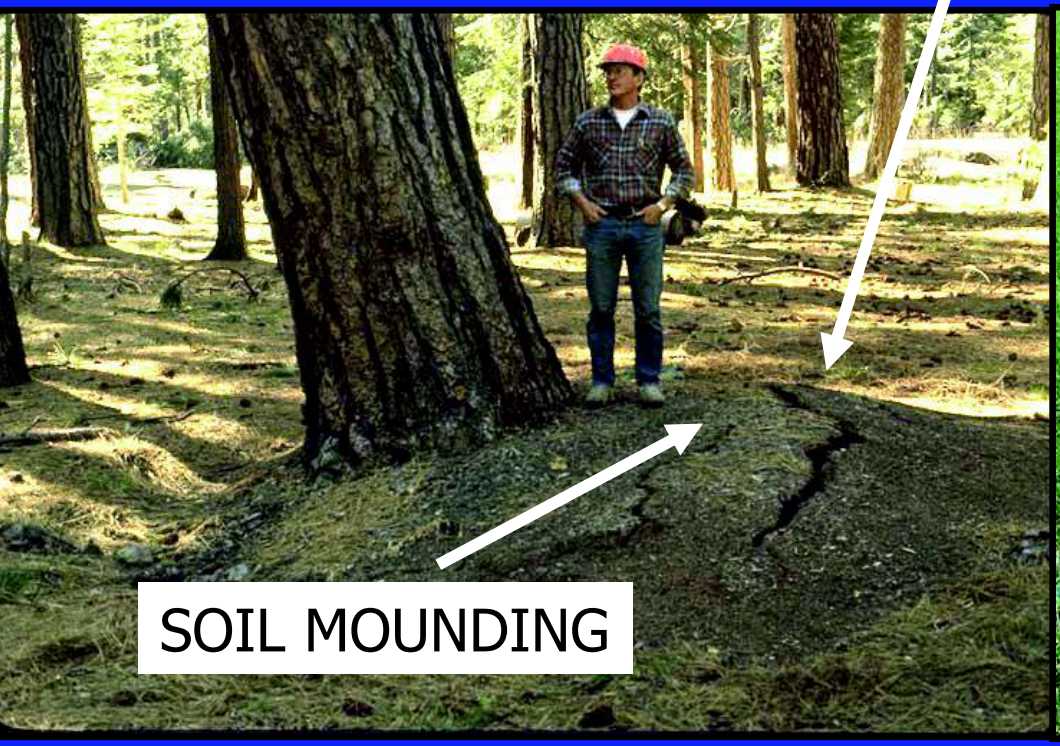
1. Root Defects
- Severed Roots

Roots are often cut during construction activities. This can lead to failure if several major roots are cut on one side of a tree. Cutting roots also reduces tree vigor and resistance to pests and may lead to future root decay.

1. Root Defects
- Loosened, cracked or broken roots

Look for newly developed lean, cracks in the soil near the tree, mounding of soil in the root zone and exposed or damaged roots.

CRACKS



2. Butt and Bole Defects

- Heartwood rots
- Sapwood rots
- Cankers
- Cracks and splits
- Wounds and scars
- Codominant stems

Wood Decays

There are many fungi that can decay wood. Some, as we have seen, attack the roots, while others are typically found in the heartwood or sapwood. All of these fungi need a way to gain entry into the wood. They cannot go directly through healthy, intact bark.

Entry Courts For Decay Fungi

- Fire scars
- Logging damage
- Broken tops & branches
- Branch stubs
- Lightning strikes
- Sunscald
- Frost cracks
- Insect attacks
- Animal damage

2. Butt and Bole Defects - Heartwood rots

Decay of the heartwood plays a major role in tree failures. Look for fire scars, mechanical wounds and conks (fruiting bodies of decay fungi). If striking the bole with the flat end of an axe produces a hollow sound, there is probably a lot of heartwood decay.

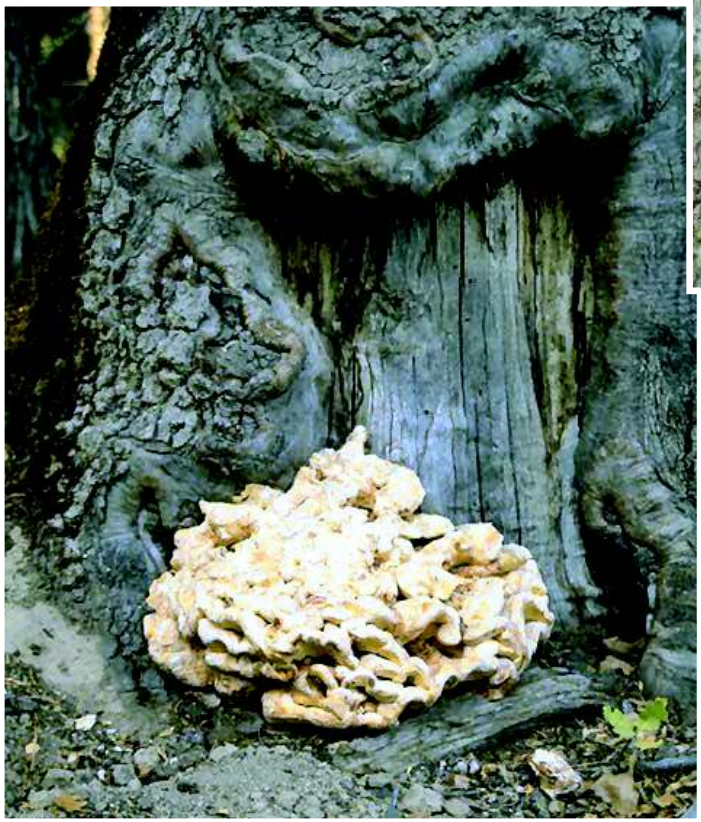
Heartwood rot may be hidden and require close examination to find

2. Butt and Bole Defects
- Heartwood rots

Large wounds, regardless of cause, are common ways that decay fungi get inside a tree.

Conks = Fruiting Bodies of Decay Fungi

Conks come in many sizes, shapes and colors. If you see one on a standing green tree it means that there is rot in the tree, and it should be examined more carefully.



2. Butt and Bole Defects - Sapwood Rots

Decay of the outer sapwood is less common than heartwood rots in California and occurs most often in hard-woods. Sapwood decay is frequently found behind wounds and cankers. The bark over areas with sapwood decay is usually dead and can be easily removed.

2. Butt and Bole Defects - Cankers and swellings

Cankers are dead areas on the bark of a tree and are caused by several different agents. Swellings on the bole of true firs are often caused by dwarf mistletoes. If the bark is intact and tight on the tree there is usually no decay present, and the tree is not hazardous. Once the bark dies, decay fungi are able to infect the wood underneath. The amount of decay present will dictate whether the tree should be removed.

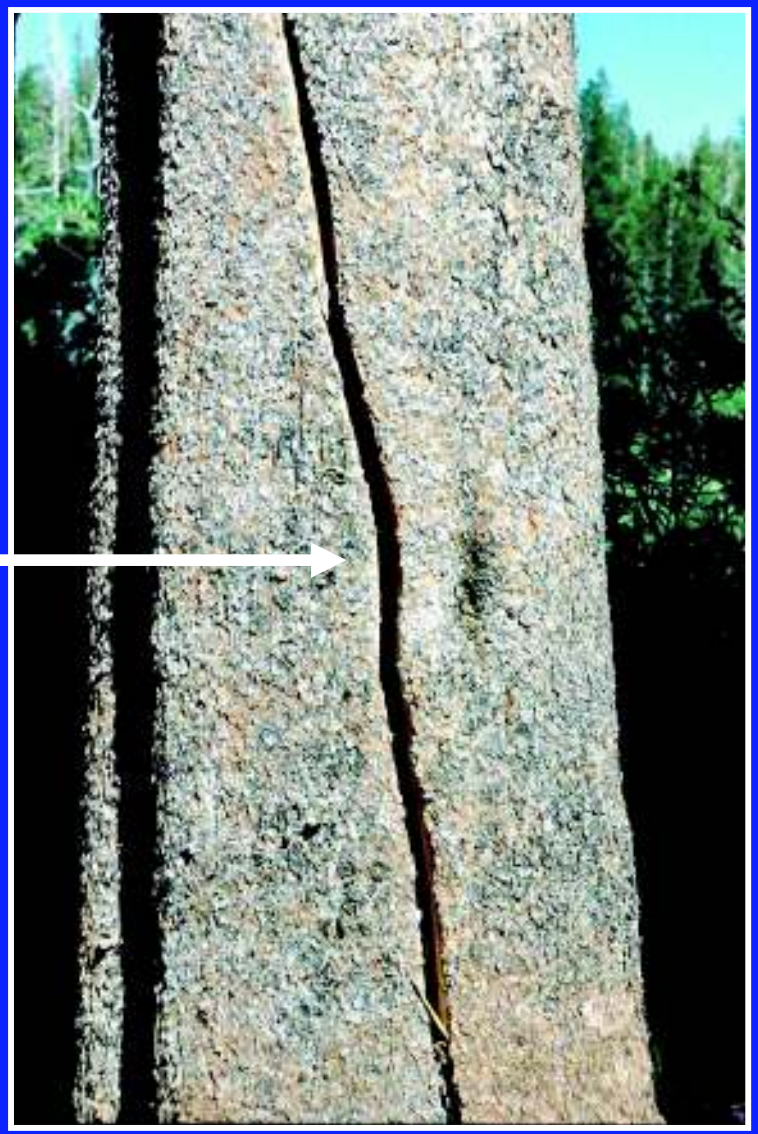
Bole canker with conks of a wood decay fungus

Bole swellings with tight, intact bark usually have no decay

Cankers with dead bark are often decayed, especially in true fir.

2. Butt and Bole Defects - Cracks and splits

Cracks in the bole can occur due to lightning, frost, or because the tree has begun to fail. They are especially serious with trees that lean and may also provide an entry way for decay fungi.



2. Butt and Bole Defects - Wounds and scars

If wounds are severe they may reduce a tree's stability directly, but more often they create avenues for decay fungi to get estab-lished. Scars are old wounds that have healed over and may hide internal rot.

This tree was trying to heal over an old wound that allowed decay to enter

2. Butt and Bole Defects - Codominant stems

Codominant stems occur when a tree forks and produces 2 stems of about equal size. Over time the stems get larger and tend to push each other apart.

2. Butt and Bole Defects
- Codominant stems

Look closely at the union of the two stems (crotch) and see if there are cracks, loose bark, weeping sap or any evidence of decay.

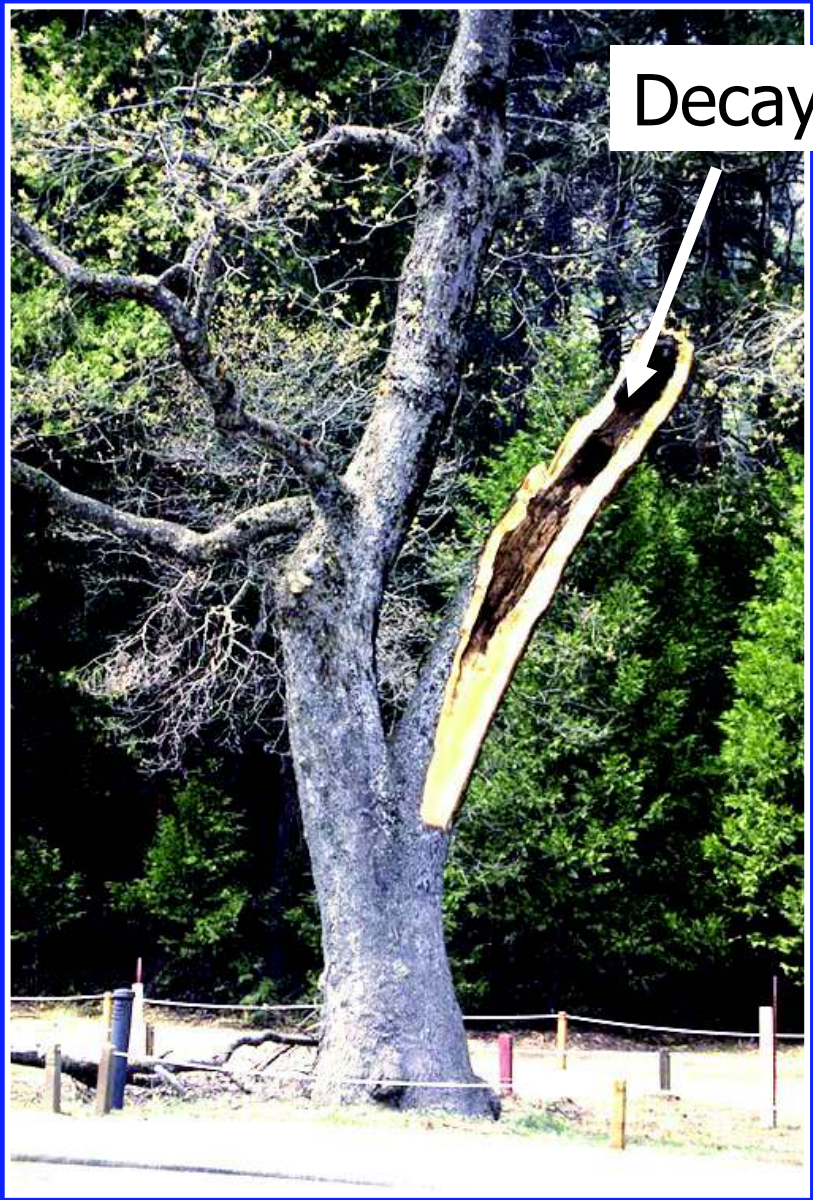
Stems splitting apart

3. Branch (Limb) Defects

In general, branch failures are less damaging than those caused by defective stems and roots. Also the target area is usually smaller with falling branches. Hardwoods tend to have more branch failures than conifers. This category includes the following three defects:

- Decay
- Dead branches
- Dwarf mistletoe brooms

3. Branch (Limb) Defects - Decay



Look for the same decay indicators on branches as on stems, such as conks and cracks, plus broken or hollow branch stubs.

Conk growing on a black oak branch

3. Branch (Limb) Defects - Decay

Crack on black oak branch may lead to decay or sudden failure of entire branch

Hollow branch stub on hardwoods probably indicates internal decay

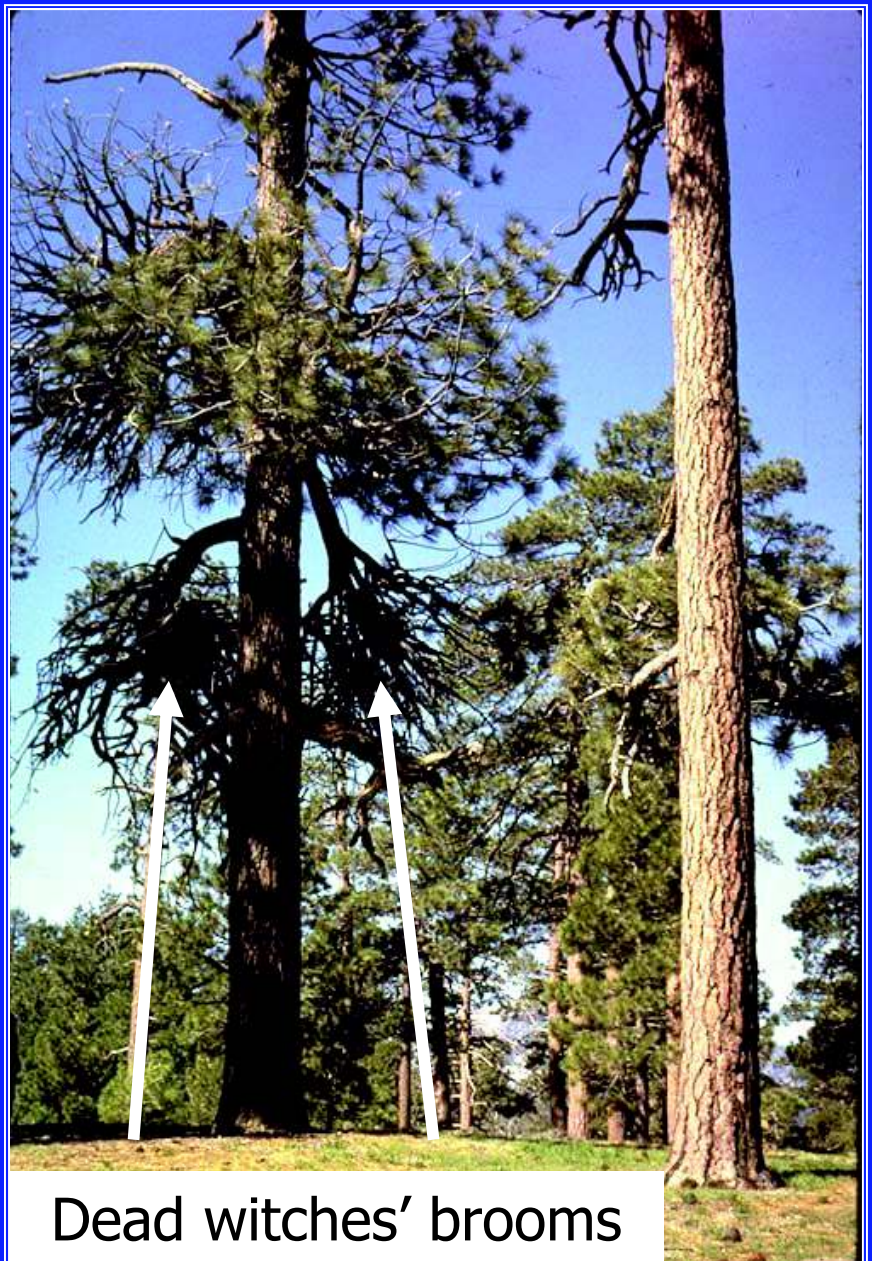
3. Branch (Limb) Defects - Dead branches

Dead branches are common in California hardwoods and often fail during the winter because of the increased weight of ice and snow

3. Branch (Limb) Defects - Dead branches

Large, dead limbs should not be allowed to remain adjacent to structures or in areas where people congre-gate, camp or park their vehicles

3. Branch (Limb) Defects - Dwarf mistletoe booms



Dwarf mistletoe is a parasite that causes trees to produce dense, heavy masses of branches and foliage called "witches' brooms". If these brooms die, they can be a hazard to the area underneath the tree.

4. Tree Top Defects

When the top of a tree dies, some species will form one or more tops to replace the dead one. Two categories of hazardous trees involving the top are:

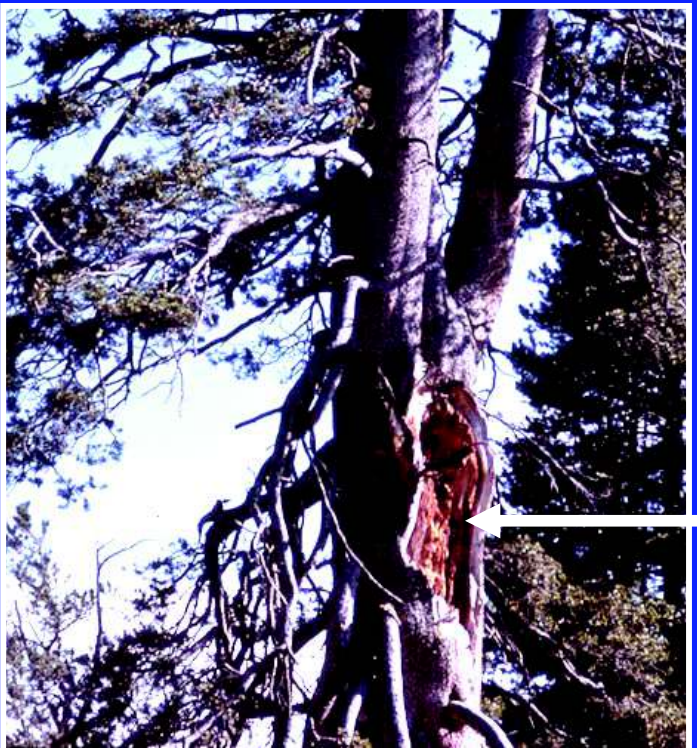
- Dead tops
- Multiple tops

4. Tree Top Defects - Dead tops

Dead tops can occur in any tree species but are especially hazardous in white and red fir because these trees are very susceptible to decay.

4. Tree Top Defects - Multiple tops

Decay at the site where multiple tops originate makes a very hazardous situation.



4. Tree Top Defects
- Dead tops
- Multiple tops

Decay

Dead or multiple tops may not look very large when they are still in the tree, but it's a different story when they hit the ground.

5. Whole Tree Defects

This category involves the two situations below where the entire tree is defective

- Snags
- Leaning trees

5. Whole Tree Defects
- Snags (dead trees)

This is one of the easiest categories of hazardous trees to recognize. As soon as a tree dies, it loses the ability to resist a wide variety of wood-destroying insects and fungi, and the wood begins to deteriorate.

Although some snags stand for many years, most do not, and their structural stability is very unpredictable.

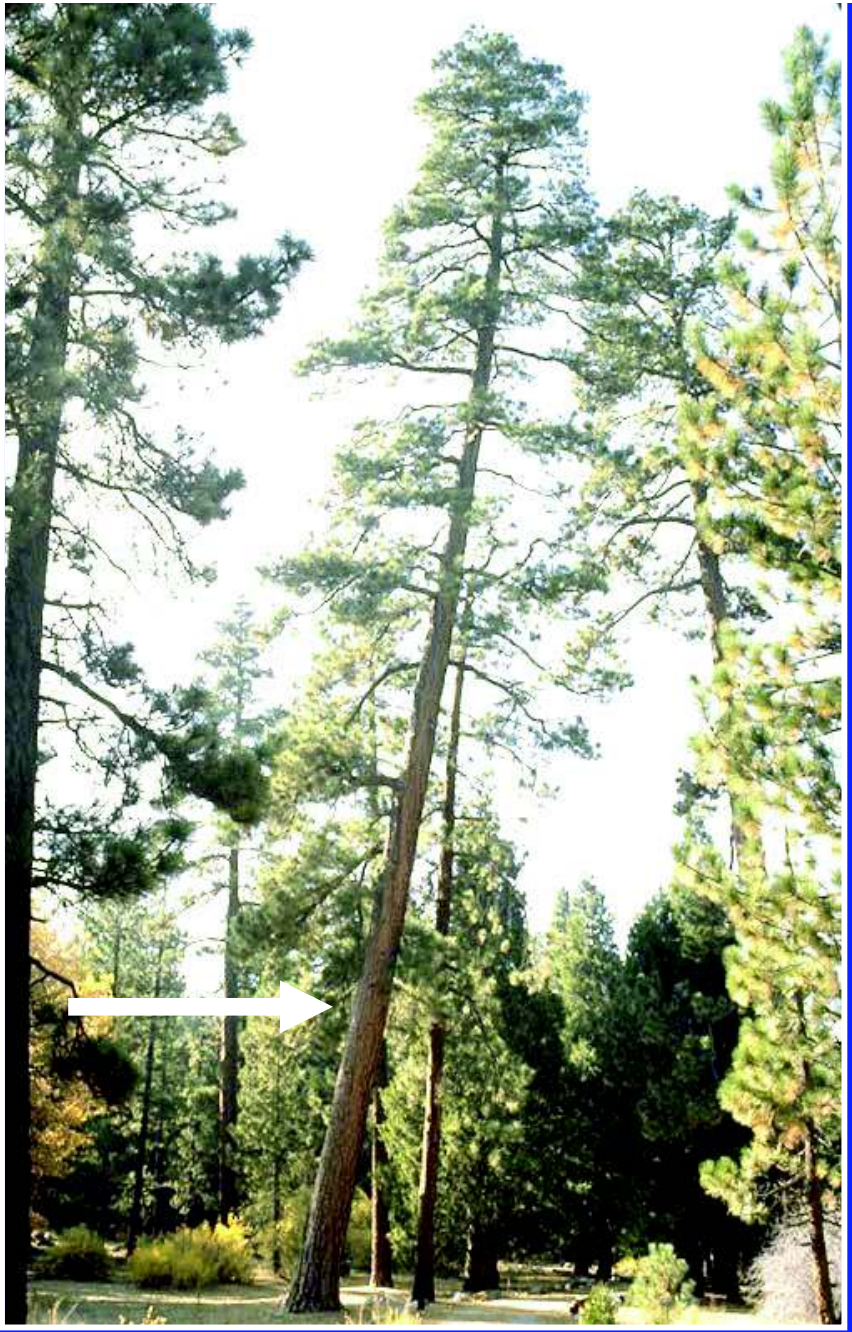
No matter how long trees have been dead, they are structurally unstable and should be considered potentially hazardous.

5. Whole Tree Defects - Leaning Trees

Lean increases the likelihood of a failure because the weight of the tree is pulling it in the direction of the lean. We can use this information to predict where the leaning tree will fall, and if it leans away from a target, it is not considered hazardous.

A tree that has been leaning for a long time will try to compensate for the lean by growing it's top vertically. This is called a corrected lean, which may indicate the tree is fairly stable. A tree that has not corrected its lean may indicate the lean occurred recently – this is potentially more hazardous.

This tree has not corrected its lean which may indicate a recent change.



This tree has corrected the lean which may indicate a more stable situation.

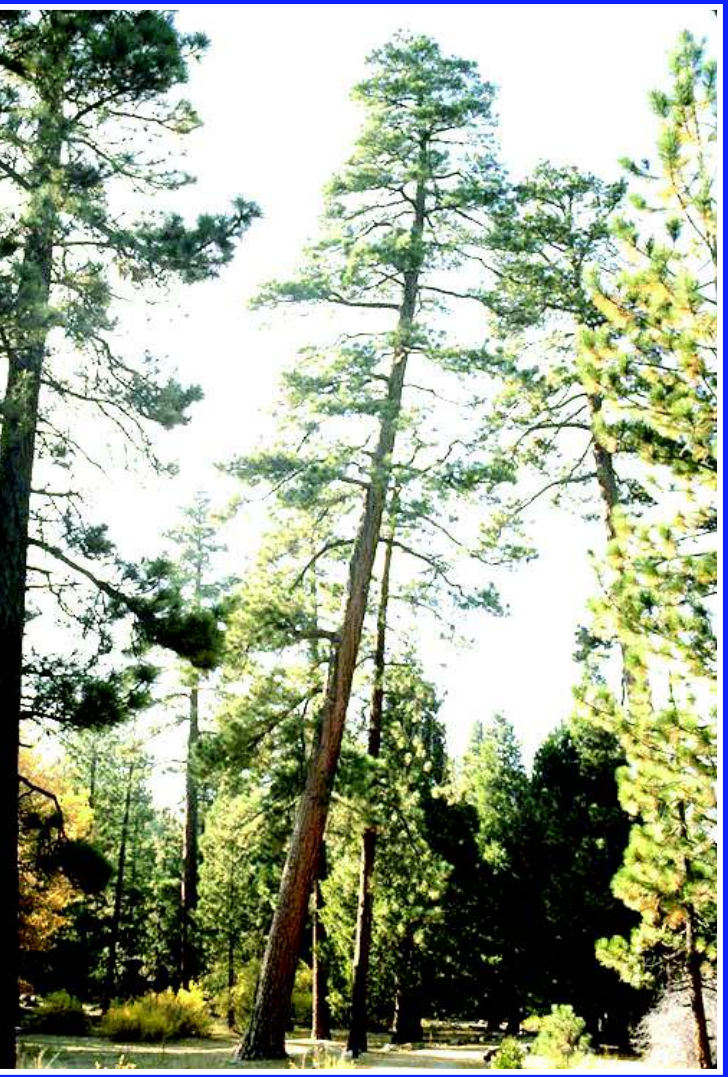
5. Whole Tree Defects - Lean

Regardless of the type of lean, all trees that lean toward a target should be carefully examined, especially at the base. Look for cracked roots, cracks in the lower bole, uplifted soil on one side of the tree, fruiting bodies (conks) that may indicate root disease/decay, mechanical wounds and fire scars.

6. Whole Tree Defects - Multiple defects

Multiple defects refers to situations when a tree has more than one structural problem that act together to make the tree even more hazardous. If a tree has a dead top and a basal fire scar, it would not be considered as a multiple defect – each of these defects would be treated separately. If, however, a tree is leaning and has decay in the butt log, it would be considered a multiple defect because the lean increases the likelihood that the tree will fail at the weakened butt log . Most commonly, multiple defects involve leaning trees.

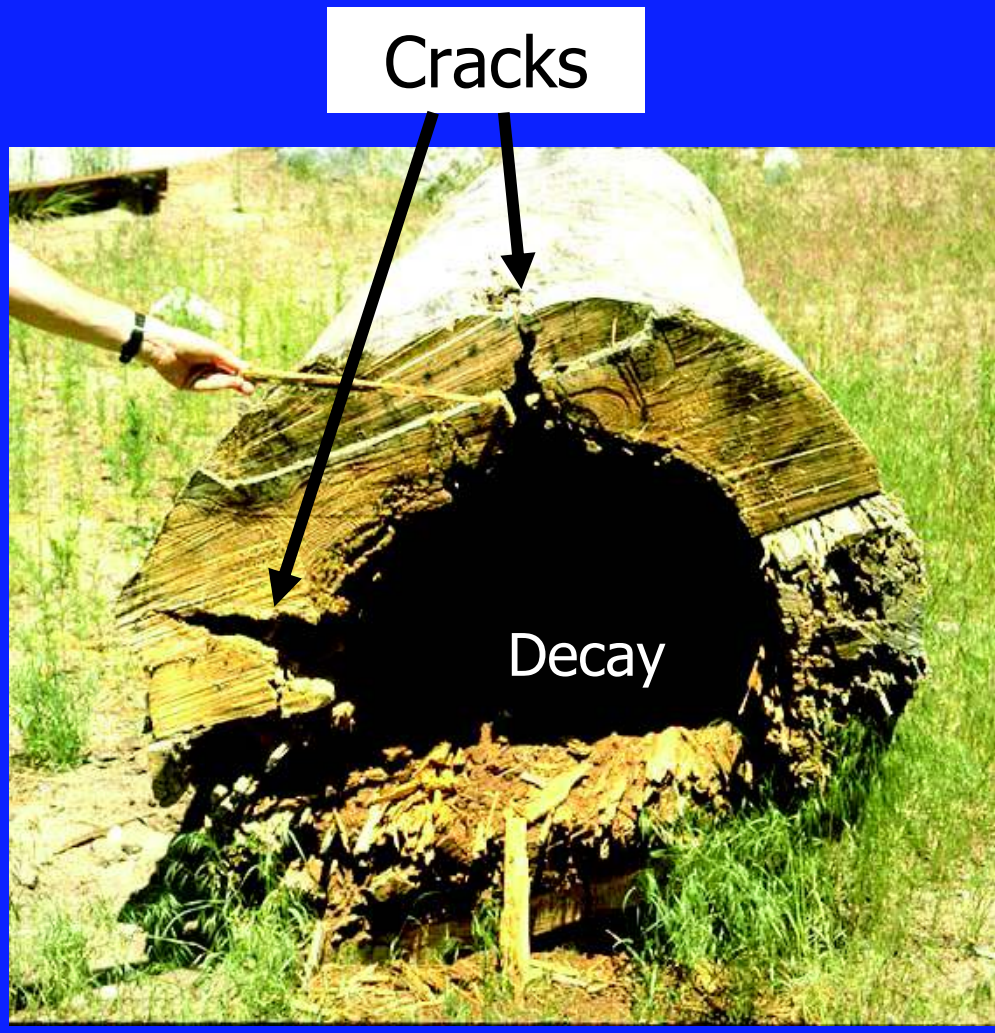
6. Whole Tree Defects - Multiple defects



The tree on the left is leaning and had a crack at the base facing away from the lean. It also had heartwood rot that was detected only after using an increment borer. These are interact-ing multiple defects which made the tree very hazardous.

6. Whole Tree Defects - Multiple defects

After the crack at the base got much bigger, the tree was removed for safety reasons. The end of the cut log shows heartwood rot and two cracks that extend from the hollow center out to the cambium.



Summary

- Be alert and look for the many indicators of potentially hazardous trees.
- Examine suspicious trees carefully and thoroughly from top to bottom.
- Contact local folks who may know more about the history of tree failures in the area.
- If you still aren't sure about a specific tree, contact a Forest Health Protection (FHP) specialist who may be able to help.

This training was developed to help you, protect yourself while working in the forest. Gwen's love of the forest was second only to the love she had for everyone she met.