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## Update

After the last meeting we spent some time doing additional research as suggested by the commissioners. We looked more closely at how the removal would substantially improve the hazard, as well as possible alternatives to removal. Here is what we learned.

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## Alternatives to Removal

We investigated alternatives to removal. There were 2 possibilities mentioned for reducing fruiting, the first being the use of plant growth regulators (PGR), and the second being excessive nitrogen fertilization in the spring.

### **PGR**

We reached out to a local arborist experienced in using this method, and his experience was that of very mixed results. He stated “Results are always mixed... I would not recommend these treatments because of this, unfortunately there is no treatment that will consistently reduce fruit year to year.” Additionally, for a tree this large, the application of these treatments is non-trivial. For instance it would be recommended for us and our neighbor given the large drip line to leave our homes for 24-48 hours during the application of Florel to avoid exposure.

### **EXCESSIVE NITROGEN FERTILIZATION**

This one was a little hard to track down. There is a general mention in a few places that excessive nitrogen can negatively affect fruiting, but very little specifics. Information specifically related to walnuts appeared to come solely from an ehow.com article with no details other than a reference to Washington State University. We reached out to the botany and agricultural departments there for more information, but they had no idea. Searching through research papers there was specific information about nitrogen affects on walnuts, but mostly about how nitrogen fertilization increased nut yields<sup>1</sup> or made the nut production more consistent from year to year even with excessive nitrogen application<sup>2</sup>. Furthermore, excessive nitrogen fertilization is shown to have a negative impact on groundwater, resulting in increased nitrates in the water supply which is an environmental and health hazard.

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<sup>1</sup> Gray D., Garrett H.E.G 1999 Nitrogen fertilization and aspects of fruit yield in a Missouri black walnut alley cropping practice

<sup>2</sup> Ponder F, Jones, J 2001 Annual applications of N, P, and K interrupt alternate-year nut crops in black walnut

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## Squirrel Caching and Feeding Behavior

Squirrels eat as many as 50% of nuts immediately on-site and scatter hoard the rest<sup>3</sup>. They cache the nuts typically from a distance of 0.2-30m<sup>4</sup> with the density found to be higher near the food source and decreasing with distance<sup>5</sup>. Also when retrieving cached nuts squirrels often take the nuts immediately up into the nearest tree for safety and to avoid conflict while eating.

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## Neighborhood Trees

From the information learned about squirrel caching behavior, we can then make some assumptions about the effect of neighborhood trees on the number of buried nuts from those trees on our property. For a given tree within 30m, only 50% of the nuts will be cached at all, and given that nuts are cached in all directions we can assume that only a very small percentage of the remaining will be cached in the specific direction of our yard, perhaps 1-5% of the total nuts from the tree depending on distance. Overall quite a small amount.

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## Impact of Tree Removal

After removal, 100% of the nuts from the tree that are both eaten on-site and cached in the yard will be eliminated. Furthermore, the small amount of cached nuts in our yard from other trees will no longer be able to be eaten safely from the tree in our yard, and are likely to be taken to alternate locations for eating. This results in an extremely significant reduction of nut fragments distributed throughout our property which is a substantial improvement.

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<sup>3</sup> Tamura, N., Hashimoto, Y. & Hayashi, F. 1999. Optimal distances for squirrels to transport and hoard walnuts.

<sup>4</sup> Kato, J 1985. Food and hoarding behavior of squirrels.

<sup>5</sup> Stapanian, M.A., Smith, C. C. 1978. A model for seed scatterhoarding: Coevolution of fox squirrels and black walnuts