Increasing Habitat by Voluntary Transfer of Risk of Owning Big Trees

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ABSTRACT

Big trees create unique types of habitat. Economic realities however provide strong incentives to harvest trees before they get large, thus creating a landscape of young stands. As an alternative to regulatory ecosystem preservation, many conservationists have taken to purchasing and not harvesting timberlands. Instead of taking forests out of production, conservationists might alternately provide incentives for landowners to increase stand ages and habitat, by directly assuming the landowner's risk of holding big trees. If landowners can be assured that they will be paid for their big trees, even if they can not bring them to market, then their financial return will be increased, giving them an incentive to delay harvest. We propose that this mechanism might better improve ecosystem preservation.

Key Words:

Risk, Transfer, Incentive, Harvest, Habitat, Conservation

Habitat

Natural disturbance patterns create a wide range in stand ages, tree sizes and the resulting diversity. As shown in Figure 1, even-age timber management tends to harvest trees before they get very large, resulting in short rotations with a smaller range of stand ages, tree sizes, and habitat diversity. Applying natural or managed rotations across a landscape produces a landscape with similar range of ages and sizes (Figure 1). The landscapes resulting from short rotation management are thus dominated by young and very young stands.

Conservationists are concerned about the survival of species that depend on the habitat provided by older stands. The gap between the lines representing natural and short rotation management might be thought of as the loss in habitat diversity due to forest management. In order to shrink this gap, conservationists have thus advocated the creation of parks, wildlands, and other unmanaged reserves that will maintain some of this older habitat. As shown in Figure 2, these reserves increase habitat diversity by taking a fraction of the landscape out of production, and allowing trees to attain a more natural distribution of ages and sizes.

To increase the fraction of the landscape in reserves, by moving the line between managed forests and reserves in Figure 2 to the left, many conservationists have contributed their own funds towards the purchase and preservation of managed forest land. Land acquisition is expensive however, and saddles the philanthropist with the management of these preserves.

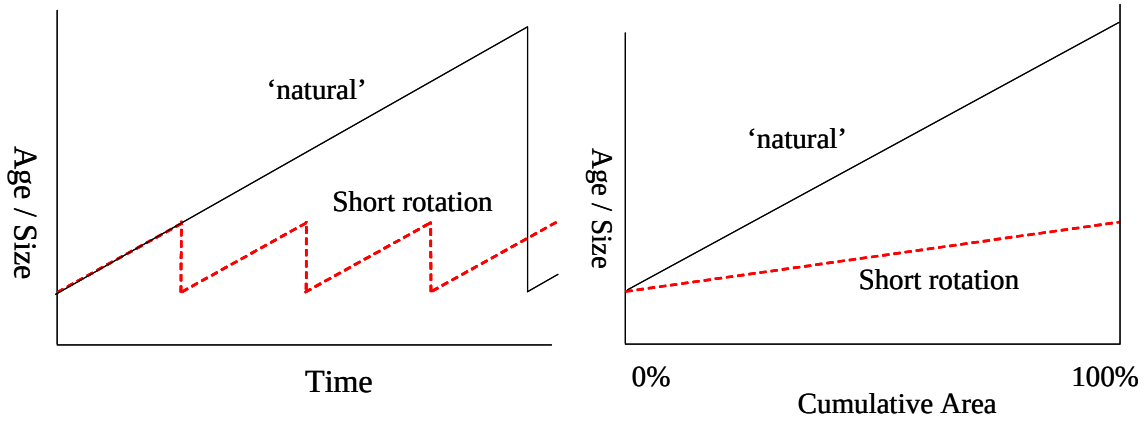

Figure 1. Natural disturbance patterns tend to produce long rotations (left, solid line) and a landscape with a wide rage of stand ages and tree sizes (right, solid line). Timber management tends to reduce this long rotation to a series of short rotations (left, dashed line), resulting in a landscape with a much smaller range of ages and sizes (right, dashed line).

Lengthening Harvest Rotations

Another way to reduce the gap is by lengthening the harvest rotation (in single age management) or retaining larger trees (in multi-age management). Perhaps the simplest option for delaying harvest of trees and stands is to buy lands and manage them for longer rotations. Unfortunately, this is not only costly, but requires conservationists to manage or hire managers for their timberlands. Another simple approach would be to contract with landowners to not harvest for a

given period. But this would be costly because it would expose landowners to risk of loss to natural, regulatory, and market processes.

The conceptual simplicity of these and other direct methods for delaying the harvest of big trees is appealing. Direct intervention comes at a considerable production, transaction, and management costs, which must be paid by the conservationist. If conservationists could somehow reduce the costs of the transaction, management, and lost production, then they might be able to maximize forest habitat for a given amount of money. As an alternative to direct intervention in forest management, we consider indirect methods by which conservationists might alter the economic environment in which landowners manage their forests.

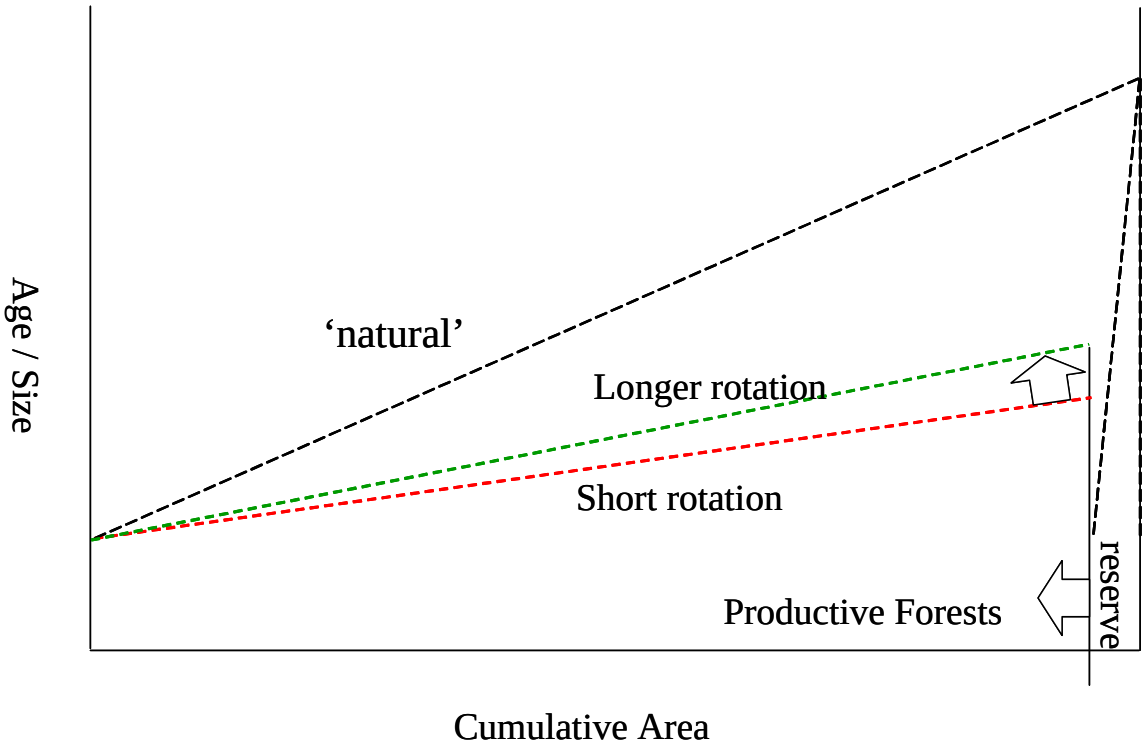

Figure 2. The gap between the natural and the short rotation age/size lines could be reduced by extending the rotation length of managed stands or by taking timberlands out of production to create unmanaged reserves.

Harvest Timing

Such a discussion of indirect methods requires a more detailed understanding on what influences landowners choice of harvest timing. Harvest timing is primarily controlled by the growth rate of the stand. For the first several years, there is no merchantable volume, but for the next several decades, the stand adds volume at a rapid rate (Figure 3). Even in a rapidly growing stand that is adding considerable volume each year, the current new growth (the line and right axis) in percent of volume already accumulated (the bars and left axis), drops off dramatically as the stand ages.

The financial growth rate is found by dividing the additional value produced by the total value that it has already produced (using volume as an approximation of value). The resulting relative growth rate is akin to an interest rate on savings or investment. Since the total growth to-date

represents a sort of value of the stand, and the annual growth rate represents an increase in value, dividing income by total value might be thought of as an interest rate.

Since the ratio is a declining curve, it will eventually drop below the interest rate that would be paid on an alternate investment as shown in Figure 4. In terms of an economic return, it's time to harvest when the value growth declines to where alternative investments are equally as good . Harvest will thus occur when harvesting and replanting becomes a better investment than the existing stand. The timing of timber harvest will thus not only be a function of tree growth, but also of the economy and the resulting financial returns available from alternate investment opportunities.

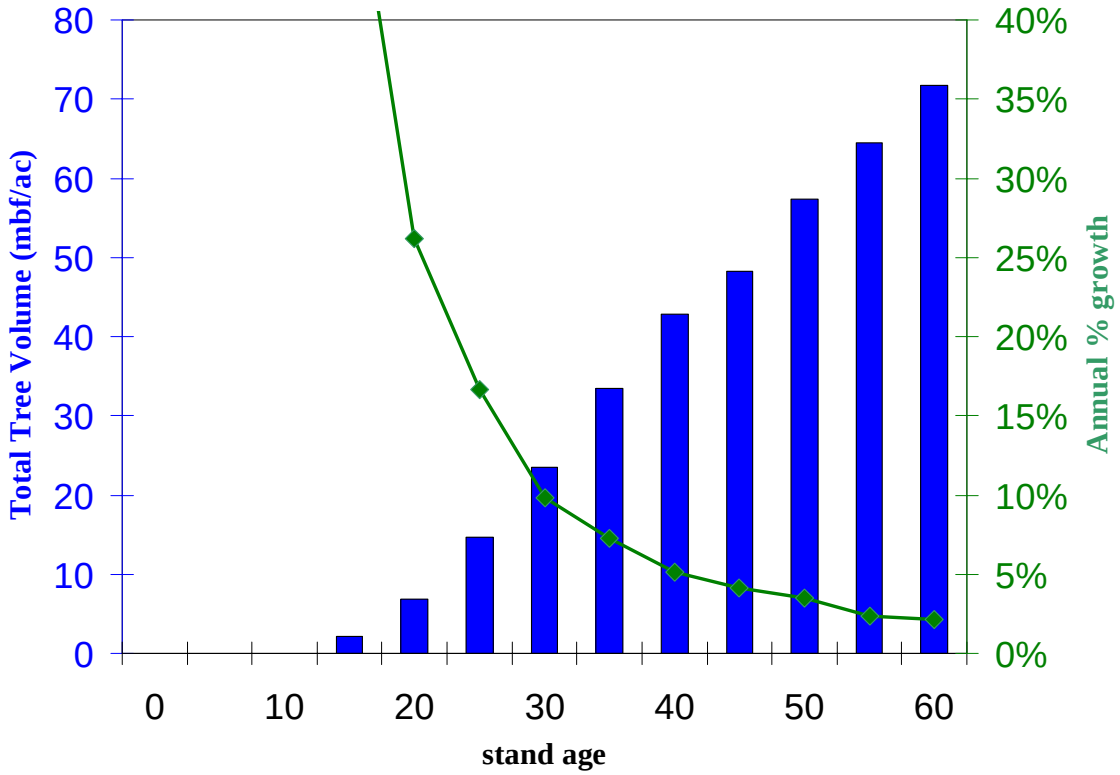

Figure 3. Even very vigorous growth becomes small when compared to cumulative growth to-date. In this example of site 145 Douglas-fir plantation growth, dividing the change in volume by the total volume (left) produces a relative growth rate (right) that rapidly shrinks to just a few percent.

Risk

Anyone familiar with forest management will know that forest management decisions are not as simple as comparing annual growth rates to economic returns on investment. First among these additional complexities are the natural, economic, and regulatory variabilities that can dramatically alter management decisions and the resulting economic returns. A natural disturbance such as a fire or storm can destroy the value of standing timber. Fluctuations in market prices can destroy timber value just as surely, but can also produce financial windfalls.

Regulatory actions can destroy forest value without even the possibility of salvaging some of the value.

These risks might be seen as a totally unpredictable process, which forest managers must endure. But since each of these risks can theoretically be insured against, forest managers (who commonly self insure) might be seen as paying an annual insurance premium to cover this risk. The annually averaged cost of this risk could be described as the annual probability of the event times the value of the loss if the event occurs.

This annual risk is a cost that must be added to the potential return for alternate investments, and compared to the stand's annual percent growth rate for the determination of economic harvest. This additional cost necessitates a larger growth rate (Figure 5) which in turn requires an earlier harvest. If this risk could be reduced or otherwise transferred away from the landowner, this would produce an indirect financial incentive for the landowner to delay harvest. This would then result in the landowner's interest being aligned with creating a landscape with a broader range of stand ages and habitats.

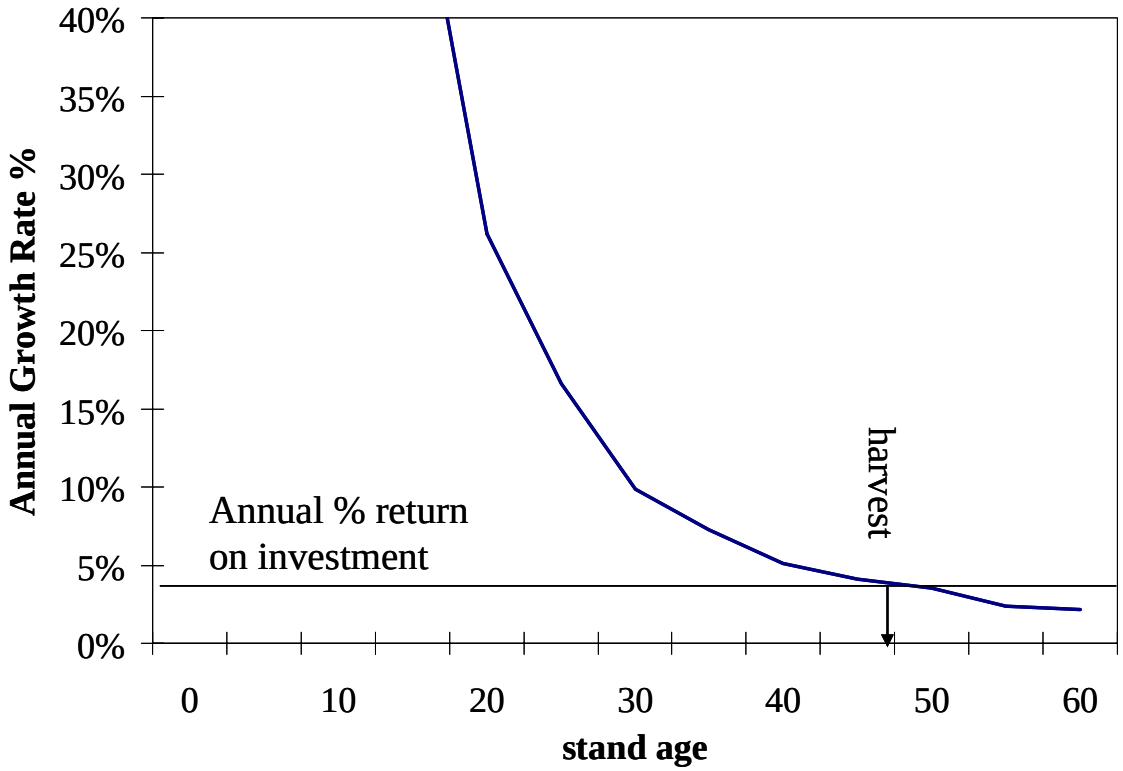

Figure 4. Harvest occurs when tree growth drops below return on alternate investments.

Reducing Perceived Risk

A common way to reduce risk is by implementing risk reduction activities such as reducing stand fuel loading to reduce the risk of loosing the stand to fire. These fuel reduction activities; however, do not commonly pay for themselves. Conservationists may wish to subsidize these risk reducing activities so landowners will have an incentive to delay harvest and potentially

increase habitat diversity. However, there are only so many opportunities for risk reducing management activities, so other options should be considered.

Another approach for reducing the risk of keeping big trees would be for conservationists to directly assume the landowner's risk of holding big trees. If landowners can be assured that they will be paid for their big trees even if they can not bring them to market, then their uncertainty will be reduced, giving them an incentive to delay harvest. Mechanisms for transferring risk from landowners to conservationists can include different combinations of natural, market, and regulatory risks.

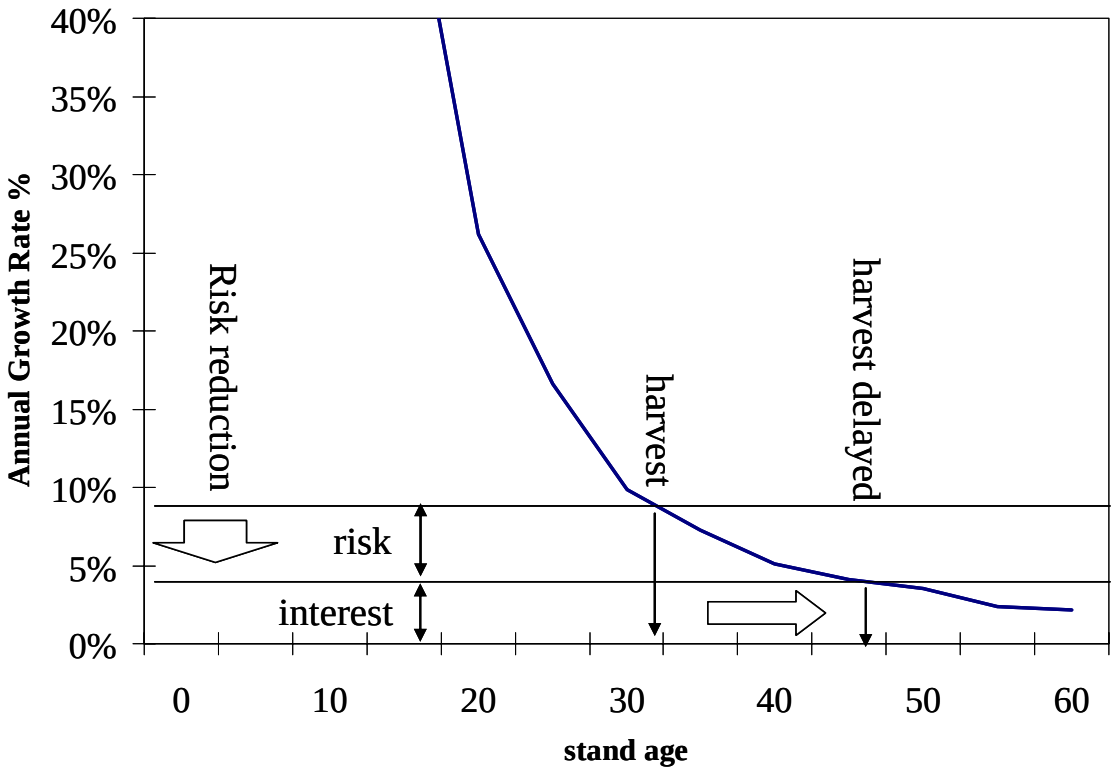

Figure 5. Annual growth must exceed the combine risk of loosing the stand and return on alternate investments. If this risk can be reduced or transferred, then landowners would have incentive to delay harvest.

Conservationists might assume the landowner's market risks, such as the risk of increased haul costs due to mill closures, or decreased log prices resulting from new alternatives or changing consumer tastes. If conservationists guarantee to pay the difference between today's market price and some future (potentially lower) market price, then landowners would not need to fear future variations in log prices and logging costs. This approach however has the unfortunate side effect that landowners will only get paid if they sell their trees, which creates an incentive to cut, and probably won't make sense to many conservationists .

Conservationists could, alternately, assume the risks from natural disturbances. In an approach much like common auto and home insurance, conservationist could pay for lost value whenever

all or part of the forest value is lost. This indirect approach would allow the landowners to still manage their land as they see best. Unlike auto and home insurance, conservationists would subsidize or completely assume the coverage. Transaction costs would be limited to paying adjusters trained in timber valuations to visit and estimate the financial loss.

Several variations to this approach could improve its utility to landowners and conservationists. Coverage could be extended to include market risk by tying assessed value to some earlier market prices. Conservationists could limit their financial exposure and focus the incentives to older stands by limiting coverage to trees larger than some minimum size. This coverage could similarly cover regulatory takings, but this could be messier, since unlike physical damage, any regulatory taking can subsequently be reversed.

Building Trust

In addition to all the common problems in building trust between members of the forestry and conservation communities, there is the additional problem of building trust in a new form of insurance. This approach will not work if landowners do not trust the policies. If they have no faith that their losses will be covered, they will not modify their management to delay harvest. Fortunately, any such insurance scheme could be subject to the same audits common to the regular insurance industry. And in any case, the real test of any such system will be in its prompt and accurate payment of claims.

As with any other insurance policy, this approach will require reserves to cover its policies. And just as insurance companies have begun acquiring forest lands to back their policies, conservationists may want to use their conservancy holdings to back their promise to insure the big trees they want to maintain. This may prove problematic, however, when conservation organizations have to explain to skeptical donors why they were selling the land they have just acquired for conservation, to pay for losses suffered by timberland managers.

Evaluating the Approach

Before conservationists and landowners commit their money and land to risk reduction, they will need to see whether this approach will provide more bang-for-the-buck than existing land acquisition programs. More specifically, does shifting up the slope of the productive forests curve make more habitat than shifting the line between productive forests and unmanaged conservation reserves? In comparing the habitat bang-for-the-buck of insuring versus acquiring forest habitat, we need to estimate financial costs and habitat benefits of each.

The cost of insuring big trees will likely be much less than the cost of land acquisition. Land acquisition involves acquiring the land along with all its potential uses, just to get the habitat. In doing so, conservationists are competing with all of society's other demands, such as for timber and recreation. Insuring big trees, however, pays only for the trees that conservationists want to protect, and only when the landowner suffers a financial loss.

The habitat benefits of this and existing approaches will be more difficult to identify. Since no forest land is acquired, it will be difficult to quantify the extra habitat indirectly maintained by this coverage. One possible method for identifying the landscape habitat benefits of this approach would be to establish artificial territorial boundaries to the coverage and look for

landscape habitat differences on either side of the boundary. However, it would be difficult to distinguish the cause of any observed habitat changes since political, market, and natural process could all create the observed habitat changes.

At a more fundamental level, it is not clear whether conservationists will value or even notice the resulting habitat improvements. Even if the landscape habitat effects of this approach could be precisely documented, it still might be difficult to prove that the resulting landscape had more ecological value. Even if graphs of cumulative landscape habitat distribution (like Figure 2) could be produced, it is not clear how to prove that a greater range of habitats across all production forests was better than a small increase in the fraction of the landscape taken out of production. It is possible that wildlife scientists might be able to quantify habitat values for specific species and resulting population health. It is unlikely, however, that the improved health of different species can be merged into a unified metric of ecosystem health.

Conclusion

The false dichotomy between ecosystem conservation and timber production might be overcome by demonstrating that ecosystem values might be most effectively conserved within productive forests. Instead of land acquisition or contracting with landowners to enhance ecosystem values, conservationists might reduce transition costs and maintain landowner flexibility by indirectly influencing landowners by assuming part of the risk of keeping big trees. But before this can become a reality, several questions need to be answered. How much does it cost to insure big trees? Will landowners believe that their losses will be made good, and thus delay harvest of big trees? How much longer will they be maintained? How do we quantify the improvement in habitat? These and other issues will need to be addressed before this approach can be implemented.