

TITLE: Assessing the impact of Beech Bark Disease, on unmanaged, old-growth stands of the Beech-Hemlock forest type, as an indicator of the potential long-term outcome of management that promotes development of a northern hardwood forest type dominated by beech and hemlock (pre-European settlement conditions).

LOCATION: Tionesta Research Natural Area, Allegheny National Forest, Warren, PA

DURATION: One-Year project (2007)

FUNDING SOURCE: Base Forest Health Monitoring-Evaluation Monitoring

PROJECT LEADER: Dr. Martin MacKenzie, Forest Health Protection, Northeastern Area, USDA Forest Service, (304) 285-1550. mmackenzie@fs.fed.us

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PROJECT OBJECTIVES:

- To provide an in depth evaluation of the impact of BBD on the Tionesta, old growth, beech-hemlock forest type by re-measuring part of the, long established, Zimmerman (1984) grid of plots. Additionally, the collected data will be of dual use for it will be used in an assessment of the BBD module of the FVS model being developed by Jones *et al.*
- To document, and seek an explanation for, beech mortality levels detected in off plot observations that far exceed expectations derived from an existing dispersed grid of FHM and FIA plots on the ANF.
- Use the documented impact of Beech Bark Disease on unmanaged, old-growth stands of the beech-hemlock forest type, as an indicator of the potential long term outcomes in areas where management promotes northern hardwoods dominated by beech and hemlock.

JUSTIFICATION:



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Figure 1. The Tionesta Research Natural Area as seen in 2004 with beech mortality over 40%. The mortality reached 52% in 2006 and shows no sign of diminishing (see figure below). The foreground is an old Tornado swath of a much younger age class.

JUSTIFICATION:

Information from aerial sketchmapping (Figure 1) and a limited number of monitoring plots (Figure 2) indicate that 52% of the beech trees at the Tionesta BBD killing front have died over the past 5 years and, unexpectedly, the BBD epidemic shows no signs of tailing off (Figure 2). This project is needed to provide an accurate assessment of the impact of BBD on this old growth forest type. The other dominant tree species in this forest type, hemlock is threatened by the HWA, which is only one county away. It is desirable to evaluate the impact of BBD on this forest type before it is confounded by the impact of HWA.

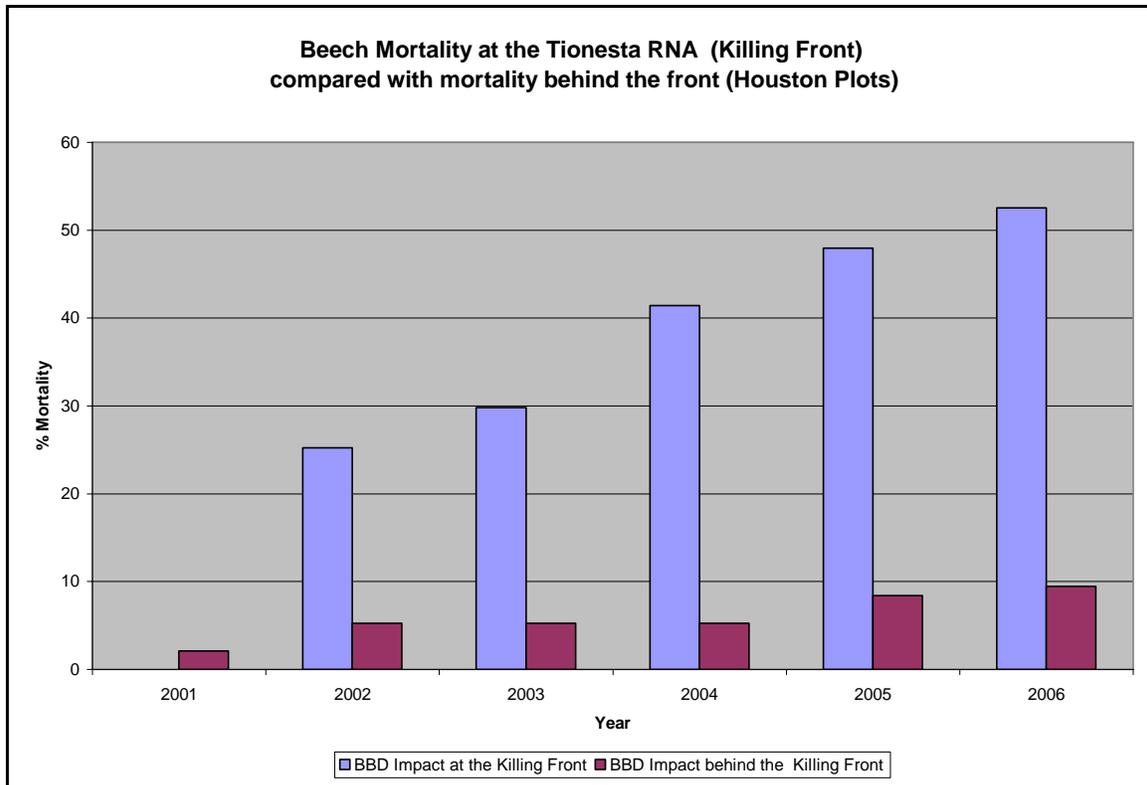


Figure 2. Graphical comparison of the ongoing mortality on the Tionesta BBD killing front (xxx) plots with current BBD mortality recorded in long term monitoring plots (Houston plots) located well behind the killing front (xxx) on the ANF. Both sets of data are based upon the trees alive in 2000.

The Tionesta old growth Beech-Hemlock reserves constitute the last remaining 4,000 acres of a forest ecosystem that once occupied 6 million acres across the northern Allegheny Plateau. Some people strongly believe forest management in the eastern United States should strive to restore this pre-settlement beech-hemlock forest. On some private lands, selective harvest often serves to accelerate forest succession in this direction, as beech and hemlock tend to be left as residual trees, and few reforestation practices are applied to stimulate development of other species. Where northern hardwoods containing a significant beech component are not actively managed, stands will likely trend in this direction. While this might be the natural climax of this area, it is a climax type that evolved in the absence of both BBD and the HWA and might no longer be attainable. Characterizing the current condition of this area, describing the change that has occurred since 1984, and evaluating the establishment of permanent plots

(FHM) which would permit future ecosystem monitoring and evaluation will provide a supportable method for describing to the public where this type of management could lead.

DESCRIPTION:

a. Background:

In 2000, very high populations of beech scale (*Cryptococcus fagisuga*) were observed when ground-truthing areas of discoloration observed from the air, on Tionesta RNA. Anticipating some mortality a small number of beech trees were selected for continued monitoring. These trees constitute the Tionesta plots and were selected to mirror existing long term BBD monitoring plots (the Houston plots). With beech mortality reaching 52% in 5 years it became obvious that the impact of BBD on old growth beech hemlock forest required a more in depth evaluation. While studying for his Ph D. at Rutgers University George Zimmerman (1984) established a grid of 676 plots on a 855 hectare remnant of remnant unmanaged old growth hemlock–beech forest. In 1998 and 1999 USDA personnel relocated 588 of these plots and documented their GPS location and differential correction. A sub-sample of these plots were subsequently used in a survey of the old growth black cherry (Engleman *et al.*, unpublished).

b. Methods:

It is proposed to use summer student labour to re-measure 50 randomly located Zimmermann (1984) plots. The diameter, species, crown position (Nyland, 1996) will be recorded in prism plots following the methods used by both Zimmerman (1984) and Engleman (unpublished). Crown characteristics will be recorded using FHM protocols and in addition records will be made of beech scale, *Neonectria*, fungal conks and insect attacks with special attention being paid to Tremex, Ambrosia beetles and other wood boring insects. This will be a stand alone \$15,000 project that will generate a report on the forest changes since 1984 and will provide a data set to provide a test of the newly developed FVS BBD module (Jones, *et al.*, unpublished).

c. Products:

(1). This project will contribute to our understanding of the impact of BBD on Allegheny Plateau old growth, beech-hemlock forest and provide an insight into what might be the outcome of land management practices that cause a trend towards a, deer-modified, beech-hemlock climax type. Today the ANF has 4000 remnant acres of a forest ecosystem that once covered about 6 million acres of the Allegheny Plateau in PA. It was in forests very similar to this type that Ehrlich (1934) made his seminal observations of BBD and now, 100 years later, we get a second chance to observe BBD impacting old growth forest and, with the hindsight of Ehrlich's observations learn a lot about this disease complex.

(2) This project will provide data which can be used to test the USDA FS Forest Vegetation Simulator BBD keyword add-file.

(3) Additionally, as the plot centers will be GPS'ed the option will be available (in a subsequent evaluation) to convert these plot locations into permanent FHM plots,

when and if HWA reaches the ANF and the largest reserve of this forest type in the Northeast.

d. Schedule of Activities:

- Early spring (before leaf expansion) of 2007, demark the boundaries of the Zimmerman plot grid and locate 50 Zimmerman plot centers for re-measurement.
- Summer of 2007, re-measure plots (with 2 students).
- Fall of 2007, test FVS BBD keyword add-file outputs and modifies files as needed.
- Fall of 2007, if either HWA is found on the ANF or if the forest considers it a worthy project, a subsequent proposal will be drawn up, seeking funds to establish FHM plots, permit future ecosystem monitoring and evaluation of beech-hemlock old growth impacted by both BBD & HWA!
- Winter of 2007, publish internal and FHM summary report(s) and assess the number of FHM plots needed, in subsequent evaluations, to answer the questions the project has raised.

COSTS:

	Item	FHM EM funds	Other Funds	Source
2007 Remeasuring Zimmermann Plots	Student labour	12,000	15,000	SPFH35
	Salary	0		
	Equipment	500		
	Travel	1,600		
	Misc	900		
		\$15,000	\$15,000	

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REFERENCES:

Literature citations supplied upon request.