Economic Loss Associated with the Introduction of Thousand Cankers Disease of Black Walnut to Kansas

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March 18, 2010

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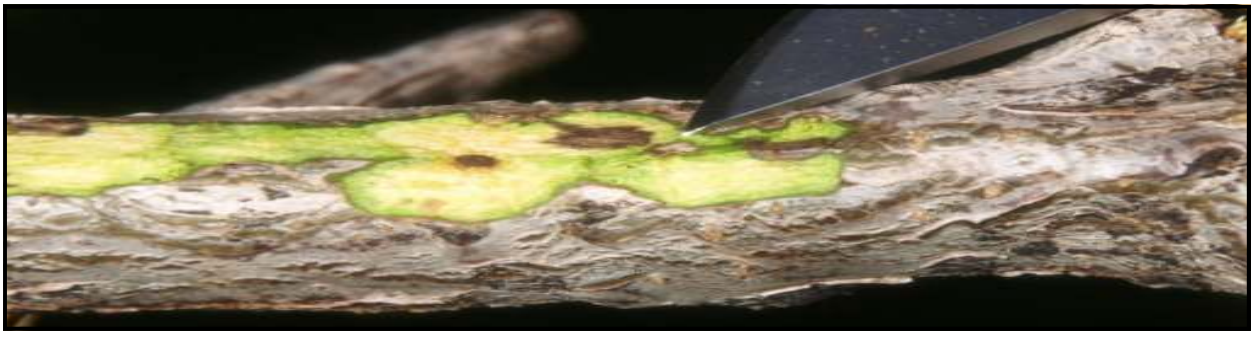
Background

Since the 1990's black walnut has been dying along the front range of Colorado and in several other western states. The deaths are caused by a walnut twig beetle (*Pityophthorus juglandis*) that carries a fungus (the proposed scientific name is *Geosmithia morbida*) which is spread as the beetles tunnel through tree tissue. Beetles can reach very high populations and numerous cankers can develop. Instead of one large girdling canker, tree decline and death appears to result from the high number of cankers (hence the name Thousand Cankers Disease, TCD). Initial symptoms involve yellowing and thinning of the upper crown, which progresses to include death of progressively larger branches. During the final stages large areas of foliage may rapidly wilt.

The disease complex has been discovered as close to Kansas as Rocky Ford, Colorado. The introduction of TCD into Kansas could have disastrous affects economically and environmentally to the state and the rest of the nation since Kansas represents the westernmost native range of black walnut. Some experts believe that TCD has the potential to decimate black walnut in the same way Dutch elm disease, emerald ash borer and chestnut blight have destroyed their respective hosts. In preparation for such a potentially devastating attack it is necessary to estimate potential economic losses to support policies and quarantines to slow and hopefully prevent the introduction of TCD to Kansas and the native range of black walnut.

Control

Controls for TCD have not yet been identified and their development will require better understanding of the biology of the walnut twig beetle and the fungus. Because of the extended period when adult beetles are active, insecticide spray applications will likely have limited effectiveness. Furthermore, colonization of the bark and cambium by the fungus may continue even if adult beetles or larvae are killed by the insecticide. Colonization will likely limit the ability of systemic insecticides to control transmission of the fungus to new hosts before substantial infection occurs. Rapid detection and removal of infected trees currently remains the primary means of managing TCD. Stopping or slowing its spread from infested areas relies on quarantines of wood products and public education.



Geosmithia canker on black walnut twig

Economic Impacts

Using existing data from Forest Inventory and Analysis plots, Timber Product Output surveys, Missouri Timber Price Trend reports and the most recent street tree inventories, we can estimate the potential economic impact of TCD in Kansas. The economic impacts of TCD would occur in three areas, 1) loss to the wood products industry as trees die, 2) loss to the nut industry, and 3) the loss to communities as street trees die.

The annual impact to the wood products industry includes foregone payments to landowners and loggers, and the lost value added at the sawmill. In addition, these losses will lead to further effects throughout the economy, as landowners, loggers and mill operators have that much less to spend on other items. (This "indirect" effect was calculated using IMPLAN(1) software, data and models.) These are annual losses that the Kansas economy would forgo every year into the future. In addition to the annual losses shown below, the IMPLAN model estimates that 46 jobs would be lost.

Statewide Wood Products Loss		
Volume	3,603,000	board feet (sawlogs)2
Landowners	$2,432,025	$0.68/board feet (sawlogs)3
Loggers	$2,161,800	$0.60/board feet (sawlogs)4
Mills	$1,441,200	$0.40/board feet (sawlogs)4
Total Direct Impact	**$6,035,025**	
Indirect Impact	**$3,690,000**	
Total	**$9,725,025**	annual value

The annual impact to the nut industry includes foregone payments to nut gatherers, and the lost value added at the processor. Again, these losses will lead to further effects throughout the economy and are annual losses that the Kansas economy would forgo every year into the future. In addition to the annual losses shown below, the model estimates that 4 jobs would be lost in the nut industry and the other sectors it affects.

Statewide Nut Production Loss		
	Low	**High**(5)
Harvester(6)	$430,000	$650,000
Avg. Direct Impact	**$540,000**	
Indirect Impact(7)	**$175,000**	
Total	**$605,000**	

1 Minnesota IMPLAN Group uses classic input-output analysis in combination with regional specific social accounting matrices and multiplier models.
2 Harvest volumes from Kansas 2003 Timber Products Output survey (Reading et al., 2007).
3 Timber prices from Missouri Timber Price Trends (Tuttle and Trieman, 2009).
4 Personal communication with authors (Kansas Forest Service, KSU, 2010).
5 Annual black walnut nut yields vary significantly producing good crops every 2 to 5 years.
6 Personal communication with Hammons Products Company.
7 Estimated using the IMPLAN model.

Losses from affected street trees include the cost of removing the tree, its "landscape value" and the cost of replacing it. Landscape value is a catchall term that includes everything from a tree's aesthetic value to its impact on property values and cooling costs. Losses from affected street trees are not annual, but rather a one-time phenomena, although spread out over many years. These numbers only include public trees located along streets and in parks. They do not take into account walnut occurring in private residential and other urban areas.

Statewide Urban Street and Park Tree Loss		
Number of Black Walnut trees(7)	28,181	
Removal Costs(8)	$7,045,250	$250/tree
Landscape Value(9)	$51,204,877	$1,817/tree
Replacement Cost(10)	$7,045,250	$250/tree
Total	**$65,295,377**	

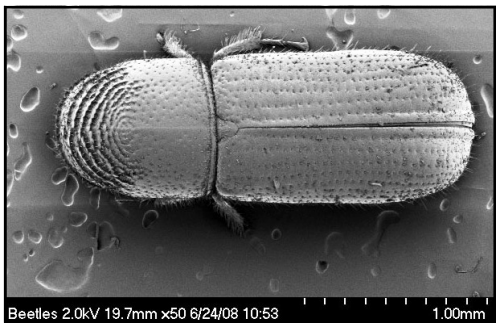
To determine total impact, annual industry losses are combined with "one-time" community losses. Little is known about the spread of TCD and it is impossible to estimate when it will arrive in Kansas. (Indeed, since TCD symptoms may be invisible for several years, TCD may already be in Kansas.) Assuming that TCD arrives next year and that the losses are spread out over 20 years, we can estimate losses by determining the net present value (NPV) of each years impact. NPV translates future dollars into today's dollars, using a discount rate. One way of thinking about NPV is to imagine paying for future losses by putting some money in the bank today. For example, putting $100 in the bank today at a 4% interest rate could pay for a $104 in damages next year.

Year	Wood Products (future dollars)	Nuts (future dollars)	Community Trees (future dollars)	Total (future dollars)	NPV (2010 dollars)
2010	$486,251	$30,250	$3,264,769	$3,781,270	$3,635,837
2011	$972,503	$60,500	$3,264,769	$4,297,771	$3,973,531
2012	$1,458,754	$90,750	$3,264,769	$4,814,273	$4,279,871
…..	…..	…..	…..	…..	…..
2028	$9,238,774	$574,750	$3,264,769	$13,078,293	$6,207,512
2029	$9,725,025	$605,000	$3,264,769	$13,594,794	$6,204,486
Total (during spread)	$102,112,762	$6,352,500	$65,295,377	$173,760,639	**$109,011,994**
Years 2030 on (total)	$9,725,025	$605,000	$0	$10,330,025	$51,721,900
Total					**$160,733,894**

7 Kansas Community Forestry tree inventories, 192 communities, average # of street & park trees.
8 Average removal and stump grinding costs, communication with Kansas arboriculture industry.
9 Estimated using Ornamental Tree and Shrub Evaluation, K-State Research & Extension, Gustaaf A. van der Hoeven, 1998.
10 Based on Kansas Nursery Industry average costs for 2" diameter planting stock.

Conclusion

Under these assumptions, the statewide effect of TCD in the future is over $160 million in 2010 dollars. Obviously the result changes with the discount rate (for example, the total present value of losses go up if the discount rate goes down to the current Federal Funds rate target of 0.25%). If Kansas can delay, or even stop the spread of TCD – losses farther in the future are worth less today. Clearly, Kansans have a lot to gain by keeping TCD out of the state!



The twig beetle, (*Pityophthorus juglandis*), that carries Geosmithia morbida, is the tiny vector for TCD.

For additional information about TCD:

http://www.ksda.gov/plant_protection/content/350/cid/1615
http://mda.mo.gov/plants/pdf/tc_pathwayanalysis.pdf
http://www.plantmanagementnetwork.org/php/elements/sum.aspx?id=8033&photo=4600

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