You Get What You Pay For: A Timberland Investor's Perspective on Forest Carbon Offsets and Evolving Carbon Markets

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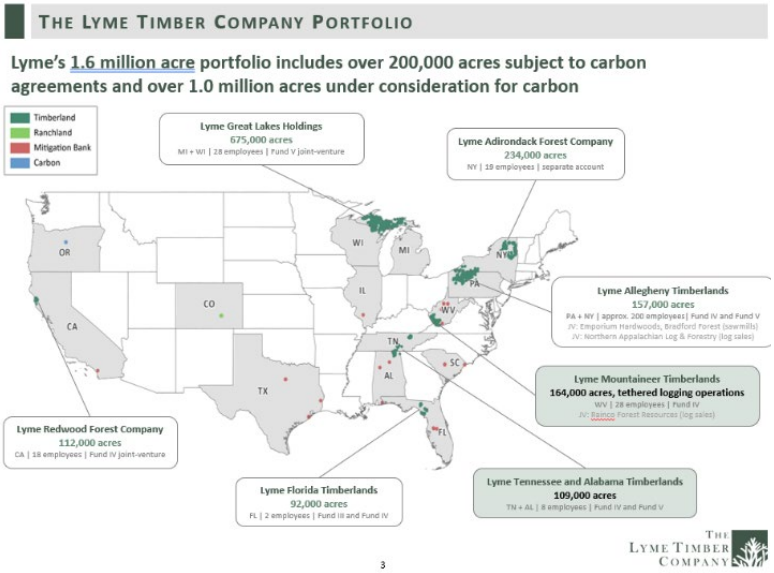
Thanks to all of you for choosing to spend some more time with me. After an hour in the last session, I assumed there would be some fallout, but it looks like we have a pretty good crowd.

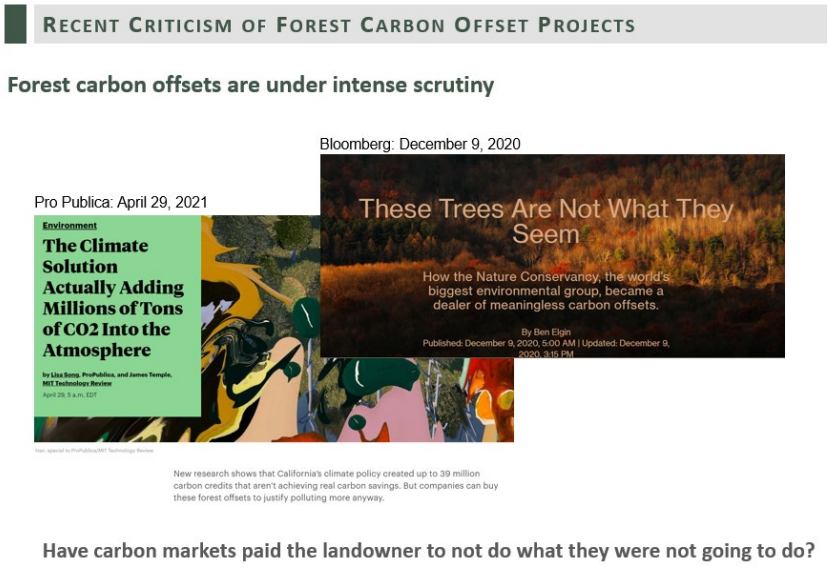
Agenda: I'm going to do four things before opening the session for questions and discussion. First, I'll respond to some of the legitimate criticisms of forest carbon offsets that have made the news over the past year. Second, I will provide a framework for thinking about the two bookends of forest carbon markets: the well-established 100-year California compliance offsets and the recently developed NCX one year harvest deferral credits. Third, I will use three case studies from the Lyme portfolio to discuss an approach to carbon pricing that begins with changes in forest management – specifically, harvest reductions and rotation extensions - then backs into the carbon price necessary to incentivize such changes. Finally, I'll share some observations about where carbon markets may be headed and discuss the implications for landowners and the forest products industry.

Background on Lyme: Before I get started: a little background on The Lyme Timber Company. Our 1.6 million-acre forestland portfolio is built around seven businesses, all of which include significant naturally re-generated forests. Over 90% of our portfolio is hardwood and mixed wood forests in the Eastern US. For this reason, we have been active in carbon markets. In just the last 18 months, we've sold over $50 million of compliance offsets from five different projects on 200,000 acres of



our portfolio. We are currently evaluating carbon on an additional 800,000 acres and may enroll new carbon projects in the coming year.

Criticisms of Forest Carbon Offsets: As many of you know, despite what appears to be growing interest in investing in forestland as a natural climate solution, there have recently been several high-profile criticisms of forest carbon offsets. Articles in Bloomberg and Pro Publica have questioned whether compliance and voluntary transactions have accomplished their purpose to take carbon dioxide out of the air and thereby offset carbon dioxide emissions.



The Bloomberg article pointed to The Nature Conservancy's selling of offsets on lands that were unlikely to be harvested due to their conservation status. And an honest assessment of many other carbon projects, including some that Lyme has developed, is that while legal and fully compliant with the protocols, they may not have required the manager to reduce near-term harvest levels relative to historical harvests or change management practices to increase carbon sequestration. A large portion of the carbon sold outside of California has been on tribal lands, NGO lands, or difficult and marginal lands where harvesting well above biological growth and thereby substantially reducing standing carbon stocks may not be practical in the near-term or likely in the long-term.

In these circumstances, it can be argued that carbon markets have paid the landowner to "not do what they were not going to do". Critics are not being unreasonable when they question the "additionality" of forest carbon offsets.

On the one hand, this is a cause for concern: carbon markets are not adequately offsetting emissions and doing what they were designed to do. On the other hand, the lack of additionality on some projects – including those developed by TIMOs and NGOs - may simply be the outcome of utilizing an evolving market-based approach to address climate change. In that context, it should come as no surprise that early market participants sought out projects that could yield the greatest number of offsets at the lowest cost. Especially early on, carbon markets were unknown territory. Even without immediate harvest reductions, enrollment in a carbon project presented (and still presents) real risks and costs to the landowner, including 100-year requirements for sustainable forestry practices, restrictions on land conversion, limitations on land sales, and other obligations.

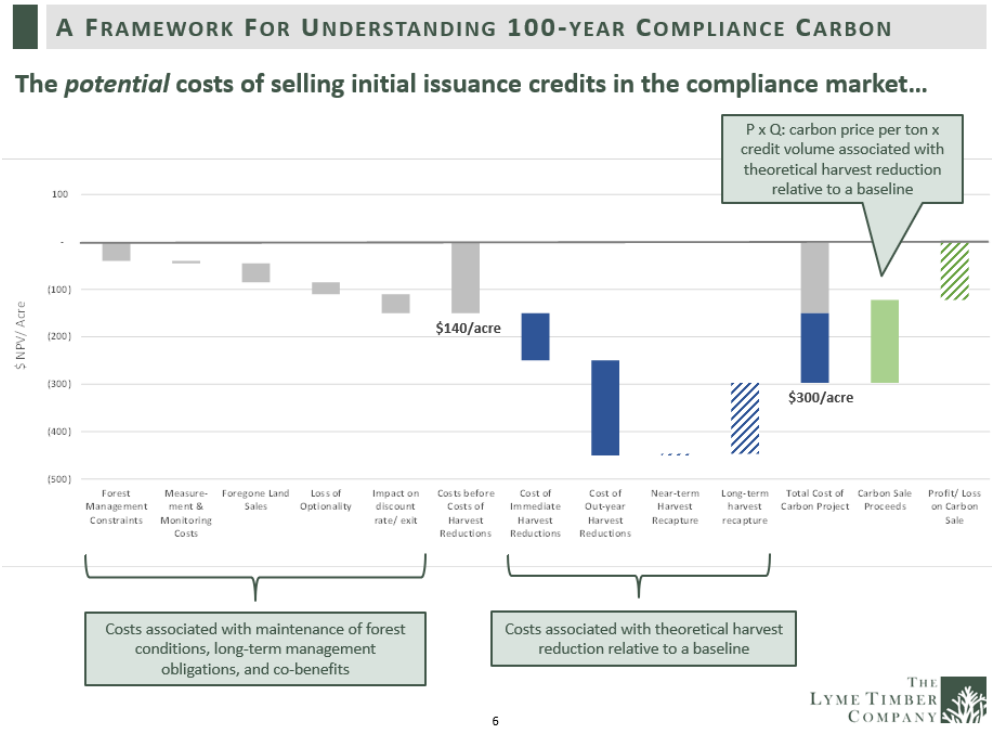
All that said, I don't think it's correct to conclude that the markets are incapable of functioning and delivering climate solutions. The California protocols have gotten much tighter over the

years. Some projects that were permissible in the early days when the markets were just getting started would not meet today's standards. Consequently, properties that generate large volumes of initial issuance credits for the compliance market are increasingly rare. Going forward, opportunities may be more limited to selling "annuals" which entail reducing harvests and thereby trading timber harvesting cash flows for carbon cash flows.

At the same time, it's clear that a segment of offset buyers – including traditional California compliance market buyers as well as tech company buyers like Microsoft, Salesforce, Google, Amazon, Facebook, and others – are seeking higher quality credits that are more truly additional. This combination of factors - stricter protocols and tighter standards, fewer market inefficiencies, and demand for quality credits from aspirational tech and other buyers – suggests that there is a path forward for carbon markets.

Framework for Understanding Carbon: Now I would like to shift to a framework for thinking about enrolling a property in an offset project. I'll start with 100-year compliance carbon then move to the more recent one-year harvest deferral credit markets that NCX is developing.

This waterfall chart is a depiction of the costs and tradeoffs associated with enrolling a property in a 100-year compliance project. On the left side we have a set of compliance related costs: constraints on forest management, measuring and monitoring costs, foregone land sales, loss of the ability to pursue other options in the future, and impacts on discount rate/ exit.



The compliance and management costs represented on the left-hand side of the chart, which total $140/ acre, are for a naturally regenerating hardwood property. On a softwood plantation, these costs could be far higher given prevailing softwood management practices. The California protocol requires a transition to uneven-aged management, limits clear cut size to 40-acres or fewer, and restricts the use of fertilizers. Such requirements could impose costs of $500/ acre or more on a conventionally managed plantation property, and this helps to explain why there have been almost no southern pine carbon projects developed under the California protocol.

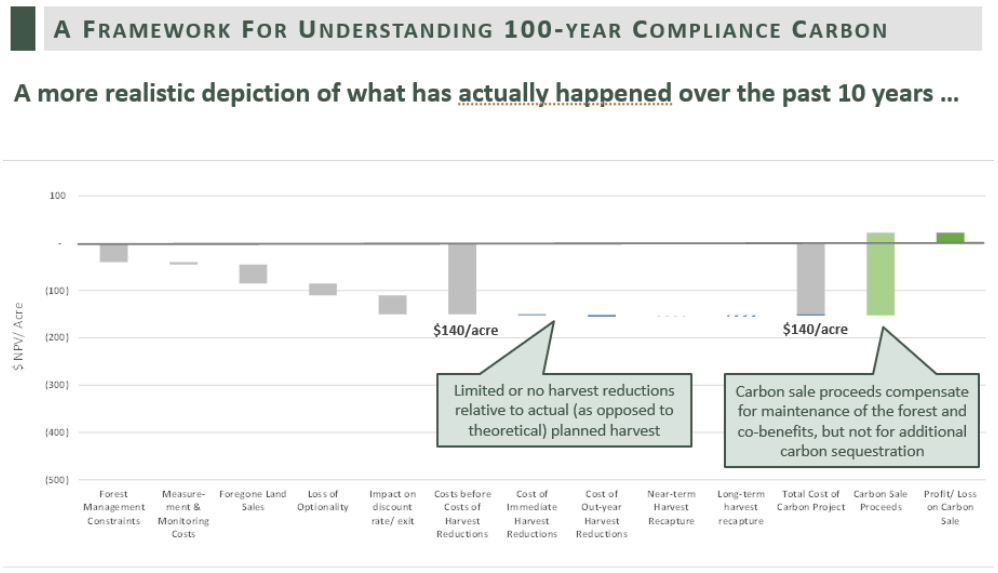
On the right-hand side of the chart, we have the theoretical costs of *not* harvesting at levels that would draw down inventory to a regional baseline. Some of these harvest reduction costs can be partially offset by product shifts and the potential for higher harvest levels in the future, and the recaptured value is represented by the hashed bars. In this example, the net costs associated with harvest reductions total about $160/acre.

This brings us to a theoretical combined total cost of about $300 per acre with the costs roughly split between management costs and harvest reduction costs.

The last thing you will note on this slide is that the assumed carbon sale proceeds do not fully cover the landowner costs of delivering the credits. In this hypothetical example, proceeds from a carbon sale cover only about half of the cost. This begs the question of how forest landowners have been able to sell carbon credits in the compliance market.

How have forest landowners been able to sell carbon credits when the carbon payments do not cover all of their costs? The answer is that the harvest levels necessary to draw inventory down to common practice are largely theoretical - at least in the short term - and consequently the landowner may not *actually* be foregoing the timber harvest revenue depicted by the blue bars on the previous chart. On many properties where carbon has been sold, it would be difficult (though not necessarily impossible) for an institutional timberland investor, to reduce standing timber stocks to common practice baselines in any near-term timeframe.

These dynamics are illustrated here (chart on right). While the landowner does incur significant compliance, conservation, and long-term management costs associated with the carbon project (again depicted by grey bars), the landowner may not incur the more theoretical harvest reduction costs that were depicted in blue on the previous chart. Because the carbon payment covers the compliance, conservation, and management costs, and the harvest reduction costs are not immediately incurred, the landowner can justify the carbon contract and associated encumbrances. For the carbon buyer, you can argue that this is "paying the landowner to not do what they were not going to do", but I think a better analogy is that it's more like paying a



"Paying to enter a beer hall, enjoying a fine meal, but learning that they've run out of beer"

cover charge to enter a beer hall, being offered a finely prepared meal, but learning that they've run out of beer.

Although they have not had to change near term management practices to sequester and store more carbon, the landowners who have enrolled properties in compliance carbon projects have, by and large, not extracted rents from the market. Instead, they have delivered co-benefits and ensured that their forestland properties remain intact for 100 years. The have also foregone the *potential* to reduce timber stocks even if that potential was relatively unlikely to occur in the near-term. They were not able to serve the beer that brought the customer into the beer hall, but they served a fine meal instead.

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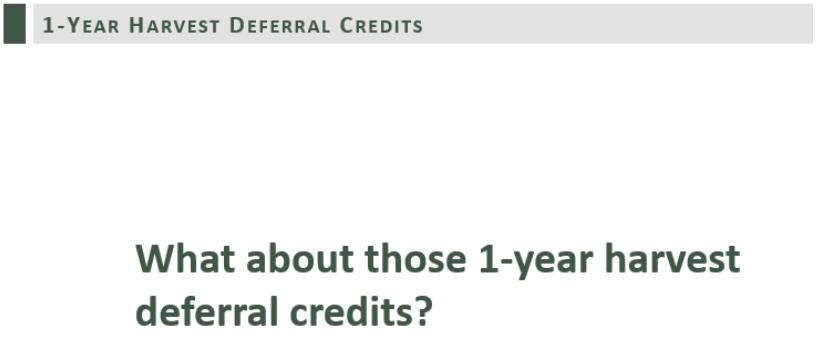
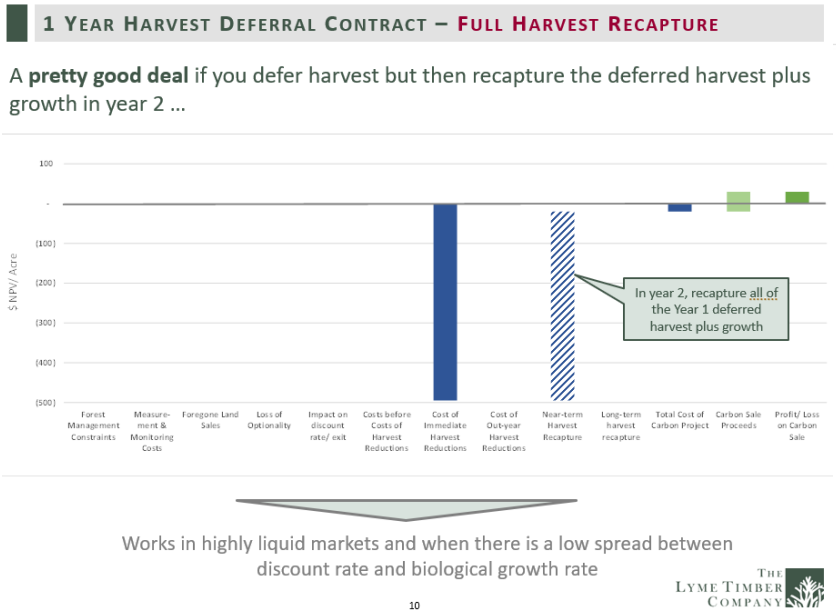
1-Year Harvest Deferral Contracts: Next, I'm going to quickly run through some hypothetical examples of the decision to enter into a one-year harvest deferral contract using the NCX exchange. This is an important market that has addressed three barriers to wider participation in carbon markets: 1) onerous management requirements under the California protocol that make it nearly impossible to enroll conventionally managed southern pine plantations; 2) long-term (100 year) project durations that impose high opportunity costs on all landowners; and 3) high up-front transaction costs that make compliance carbon inaccessible to smaller, non-industrial timberland owners.



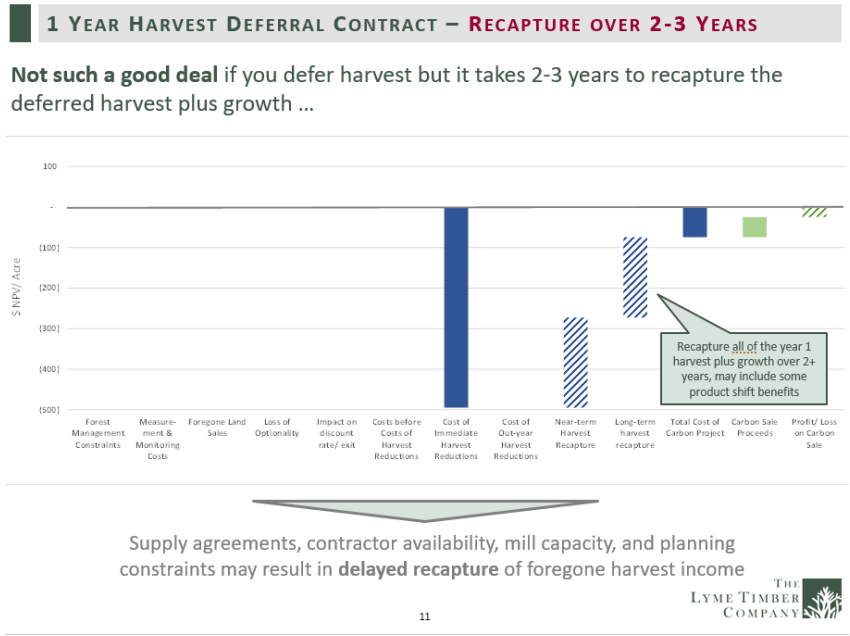
While the NCX approach is novel and could present an attractive solution for landowners and offset buyers, the underlying modelling and assumptions need to be made public and more fully scrutinized. The biggest question is whether the algorithms used by NCX are accurately predicting what a landowner, or aggregation of landowners, would do in the absence of carbon payments.

No Planned Harvest: As illustrated here, getting paid to defer harvest by one year is a very good deal if you never planned to perform the harvest in the first place. You get the carbon payment and incur almost no associated costs.

Full Harvest Recapture: As illustrated here, the arrangement can still be a good deal if you defer a planned harvest but have the ability to fully recapture that harvest plus growth in the following year. The payment is essentially covering the spread between your discount rate and biological growth, and this works best in faster growing forests in highly liquid markets where you can time your harvest with confidence.

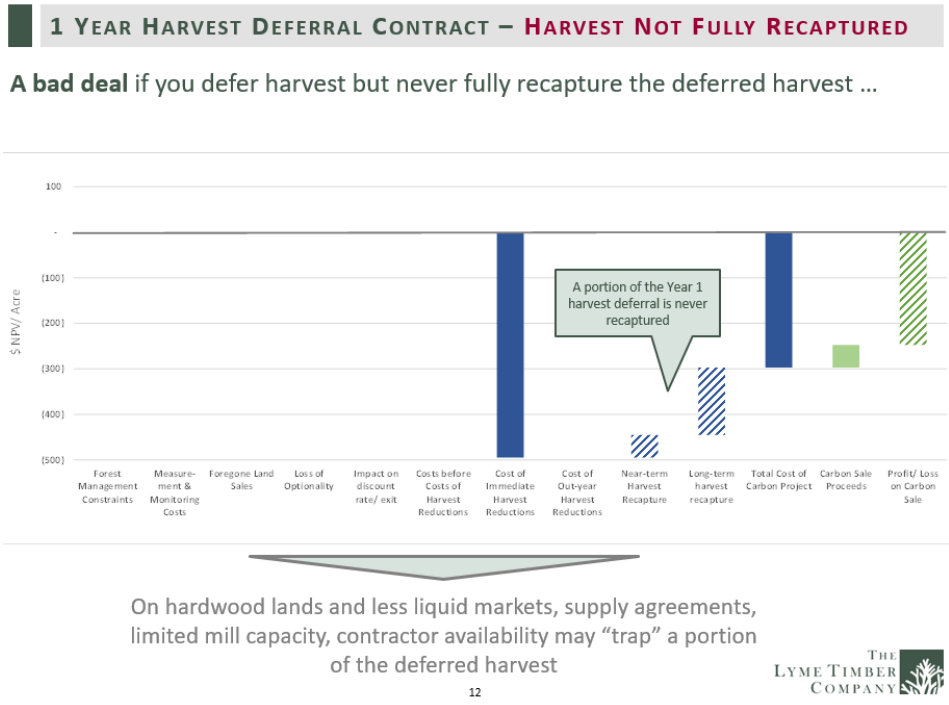


Partial Harvest Recapture: At current pricing levels, the one-year harvest deferral is not such a good deal if it will take more than one year to recapture the deferred harvest. This can be the case if a landowner's ability to modulate their harvest is constrained by log supply agreements, contractor availability, and/ or mill capacity. For large industrial landowners, even owners of more liquid southern pine, it can be difficult to reduce the harvest in one year and then perform the following



year's planned harvest plus 100% of the deferred harvest. If the landowner cannot do this, the harvest deferral credit may not adequately compensate them for their harvest deferral.

Harvest Not Fully Recaptured: Finally, deferring a planned harvest can be a bad deal in slower growing forests and in markets where it may not be possible to fully recapture the deferred harvest in the following year. This can be the case for hardwood timberland which are slower growing and generally located in less liquid timber markets. The choice to defer harvesting may result in a portion of foregone harvest volume becoming permanently trapped due to contractor or market constraints. Thus, the owner of a large hardwood property might be better served by selling harvest deferrals over a longer timeframe than one year.



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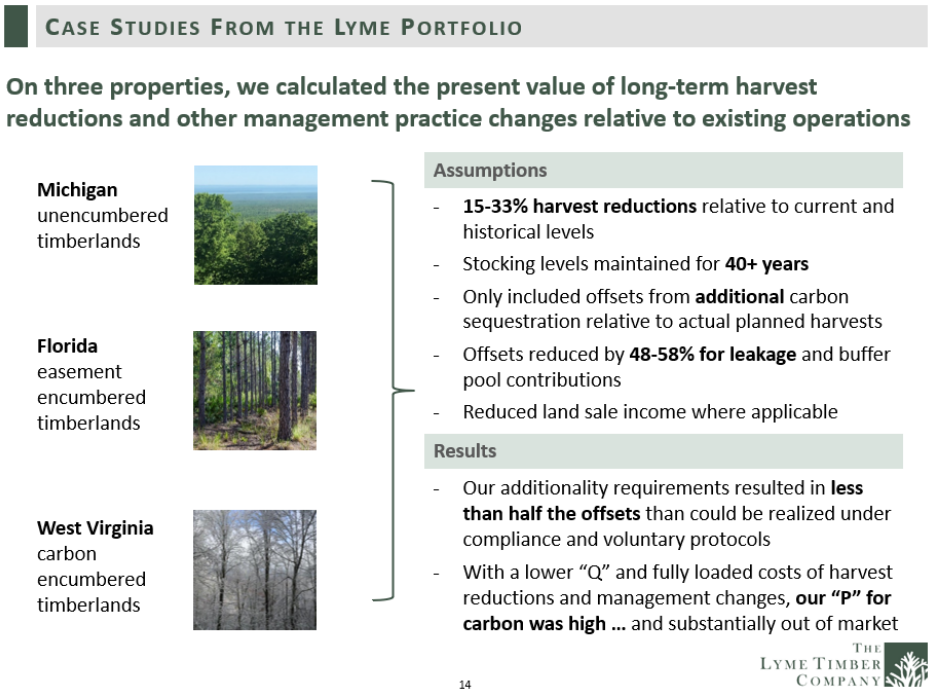
Hypothetical Case Studies from the Lyme Portfolio: This brings me to three hypothetical case studies from the Lyme portfolio.

Historically, we've approached carbon the way most landowners have: carbon developers come to us with carbon assessments, then we consider the tradeoff between the upfront initial issuance payment and the ongoing obligations under the proposed project. In some cases, we've decided to proceed while in others we have not.

What happens if you start with management changes, then calculate the carbon price?

What we haven't done, until now, is start the process with a set of immediate management changes – specifically harvest reductions and rotation extensions – then calculate the price of carbon necessary to incentivize those changes.

Assumptions and Results: We analyzed the costs of immediately implementing management changes to achieve carbon objectives on three properties in our portfolio: Michigan, Florida, and West Virginia.



Our Michigan property is not encumbered by any conservation easements and has a long history of timber harvesting and land sales.

Our Florida timberland is largely subject to working forest conservation easements.

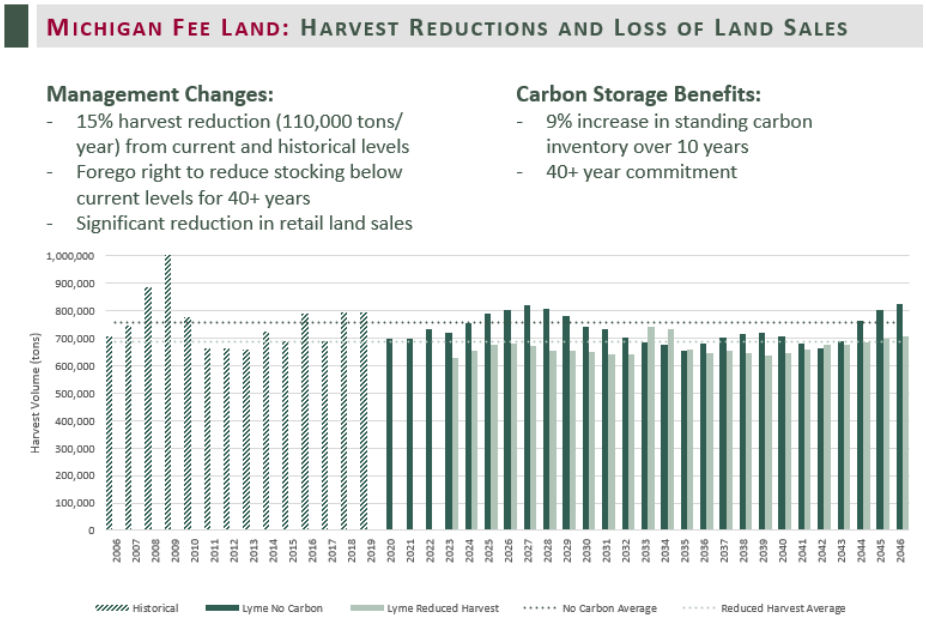
West Virginia is subject to an existing California compliance market carbon project.

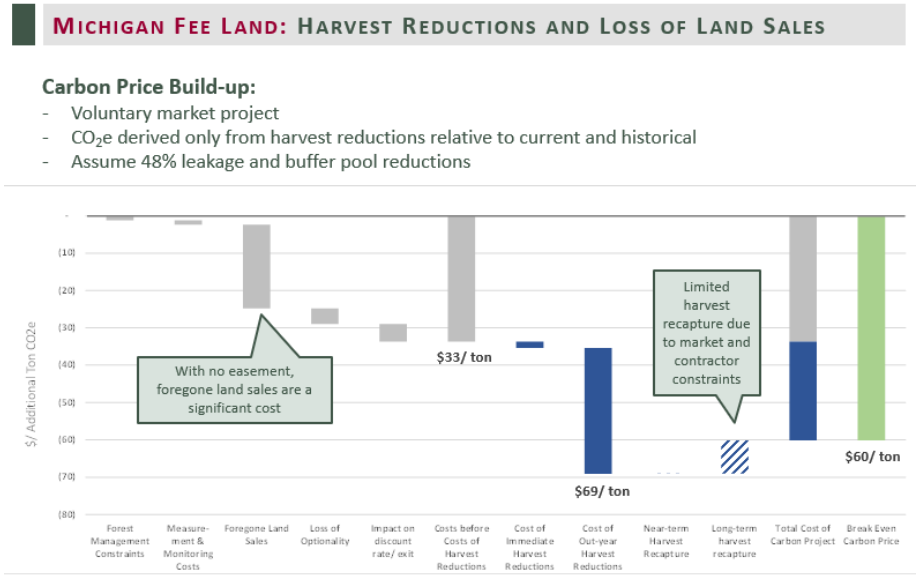
In each case we assumed 15-33% harvest reductions relative to our current and historical harvesting practices. We assumed that stocking levels would need to be maintained for 40+ years, and we calculated carbon offsets based *only* on the additional carbon storage relative to our planned and historical harvests. We adjusted carbon tons downward by 48-58% for leakage and buffer pool allocations, and reduced our land sale program on lands where we are currently making regular land sales.

Results from Case Studies: I'll get to the resulting carbon prices in a moment, but first I want to summarize two key findings across all three properties. First, our approach to additionality – essentially using our current harvest levels and plans as the baseline – resulted in less than half the offsets than would have been realized under the compliance and voluntary protocols we have considered. Second, because the quantity of credits was so much lower and because we needed to fully incorporate the cost of harvest reductions into our pricing model – the carbon offset prices that we derived were high and substantially out of market.

Case Study #1: Lyme Michigan Timberlands

On our Michigan lands, you can see a history of harvest levels dating back to 2006, which included the harvesting activity of Plum Creek and Weyerhaeuser who previously owned the property. That harvest averaged around 800,000 tons per year. We modelled a harvest reduction of 110,000 tons per year, a 15%, reduction relative to current and historical practice. We have also forgone the right to increase harvesting and drop stocking levels at any time during the 40-year project period, which is to say that standing carbon stocks must increase over time. As noted, we also assumed that our retail land sale program would be substantially reduced to ensure compliance under a long-term carbon protocol. These management changes produced a 9% increase in standing inventory over a 10-year period.

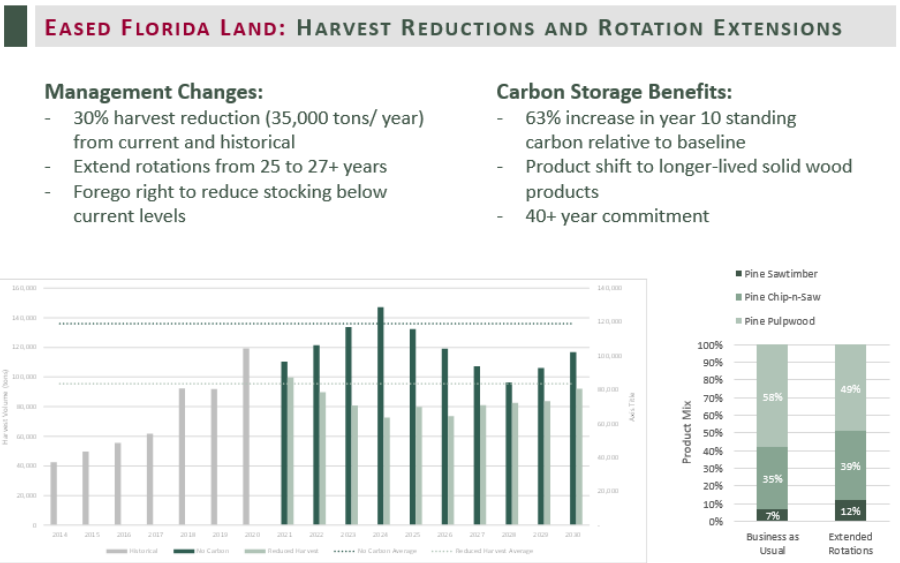




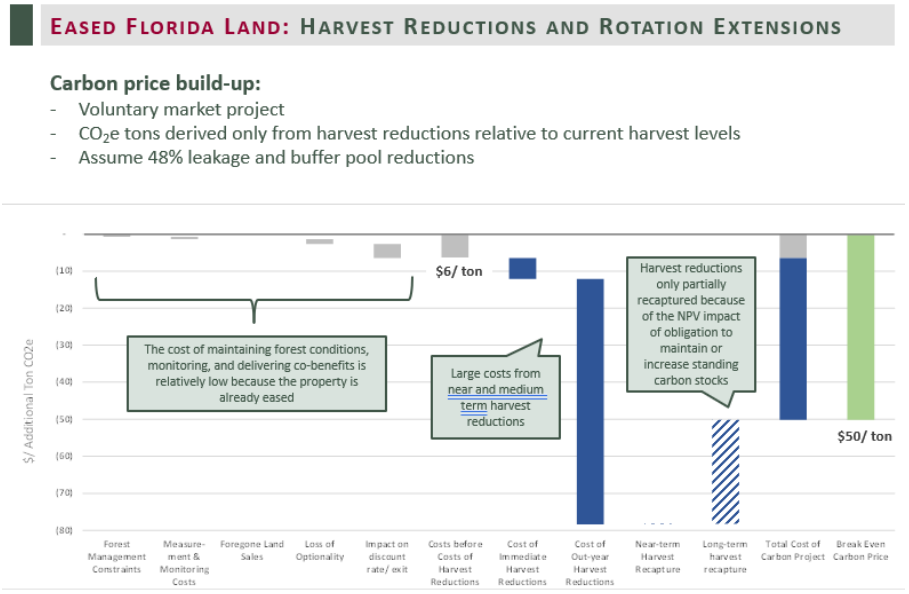
What was the cost of these management changes and the carbon encumbrance? On the left-side of the chart, you can see that reducing land sales has a significant impact on cost – about $22/ ton. That, combined with the loss of optionality and an impact on discount rate, equated to about $33/ ton just to enroll the property in a 40-year project. We then layered in the cost of reducing the harvest by 110,000 tons per year, and that added another $36/ton of cost. We've assumed that we could recover some of the harvest reduction cost through product shifts and the recapture of harvesting in out years, but still we landed at a carbon price of approximately $60/ ton to make these changes – well out of market.

Case Study #2: Lyme Florida Timberlands

In Florida, we assumed harvest reductions of approximately 30% over the next several years in order to transition the pine plantations from 25-year rotations to 27+ year rotations. We assumed that at no point during the 40-year life of the project could standing timber stocks drop below their current levels. This constraint presented a particularly significant challenge given the uneven aged class distribution on this forest. Over a 10-year period, our assumed management changes were forecast to increase standing carbon stocks by 63%. As you would expect, our growth and yield model did forecast a shift in products as we grew longer-rotation forests and increased the percentage of sawtimber to chip-n-saw and pulpwood.

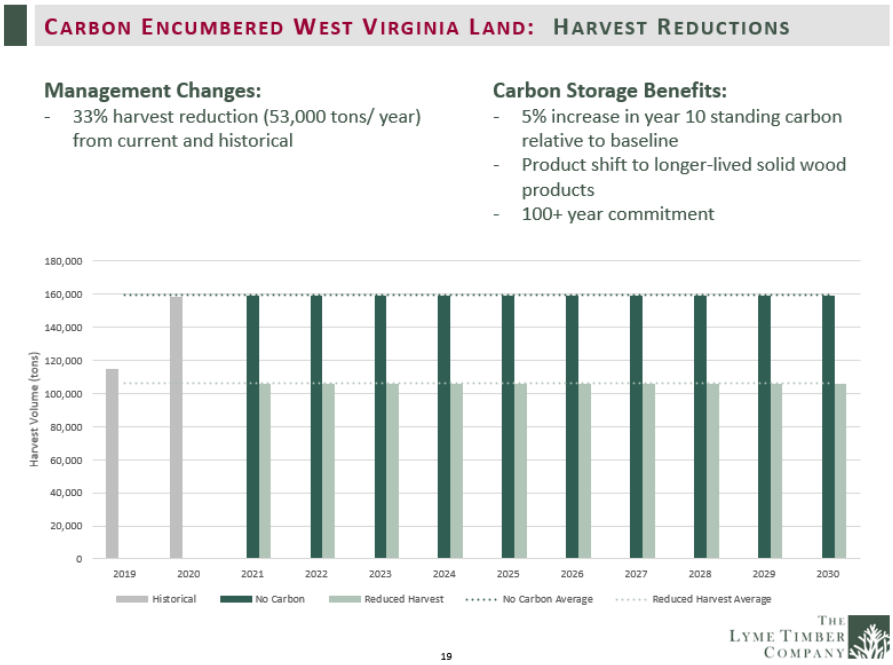


The costs on this property landed at $50/ ton, $10/ton less than Michigan, but still well out of market. The cost was lower largely because this property is subject to a conservation easement. Unlike Michigan, we did not need to burden the project with the cost of foregone land sales and other constraints that were already assumed as obligations under the conservation easement.

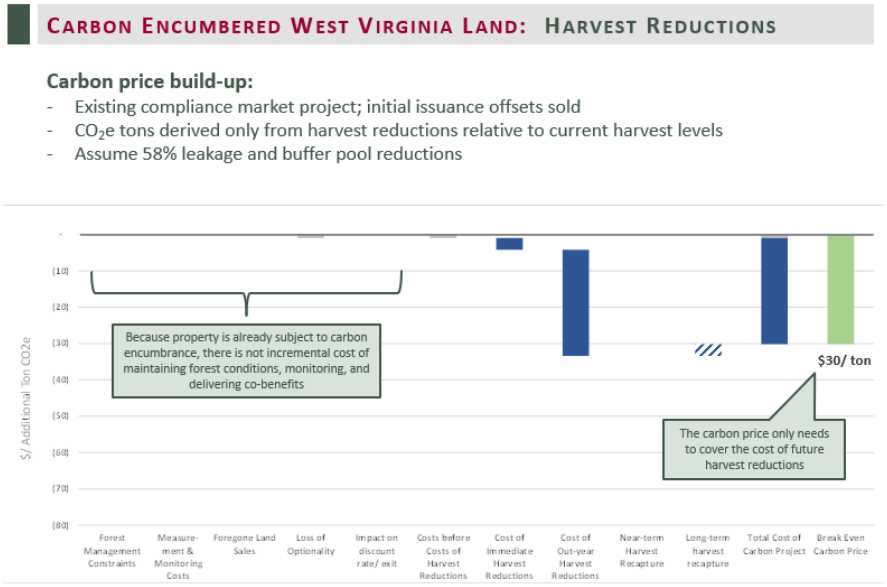


Case Study #3: Lyme West Virginia Timberlands

In West Virginia, our current harvest levels are below biological growth. Since the project is enrolled in an ARB offset project, we can sell annuals based on the difference between our current harvest levels and biological growth.



For this analysis, we assumed a further 33% harvest reduction, which would result in additional net annual carbon sequestration. In calculating carbon additionality, we did not include the carbon sequestration associated with our current, business-as-usual management. Instead, we included only the additional carbon sequestration associated with our 33% harvest reduction.



The contemplated management changes resulted in a 5% increase in standing carbon stocks over a 10-year period. The harvest reductions produced a direct cost of just under $30/ ton. Because of contractor and market constraints, we assumed that only a small portion of our harvest reduction could be recaptured in future years. As with Florida, we assumed very low costs associated with management and compliance. The property is already enrolled in a 100-year compliance project and the compliance and management costs have already been absorbed by the project. In total, the cost a 30% harvest reduction on our West Virginia property landed at $30/ ton – well out of market.

Conclusions

I will wrap of with the following seven conclusions:

Seven Conclusions

1. **Sellers of forest offsets have accepted carbon prices in the $6-13/ ton range on projects that have maximized offset quantity at the expense of offset quality**
2. **Some buyers are expressing preferences for quality and a willingness to pay for it**
3. **Future projects may generate fewer, higher quality credits at higher, or substantially higher, prices**
4. **Co-benefits are great, but they add to the price of carbon; combining carbon projects with traditional conservation strategies can create value**
5. **If carbon markets are successful in changing practices, some timber producing regions may benefit while others may face greater challenges**
6. **Public policy will need to address the economic challenges that some communities may face as landowners reduce harvest levels in exchange for carbon payments**
7. **Promotion of solid wood for buildings, floors, cabinets and furniture will help traditional forest products industries compete against carbon**

Questions and Discussion