Why Do Unplanned or Poorly Planned Timber Harvests Occur?

Melissa M. Kreye, Assistant Professor
Department of Ecosystem Science and Management, Pennsylvania State University
May 10, 2019

Unplanned and poorly planned timber harvesting occurs in forested areas throughout the globe and the impact on forest health is often negative. The circumstances that promote unplanned harvesting are often driven by a wide range of social and economic factors. This article offers a critical review of the problem and may be useful to decision-makers and advocates who want to address unplanned harvest in PA.

What is an Unplanned Timber Harvest?

Many private owners would prefer to maintain forest health when harvesting, but short-term needs can prompt harvesting decisions that are poorly planned, or do not take into account the potential long-term effects on forest health. When unplanned timber harvests occur repeatedly in the same place, it increases the likelihood that the forest will become degraded over time.

Degraded forests tend to have the following characteristics:

Short run:

- A large number of damaged trees after harvest (i.e., crown damage, smashed trees, scarring on remaining trees; Johns et al., 1996)
- Almost all commercially valuable tree species have been removed
- Timber sale profits are not optimal (i.e., harvesting is not in response to high stumpage prices: Kittredge and Thompson, 2016).

Long run:

- There is little to no regeneration of commercially valuable or rare tree species (Mc Williams et al., 2004)
- The trees are slow growing and of poor quality

- Non-timber forest products are nonexistent or of low quality (e.g., herbaceous plants, fruit, nuts and other products; Guariguata et al., 2008)
- Invasive plant species are commonplace (e.g., hay scented fern, Scherer et al., 2000)
- There is limited habitat for wildlife species of concern (e.g., amphibians, reptiles, song birds; Askins, 1993; Higgins and Merritt, 1999)
- The forest can be more vulnerable to disturbance associated with pathogens and disease (Lovett et al., 2006; Thompson et al., 2009)

Unfortunately, many private forests in the US fit the description of a degraded forest, indicating that unplanned harvesting activities on private lands are widespread. The activities that promote unplanned harvest can be associated with the choices made by the forest owner, the actors in the forest industry (e.g., loggers) and society (e.g., local laws). These choices can be either intentional or unintentional. Larger natural forces (e.g., climate change, large disturbances, species shifts) can also lead to forest change and degradation. However, this paper will focus on the human factors that can lead to forest degradation in Pennsylvania and the Eastern US.

Property Laws and Harvesting Rights

All states, including Pennsylvania, have private property laws that help control illegal harvests or the prevent the extraction of a resource by those other than the owners (i.e., Timber Trespass Law—Act 10 of 1994, P.S. §8311). Federal and state environmental regulations also encourage responsible timber harvesting practices through the use of voluntary best management practices (e.g., Federal Water Pollution Control Act Amendments of 1972, Section 404, Chapter 102, Erosion Control Rules and Regulations—issued under Act of June 22, 1937, P.L. 1987). At the local level, ordinances may be used to place restrictions on timber harvesting activities within townships. However, state laws were created to support a forest owner's "right to cut" to make it easier to carry out forestry activities (The Pennsylvania Municipalities Code (Act 67 and 68) and the Right to Practice Forestry Act—53 P.S.§10603(f)).

This combination of laws facilitates the existence of strong private property rights for timber production. Strong property rights are necessary for encouraging people to invest in land and participate in the timber economy. There is a simple assumption that market incentives alone are enough to encourage proactive forest management (i.e., having a forest management plan to help

optimize revenues and ensure that timber harvesting practices remain sustainable). However, many family forest owners do not approach forest management the same way as industrial or production-oriented forest owners. For example, nationwide only 3% of forest owners have a written plan, and those with a plan tend to have larger holdings (Butler, 2004). In PA, only 10% of forest owners have estates greater than 50 acres (Metcalf et al., 2012). Evidence that family forest owner's are rarely production minded is the finding that decisions to harvest are rarely prompted by an increase in timber market prices (Kittredge and Thompson, 2016). This trend is concerning since in many places the size of the forest estate is expected to decrease (due to parcelization) and the number of forest owners to increase.

Just because a forest owner is not "production" minded doesn't mean that he/she will not harvest trees. Most family forest owners in PA reported that they are willing to harvest trees (Metcalf et al., 2012; 2015). However, those that seek to actively manage through harvesting tend to place timber production benefits behind aesthetic and recreational benefits (Metcalf et al., 2012; 2015). When harvesting, forest owners are not required to have a certified plan or seek advice from a forestry professional. The absence of this requirement means that harvesting decisions can and are often uninformed. A recent private forest lands survey in PA found 20.0% of forest owners who recently harvested received no advice before cutting (Metcalf et al., 2012).

Forest owners who did receive advice about harvesting often received advice from both foresters and loggers (44.6% and 44.9% respectively; Metcalf et al., 2012). Larger landowners attended to seek advice from a professional forester more often. However, in Pennsylvania there are not credentialing requirements to call one's self a forester, therefore landowners sometimes cannot distinguish between the two. Foresters and loggers may not approach timber harvest decisions the same way, and this can have important implications for forest health. A forester will use silvicultural principals to develop a timber harvest plan that is ecologically and economically sustainable. Logger's choices may be strongly motivated by the forest owner's objectives, their own preferences for conducting business (e.g., use of the diameter cut), market demands, and are often based on little understanding of forest ecology (Keefer et al., 2002).

It has been recommended for many years that if foresters are not used to guide harvesting decisions then loggers should receive more technical training in silvicultural practices (Nix, 1933). A related study found that professional education programs, such as the Forest Ecology

and Silviculture 1 course by the Sustainable Forestry Initiative, can help improve loggers' choices (Keefer et al., 2002). However, logger participation in these types of programs are often mixed due to lack of interest and training costs. In order for loggers to acquire and apply silvicultural knowledge to harvesting decisions, this knowledge needs to be recognized as valuable to both forest owners and loggers. Moreover, not all owners want to enhance timber production outcomes over other benefits (e.g., improved wildlife habitat). Forest owner demand for forest professionals with training in both production and conservation forestry is not well understood.

The Costs and Benefits of Forest Ownership

Costs

There can be a wide range of costs associated with land ownership. Almost all forest owners have to pay property and income taxes, which can reduce the value of expected timber revenues by 19% to 51% (Cushing, 2006). There is concern among many forest owners that tax policies may cause them to take unplanned actions such as prematurely selling their land or harvesting trees (Butler et al., 2012).

Property taxes are often the greatest concern to forest owners because they are paid on an annual basis (Butler et al., 2012). For example, 27% of New York landowners who had parcelized their forestland did so to relieve a property tax burden (Sanborn, Stone and Tyrrell 2012). In PA, forest owners depend on outside wages and investments as their primary source of income and are less likely to receive an annual income from their lands (Metcalf et al., 2012). This means that unexpected changes in annual income, in conjunction with property taxes, have the ability to prompt unplanned harvesting activities or property sales.

Unexpected costs are the most likely way that forest owners can expect a sudden change in income. For example, increased medical bills are known to contribute to almost half of home foreclosure filings in the US (Roberson et al., 2008). This suggest that medical bills may play a key role in unplanned harvesting. A study in PA found that most forest owners would be agreeable to selling their forests if they experienced a decline in their health. However, it is unclear if this is to help pay unexpected medical bills, or if this is more of an end of life decision and owners just want to retire in another location (Gruver et al., 2013).

In regard to income, forest owners nationwide and in PA tend to have higher than average annual household income and multiple streams of income (i.e., pensions, investments, business; Gruver et la., 2013). This suggests that most forest owners have some economic buffer when faced with large unexpected expenses. A related study also found those who live in rural areas in PA do not have greater health risks compared with urban populations, suggesting that forest owners are not more likely to get sick or have less access to health care (Jacob, 1997). A nationwide study examining the demographics of people and healthcare costs found 11.9% of populations over the age of 65 had problems paying medical bills, but this jumped to 48.4% for people between the ages of 35 to 64 (Blendon et al., 1994). This statistic is somewhat misleading because older populations may be able to pay an increasing number of medical bills by (1) enrolling in Medicare, and (2) eventually extinguishing their assets. End of life costs can be expensive and those who apply for Medicaid (different from Medicare) are required to relinquish their assets, and assets gifted up to 5 years back can even be penalized. Regardless of age, high levels of environmental pollution can also affect a person health and may increase unplanned harvest in some areas due to increased medical costs and property sales.

Income taxes have been reported as less of a concern compared to property taxes because income taxes are often levied on timber sales, and revenue from the sale is generally available to pay the taxes (Butler et al., 2012). Provisions in federal and state tax codes are designed to reduce some owners tax burdens, potentially by a third, if they are helping meet societal goals (Bailey et al., 1999). However, a nationwide study found the forest owners who take advantage of tax provisions tend to be a select group (Kilgore et al., 2018). Most own land for the purpose of timber production, have more than 88 acres of forest, have a forest management plan, received technical and financial assistance in the past, and have higher incomes (exceed $99,999). Also, those who receive provisions were not necessarily interested in keeping the land intact for future generations. Unfortunately, tax incentives programs are often not effective in encouraging additional timber production, because most program participants are already actively engaged in timber production (Kluender, et al., 1999). This suggests tax provisions for timber production would not benefit to forest owners who don’t have timber production motives.

If owners can avoid having their assets confiscated to help pay for Medicaid, death/inheritance taxes and the cost of real estate transactions can be significant and may prompt an unplanned harvest. Most forest owners have generally weak intentions towards preventing the subdivision

of their forest lands (Metcalf et al., 2012. In PA, only 8.9% of forest owners have created an estate plan and 3.7% have considered a conservation easement (Metcalf et al., 2012). Forest owners who do not want their land to become subdivided will still make choices that often lead to subdivision (e.g., leave land to multiple children). How much of an impact large onetime tax costs have on broader forest ecosystems is unclear. A nationwide survey found over several months less than 9% of all forest owners were involved in the transfer of a forest estate (Greene et al., 2006). In cases were estate taxes were due, 17% harvested timber and 11% sold land to pay the estate tax liability. Of the land sold 29% was converted to more developed uses. This suggests that at any given time about 2% of private forest lands are harvested or sold to help pay estate taxes.

In summary, taxes themselves do not affect forest management decisions, but often work in conjunction with other costs to increase the likelihood of unplanned harvesting. Because of the Medicaid look-back policy, end of life expenses may be the type of unexpected medical costs that most likely lead to unplanned harvest. Many forest owners also have low awareness, confusion and misinformation about tax policies. As such, existing tax relief policies and programs are likely not reaching their full potential in reducing the tax burden (Butler et al., 2012). There is a growing interest in how new types of incentives, such as markets and tax provisions, can help encourage forest management for non-timber benefits, such as wildlife habitat. However, many of these programs in the US are still operating at the pilot stage (Kreye et al., 2017).

Investment

Economic incentives tend to work best when the forest is seen as an investment. Forest ownership in PA, however, is only occasionally seen as an investment or a financial asset that can provide owners with economic security (e.g., pay medical bills, retirement, college tuition; Metcalf et al., 2012). About 13% of forest owners use an “hands off” approach to landownership, and smaller property owners frequently consider forest ownership to be incidental to landownership in general. This demonstrates that some forest owners lack understanding of the economic and non-economic value associated with forest land, or how to enhance that value through forest management (Metcalf et al., 2012).

Owners who do engage in some forest management rarely work to ensure economic opportunities are optimized in the long run. For example, forest owners rarely wait for higher timber market prices before harvesting (Kittredge and Thompson, 2016). The forest asset tends to grow in value over time, but not all owners wait until end of life to cash in. Parcellation has also been found to occur with owners of a business or rental property and those with slightly below average incomes (compared to other forest owners; Gruver et al., 2013).

A failure to optimize revenues is not only associated with the timing of the harvest, but also how the harvest is conducted. For example, when forest owners decide to harvest, most (over 75%) focus on harvesting only large trees and use the diameter cut even though there is no evidence that diameter-limit cut is the best financial option for a landowner (Wagner et al., 2003). On average about half of forest owners are willing to use their forests to collect non-timber products to help raise extra income (Gruver et al., 2013). It is unclear if forest owners take into account how harvesting practices may affect the provision of non-timber products. Regardless, most PA forest owners report that they are happy with the outcomes of their harvest (Metcalf et al., 2012).

The failure to see forests as an asset, that needs to be carefully managed, may also lead owners to perceive incidental financial opportunities as more preferred (e.g., logger at the door flashing money, offers from fracking, pipeline, and windmill industries). Research examining the psychology behind economic choices found that choices are often impacted by how the decision is framed. When people consider an economic opportunity (e.g., a super sale, winning the lottery), they tend to evaluate the utility of the decision in isolation (Soman, 2004). Only when prompted to consider other economic alternatives are people willing to do so. People are also generally averse to loss, even when there are equal stakes. In other words, owners may see a financial opportunity as only coming once, and ignore or discount the potential for more valuable opportunities in the future. For a person to properly assess economic alternatives, they should first determine what they want out of a limited resource or budget (i.e., make proactive choices) and then evaluate how well the new financial opportunity supports their existing plan.

Before or after a land transfer is when owners appear more aware of the economic value of their forests. The seller may harvest to maximize their investment before the land changes hands, or the buyer trying to recoup costs. The act of transferring ownership likely decreases the sense of personal relationship and obligation to the land, and increases the sense that forests are one part

of an investment portfolio. Expenses may also be highest when land is transferred, justifying the harvest. The impact of land transfer on unplanned harvest is just as important as the impact owners have on ecosystem health during the ownership period, however, there is little research examining this issue or policies to address this issue. If an intervention were to be implemented, it would need to be round the time of the transaction, which may require collaboration with property assessment offices and real estate agencies.

Since many owners (over 50%) have expressed interest in enhancing some benefits (e.g., aesthetics, recreation), this suggests that more planned or proactive behaviors would have greater value if forest owners thought it would help them meet their objectives. Forest owner outreach should advance a curriculum that helps owners understand the many values associated with forests (as an asset or otherwise) and give them the skills to strategically assess tradeoffs associated with different harvesting options. Importantly, forest owners may not see responsible harvesting choices the same as managing for restoration (Kreye, et al., 2018).

Social Values toward Forests and Timber Harvesting

How people view their forest, and their responsibility as forest owners, can play a large role in harvesting intentions. This is especially true in contexts where there are few penalties or incentives associated with management behaviors. The recent survey in PA found many forest owners have a strong utilitarian view of forests and forest products, and a commitment to sustainability (Gruver et al., 2013). Most owners expressed positive attitudes toward forests, strongly agree that trees should be cut in a manner that is healthy for the forest and disagree with converting forests for development (Gruver et al., 2013). Most forest owners (50%+) also expressed a strong "sense of place" associated with the land they own, which can motivate them to keep the land intact or to take care of the land. Many recognized that communities benefit from private forests, not just landowners, and that nature has a right to exist. Many also agreed that it makes good sense to have a plan for using and taking care of their forestland (Gruver et al., 2013). These types of cultural values suggest that many owners recognize their role as guardians of the forest. This finding is also useful for justifying policy approaches that depend on the good will of forest owners and support forests owners' land use objectives.

Unfortunately, few owners actually follow through with developing a meaningful plan. Instead they use a pragmatic approach as a general strategy to help with decision-making. For example,

when attempting to meet life's economic needs they first try to meet the need without using their land; then, if needed, harvest trees or sell non-timber forest products; then, if needed, lease mineral rights; and finally sell as a last resort (Gruver et al., 2013). The advantage of understanding this line of reasoning is that it demonstrates that forest owners are willing to use forest management to help meet their economic needs before selling the land. For these owners, financial assistance programs and new market opportunities (e.g., payment of wildlife habitat) may be a way of addressing unplanned harvest.

The problem with a "need" based decision-making strategy is that the level of need can change under different circumstances. For example, many forest owners agree they should use sustainable harvesting practices, but if they have an unclear understanding of what practices are sustainable, or if there is a sudden change in income, their personal definition of "need" may change. A process that places greater priority on addressing immediate needs is more likely to overlook important tradeoffs in the long run. Related research has found that people who regularly scrutinize their investments are more likely to make poor decisions because they are more tempted to try out other investment alternatives (Soman, 2004). To ensure forests are sustained, forest owners need strategies that will help them account and control for these types of decision-making biases in order to enhance long-term outcomes.

Summary

This article examined some of the factors thought to influence unplanned harvest on private lands. Less understood, but also potentially important is how access to information about forest management may be influenced by technology (e.g., lack of broadband internet, fragmented information sources). Unplanned harvesting may also occur before land is acquired through eminent domain to make way for road construction or power lines. Storm or disease damage may also prompt an unplanned harvest, but the effects on forest health may not be relegated entirely to the owners' harvesting decisions.

It is clear that unplanned harvesting is the result of a complicated combination of cultural, economic and legal factors, as well as the limitations that humans have in making proactive decisions when under pressure. When considering possible interventions, there is little evidence that forest owners will always respond rationally to economic incentives. Owners are not necessarily interested in maximizing revenues (that may not be the reason they decided to own

forest land), but there are often unplanned costs which may prompt them to seek out economic opportunities. Streams of revenue that can be accessed quickly with few transaction costs would likely be more attractive to owners who make decisions using a needs-based strategy. Supporting reactive strategies toward forests, however, may not be a sustainable solution compared to strategies that support responsible stewardship, planning and investment.

For policy interventions to be effective decision-makers need to consider the constraints faced by certain types of owners (e.g., owners who retire, areas where land values are increasing) and identify strategies that can curb poor choices in both the short-run (e.g., call before you cut) and in the long-run (e.g., education, forest planning opportunities, new markets). Decision-makers may also need to think about how modifying factors unrelated to forest owners (e.g., loggers, local planning initiatives, and ordinances) may also improve harvesting decisions.

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