



Figure 1. Zone lines in decaying wood of yellow birch (*Betula lutea*).

ZONE LINES

KEVIN T. SMITH
 USDA Forest Service, Northeastern Research Station
 Durham, New Hampshire

Zone lines are narrow, usually dark markings formed in decaying wood. Zone lines are found most frequently in advanced white rot of hardwoods, although they occasionally are associated both with brown rot and with softwoods. Infection of wood by ascomycetous and basidiomycetous decay fungi has long been recognized as the cause of zone lines. Early research on zone lines has been reviewed (1). Although not all wood decay fungi form zone lines, they are produced by both primary and secondary pathogens as well as by obligate saprobes. Current North American usage distinguishes between zone lines formed by the interaction of genetically distinct decay fungi in dead wood (which may or may not be part of a living tree) and those formed from reaction zones or column boundary layers associated with wound-initiated discoloration of wood in living trees (Fig. 1).

Appearing as branched or unbranched lines, zone lines may be sectional views of thin, twisted pseudosclerotial plates of impregnated wood. Such plates incorporate both fungal and wood cells. Zone lines contain distorted, killed, or sclerotized hyphae and high concentrations of wood

extractives such as gums, resins, and phenolics. The impregnations contained in zone lines increase decay resistance. In advanced decay, zone lines retain their visible structure longer than the surrounding wood. Wood that contains zone lines, known to craftsmen as spalted wood, can command a high market price for turnings and decorative pieces.

Zone lines are involved in the self-isolation of wood decay fungi and the production of survival structures. The volume of wood bounded by a single zone line system usually contains a single genetic individual of decay fungus. Different genetic individuals occur on either side of a zone line. The degree of genetic difference that results in zone line formation ranges from the large difference between an ascomycete and a basidiomycete or the comparatively small difference due to somatic incompatibility within a single species (2). Self-isolation through the production of zone lines at the margins of colonized space reduces competition from other potential colonizers.

Zone lines provide a visible marker of the spatial extent of genetically distinct decay fungi. Such markers are tools in the investigation of population dynamics of decay fungi such as *Trametes versicolor* (2), *Piptoporus betulinus* (3), and *Stereum gausapatum* (4).

The pigmented, thick-walled hyphae of zone lines produced by the pathogen *Poria weirii* were described as providing a resistant resting structure for the pathogen in stumps or wood pieces in ground contact (5). Extracts of zone lines produced by *P. weirii* contained melanin-like pigments with broadly antimicrobial properties (6).

Within a given geographic area, the combination of zone line appearance and host tree species may be a limited aid in the identification of wood decay fungi. However, the production or appearance of zone lines has not been sufficiently reliable to be widely incorporated in

keys to identification. Interpretation of the patterns of zone lines is made more complex in that a series of decay fungi may colonize the same volume of wood over time. Such successive colonization may be due to competitive displacement or to changes in wood chemistry during the decay process.

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Otis C. Maloy

Washington State University
Pullman, Washington

Timothy D. Murray

Washington State University
Pullman, Washington

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