# The Plant Doctor's LANDSCAPE TIPS

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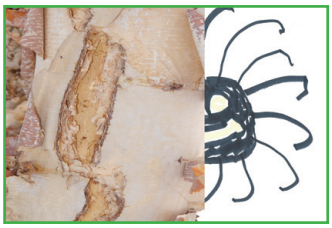
**Photo 1:** In recent years, river birches have been afflicted with leaf issues that sometimes culminate in leaf yellowing, distortion and loss.

**Photo 2:** Crinkled foliage such as this has been attributed to Mouse Ear, a nickel deficiency, and to herbicide toxicity. Perhaps the recently discovered powdery mildew is also involved.

**Photo 3:** Typical of a landscape on the Leelanau peninsula and a landscape in Birmingham, Michigan, one river birch appears unaffected (left) while another (right) had been losing foliage much of the summer. The affected trees possessed cleistothecia of powdery mildew (see Photo 5).

## RIVER BIRCH & THE ELUSIVE POWDERY MILDEW

### INTRODUCTION:



River Birch (*Betula nigra*) has been affected by some mysterious issues in many Michigan landscapes in recent years (Photo 1). In some cases, foliage is turning off-color (yellow) and becoming distorted and crinkled (Photo 2). Nurserypersons in Georgia found that when growing birch for the nursery trade in soilless media, birch trees often encountered symptoms which they termed "mouse ear"; they eventually were able to demonstrate that mouse ear was caused by a deficiency in the micronutrient Nickel (Ni). Symptoms similar to "mouse ear" have been witnessed on River Birch in landscapes in the Northern states such as Michigan; scientists and industry laypeople in the Midwest have assumed this malady is "Mouse Ear." However, arborists who have applied supplemental Ni according to Georgia recommendations encountered mixed results. Several years ago, the author published a paper (see "River Birch: Mouse Ear or Herbicide?", The Landsculptor, September 2010) showing that at least some of the symptoms of "mouse ear" in Michigan might be explained by herbicide toxicity. Indeed, where herbicides such as 2,4-D and especially dicamba were discontinued in lawns containing river birches, the symptoms of mouse ear in many of these trees disappeared in following seasons.

During the late fall of 2013, another possible cause of river birch decline was found by the author. A rather unique strain of Powdery Mildew appeared to be causing leaf distortion and premature leaf drop on some river birches (Photo 3).

### RIVER BIRCH POWDERY MILDEW CHARACTERISTICS:

Powdery mildew (PM) is found on many plants and is (usually) easily readily discernable by the distinctive mildew (= fungal mat) appearance (Photo 4). Most PM strains produce spores known as conidia in these mildew mats (Photo 5). The powdery mildew found on River Birch late in 2013 exhibited no conspicuous mildew. The only identifying characteristic that disclosed the presence of powdery mildew on river birch was the presence of cleistothecia on the foliage (Photos 6 & 7). Cleistothecia (singular cleistothecium) are the overwintering, sexual stage of the powdery mildew fungus. For a typical disease cycle, powdery mildews produce mycelium (=hyphae=fungus body) and conidia during the summer season (Photos 4 & 5); the mycelium and spores account for the conspicuous mildew-like appearance typically associated with powdery mildew diseases. As the weather cools down later in the season, cleistothecia are produced as the over-wintering stage of the fungus in the northern states (the fungus may also overwinter as conidia and mycelium, particularly in warmer climates).

The Powdery Mildew on river birch appears unique, if elusive, for several reasons:

1) No conspicuous white mats of mildew seem to be produced.
2) This strain seems to move internal, ramifying through epidermal tissues.
3) Symptoms of infection seem to be somewhat debilitating to destructive.
4) Cleistothecia are produced late in the season and only on the undersurface of leaves.

While many powdery mildews on plants appear superficial and innocuous (ex. lilac), some strains can be quite destructive. The PM strain on river birch seems, perhaps, to be somewhat aggressive, infecting various layers of leaf epidermal tissues. Symptoms on foliage that seem to be associated with this River Birch PM include: chlorosis (yellowing), distortion, cupping, crinkling, necrosis and premature leaf fall. Some of these symptoms may mimic some of those commonly associated with mouse ear and herbicide toxicity. The river birch PM may represent yet another instigator for the river birch decline symptoms observed around Michigan during the past decade. The powdery mildew on river birch was found at two locations, the Leelanau Peninsula and Birmingham, in late 2013, possibly indicating a widespread distribution. Limited scrutiny of the scientific literature suggests that the river birch strain of PM may be Phyllactinia guttata (=P. corylea) or from the *Microsphaera penicillata* complex (including M. ornata). Further work needs to be performed to determine its identity, distribution and importance to river birch health.

## MANAGING POWDERY MILDEW ON RIVER BIRCH:

Because foliar issues such as tissue distortion and premature leaf loss on River Birch have been reported from around Michigan for many years, it is possible that powdery mildew may be involved. With this possibility in mind, several management techniques can be implemented to minimize PM effects on river birch (and other plants). First, because this PM overwinters as cleistothecia on fallen leaves, gathering and destroying (composting, etc.) the foliage in the fall may reduce infections the following season. Unlike most foliar diseases, which require water on the leaves for spore germination and infection, PM only needs humidity for infection. Hence, keeping irrigation water and humidity in landscapes and gardens low (sometimes difficult to do!) may help. Fungicide applications can help minimize PM infections. In the case of River Birch, fungicide applications may not only inhibit the PM but may also serve as a diagnostic tool to determine whether this elusive PM (or other fungal disease) is causing foliar problems on river birches in specific landscapes.

*The author would appreciate hearing from individuals who are experiencing issues with river birch, especially those affected by apparent symptoms of "Mouse Ear" and Powdery Mildew. Please contact him at roberstd@msu.edu or (248) 320-7124.*

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**Photo 4:** Powdery mildew infections on plants usually produce conspicuous white mildew mats such as on this tall phlox leaf.

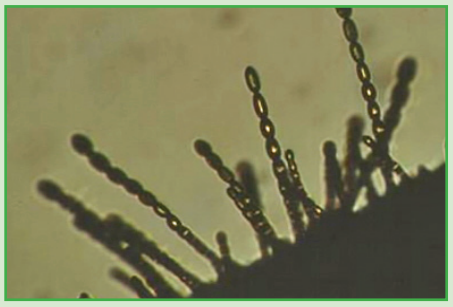

**Photo 5:** Typical powdery mildew fuzz on leaf surfaces is usually comprised of the fungus body known as hyphae or mycelium. Condia (spores), here magnified many times with the aid of a microscope, are produced from the hyphae and are disperse by wind to other plants.

**Photo 6:** This close-up photo of a leaf from a river birch on the Leelanau Peninsula shows powdery mildew cleistothecia (tiny dark blobs), which seem to only inhabit the undersurfaces of the leaf.

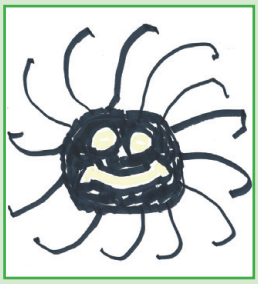

**Photo 7:** An artist rendering of how cleistothecia might appear when greatly magnified with a microscope.