Armillaria or Shoestring Root Rot
Armillaria spp.

Hosts: Douglas-fir, spruce, subalpine fir, oaks, and ponderosa pine.

Figure 266. White mycelial fans are found under the bark of infested trees.

Symptoms/signs: The most diagnostic trait of *Armillaria* is the thick, fan-shaped mat of white mycelium in the cambium of roots and root crown. This may be accompanied by copious resin flow on bark surfaces, although this trait is not common in the Southwest. Other signs of the fungus include rhizomorphs, or black shoestring-like structures, on the outside of infected roots. The fruiting bodies of this fungus are commonly produced in clusters but can be found singly. The caps are yellow brown to dark tan, with small scales on upper surface. The stem is stout, tapering upward to a ring of tissue just below the cap. The decay is light yellow, soft and spongy to stringy often containing numerous black zone lines.

Figure 267. Armillaria produces shoestring-like rhizomorphs.

Biology: Armillaria root decay spreads primarily by rhizomorphs and root contacts. Armillaria invades the bark and cambial region of roots and the root collar, killing roots and trees of all sizes. Wood decay follows cambial attack, and the wood serves as a source

of energy necessary for infection of new hosts. New infections are less common, occurring when mushrooms release windborne spores that germinate and colonize recently killed material. As with other root disease fungi, Armillaria can persist for decades in decaying wood in soil.

Figure 268. Fruiting bodies of Armillaria *spp.*

Armillaria often acts in conjunction with other secondary pests and pathogens. For example, *Dendroctonus* and fir engraver beetles may attack trees with this root disease.

Effects: Armillaria is the most common root disease in the Southwest and may account for up to 80 percent of the root disease conifer mortality in the region. There are over 10 species of Armillaria, some are virulent parasites while others are opportunists that act selectively on small or weak individuals such as those shaded by taller plants, defoliated by insects, attacked by other fungi, or weakened by drought.

Figure 269. Decay of Armillaria is soft and spongy.

Similar Insects and Diseases: Other fungi such as *Fomitopsis pinicola* produce white mycelium beneath the bark of infected stumps, but the mycelium is not thick and fan-shaped like that produced by *Armillaria* spp, and *F. pinicola* produces a brown cubicle rot.

References: 32, 72, 91, 93, 113, 115