BeZero Carbon ex ante rating report

Project Nimbus

ICR304v2

April 2026

BeZero

Project description

Project Nimbus is a USA-based Improved Forest Management (IFM) project developed by Sky Harvest Resources LLC under the ICR grouped project methodology. Launched in 2022, it spans approximately 6,340 hectares of privately owned forestland across Virginia, North Carolina, Mississippi, and Louisiana, with the majority in Virginia. The project incentivises non-industrial private landowners to defer harvests through renewable 5-year contracts, restricting clear-cutting and limiting thinning. It credits increased carbon sequestration only and is forecast to generate approximately 24,428 tCO_2e over the rated vintage (1 June 2024 – 31 May 2025). The project has a 45-year project life.

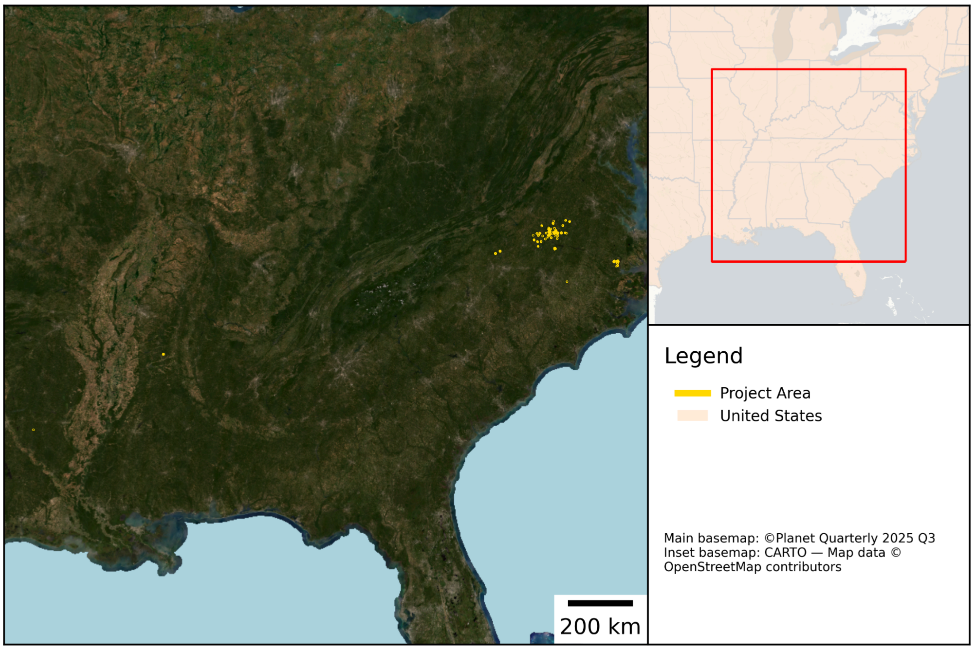

Figure 1. Map of the project area of ICR304 in USA. Background imagery from Planet Labs, showing a high-resolution satellite view obtained in July-September 2025.

Table 1. Project details.

Particulars	**Details**
Project name	Project Nimbus
Sector classification	Nature-Based Solutions → Forestry → Improved Forest Management
Methodology	ICR: ISO 14064-2
Project proponent	Sky Harvest
Location	USA
Project crediting period	01/06/2022 → 31/05/2067
Vintages assessed	01/06/2024 → 31/05/2025
Issuance forecast (in rated vintages)	24,428 tCO_2e
Project commitment period	28 years
Year of first issuance	2024

Contents

Executive summary

BeZero Carbon has assigned ICR304 a ' A.pre ' ex ante rating, with ' Low ' execution risk. This is based on the opinions and reasons expressed below, following our analysis of information made available by the customer, our interactions with the various stakeholders, and related publicly available information. Credits rated 'A.pre' provide a high likelihood of achieving 1 tonne of CO_2e avoidance or removal.

The ex ante rating of ' A.pre ' is driven by the project's high additionality, high likelihood of accurate carbon accounting and very high permanence.

Table 2. BeZero Carbon ex ante rating summary for ICR304, as of April 2026.

COMPONENT	ASSESSMENT
Additionality	a
Carbon accounting	a
Permanence	aa
Ex ante rating	A.pre
Project execution risk	Low

Benchmarking

A **' A.pre '** ex ante rating is comparable to the **highest quartile** of equivalently rated ex post IFM projects as of April 2026.

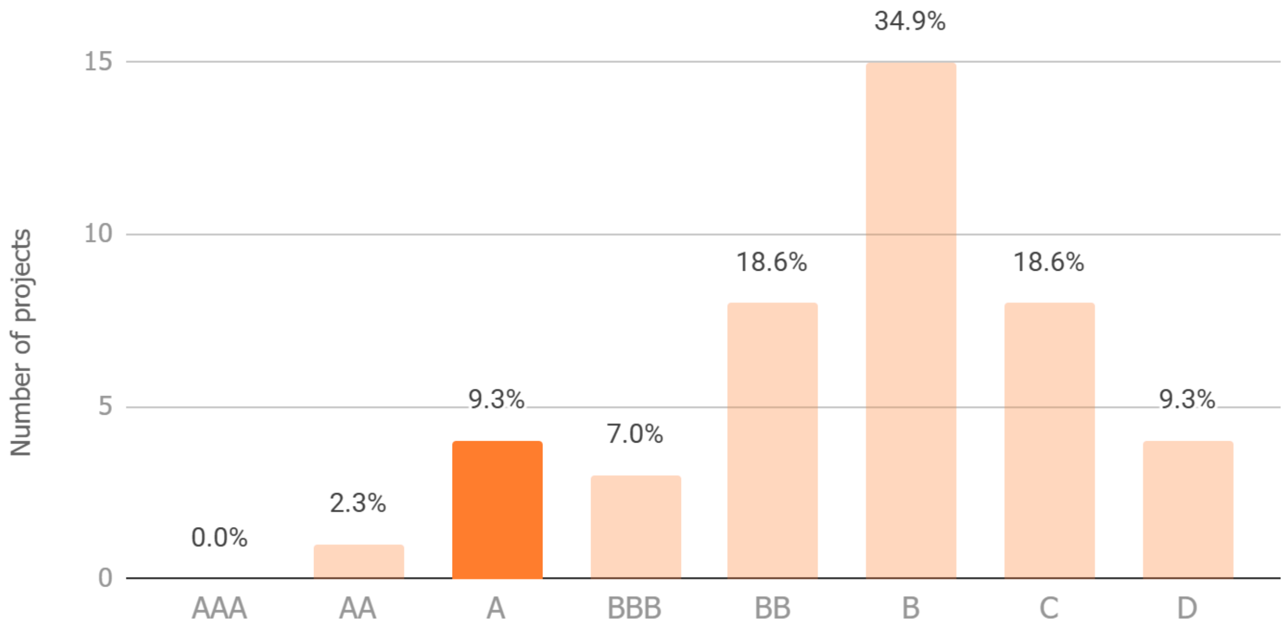

Figure 2. Distribution of ex post ratings for global IFM projects. (% = proportion of projects assigned to each rating within the analysed cohort).

Risk factor summaries

Table 3. BeZero Carbon ex ante risk factor summary for ICR304, as of *April 2026.*

RISK FACTOR[1]	
Additionality: a	
++	Project activities deviate from the common practices of the southeastern USA.
++	Market trends support the project's additionality.
+	No risk from policy or financial analysis.
-	Some risk from adverse selection.
-	Some risk from evidence of clear-cut harvests during the project period.
Carbon accounting: a	
++	Stands below commercially viable tree diameter were excluded from the crediting calculation.
+	A true up will correct potential growth variations from ex ante projections.
-	Project accounts for harvesting delay, though uncertainty around landowners' intention remains.
-	Market leakage is not fully mitigated.
-	Including unmeasured carbon pools introduces some small uncertainty.
Permanence: aa	
+	Tonne-year approach ensures low reversal risk.
+	Retrospective issuance.
=	The absence of a buffer pool is acceptable under tonne-year accounting.
Project execution risk: Low	
++	Project is through the majority of the deferral period.
+	Low operational and technical risk.
=	Low risk from natural hazards.
=	Low risk from pests and disease.
=	Early-stage company with limited experience in delivering carbon projects.

[1] ++ = Major positive, + = Minor positive, = = Neutral, - = Minor negative, -- = Major negative

Structured risk feedback

The table below outlines steps the project could take to mitigate risks identified in our analysis. It includes the feasibility of executing these strategies and their potential impact – if successful – on the project's credit issuance and our rating of the project.

Table 4. Structured risk feedback.

RATING IMPACT[2]	COMPONENT	MITIGATION STRATEGY	FEASIBILITY[3]	ISSUANCE REDUCTION
Ex ante rating: Current: A.pre → Potential: AA.pre				
Additionality: Current: a → Potential: aa				
+	Common practice *Voluntary landowner enrolment creates exposure to adverse selection risk*	Restrict enrolment to lands with demonstrable harvest intent, regardless of past activity, ideally with support from harvest activity schedules in forest management plans	Low	0%
Carbon accounting: Current: a → Potential: aa				
+	Market Leakage *Regional market conditions and literature suggest higher market leakage risk*	Apply a more conservative market leakage deduction given uncertain evidence	Moderate	5-20%
+	Baseline scenario *Small landowners' harvest decisions are inherently unpredictable*	Provide evidence of counterfactual harvest schedules, such as pre-project forest management plans	Low	0%
+	GHG conversion *Inclusion of unmeasured carbon pools introduces additional accounting uncertainty*	Credit only above- and belowground live and dead biomass, or measure additional pools such as wood debris, forest floor carbon, shrubs, and herbs	High	0-5%
Permanence: Current: aa → Potential: aa				
=	No amendable risks			0%

[2] Mitigation strategies are ranked in order of their potential impact on the risk factor and therefore rating. +++ = Potential to boost risk factor score by three or more notches, ++ = Potential to boost risk factor score by up to two notches, + = Potential to boost risk factor score by one notch, = = Minor impact.

[3] **Feasibility:** The ease of implementing the respective mitigation strategy considering: time, cost, complexity and effort required. High = Very feasible

Analysis

Additionality: ‘ a ’

ICR304 has a high likelihood of additionality. We find a high likelihood of additionality for ICR304. The project’s five-year harvest deferral represents a departure from common practice in the Southeastern USA over the enrolled lands. ICR304’s voluntary, owner-led enrolment model introduces some risk of adverse selection, as landowners who are less likely to harvest may be overrepresented relative to the regional average. There is some risk to additionality from project effectiveness, due to evidence of clear-cuts within the project area. Access to sawtimber markets is strong, and financial analysis shows carbon revenue is potentially necessary to maintain landowner participation, supporting the case for additionality across most of the project area.

Activity analysis

Common practice

Project activities have a high likelihood of additionality due to the project’s departure from regional harvesting norms. Project Nimbus contains pine plantations and mixed hardwood-pine stands, predominantly loblolly pine; other species include red maple, yellow poplar, and various oak species. Project Nimbus is located within major commercial forestry areas in the Southeastern USA. The project’s core activity is a 5-year minimum avoidance of commercial harvest. Thinning treatments are permitted within the 5-year deferral period, but all final harvests are disallowed for a minimum of 5 years.

Forest ownership is predominantly categorised as privately owned across the project’s four states, with 80 to 88%[1] of the region held by a combination of corporate industrial owners and non-industrial private forest (NIPF) owners. The US National Woodland Owners Survey (NWOS), also confirms that NIPF dominate forest ownership in the Southeast, with fragmented ownership of small parcels. In North Carolina, 65% of timberland is NIPF owned, and in Virginia, the share is 70%[1]. All 6 landowners in Project Nimbus are categorised as NIPF owners.

Approximately 50% of the project is loblolly pine; on pine-dominated NIPF lands, clear-cutting and short rotations are common[1]. Common silvicultural approaches involve a 22- to 28-year rotation cycle with one thinning event occurring between 12 and 15 years. Extended rotation incorporating a second thinning is less prevalent due to increased operational costs and delayed economic returns associated with longer investment periods[2]. One study on loblolly pine rotation age economic comparisons in the southeastern US found that a 24-year rotation was more cost-effective than a 33-year rotation[3]. The NWOS found that whilst NIPFs often harvest on longer rotations for economic benefit, NIPFs also harvest opportunistically as a reflection of financial pressures[1]. The NWOS finds that general silvicultural practices on NIPFs are lower than on industrial ownership lands, with less than 20% of NIPF owners surveyed in the Southeast having a written management plan[1]. Therefore, the project extension of harvest by 5 years in mature stands is a deviation from common practice, as it negates opportunistic harvesting.

The project’s voluntary landowner enrolment process is vulnerable to adverse selection. This raises uncertainty that the project causes enrolled landowners to deviate from their common practice. While the project includes design safeguards to mitigate this, available evidence suggests that incentives to harvest were not uniformly strong across the enrolled project area, introducing uncertainty that lack of harvesting was solely driven by carbon finance.

Adverse selection is a primary concern for all forest carbon project types, and particularly in aggregated projects, given the quantity of independent landowners enrolled and the difficulty in conducting detailed financial analysis per enrollee [4–6]. Adverse selection occurs when expected harvesting behaviour depends on information known to the project participants at the time of enrollment but unknown to the project developer and therefore not accounted for in the baseline. Crucially, adverse selection occurs if the enrolled landowners are self-selected such that they are, as a group, less likely to harvest under a business-as-usual scenario than the at-large population of landowners of similar forests.

Two factors combine to result in adverse selection in voluntary carbon projects: (1) a voluntary element, whereby agents can choose whether or not to enrol in the project, and (2) asymmetric information, given that the agents know more about their own intent in managing their forestland than the project developer does [7]. A systemic adverse selection issue across the population of enrollees would present significant additionality risk.

Project Nimbus is a grouped project that permits the ongoing enrolment of new landowners. As such, the risk of adverse selection is not limited to initial participation but may persist or compound throughout future vintages. The project relies on a voluntary, owner-driven enrolment framework. This structure exposes it to adverse selection because landowners who were already unlikely to harvest under business-as-usual can self-select, while the baseline harvest model assumes average behaviour. The project, therefore, introduces safeguards to mitigate adverse selection. To participate in ICR304, a landowner must enrol all timberland they own, which limits both selective enrolment of nonadditional stands and activity-shifting leakage.

The project has potentially targeted landowners with a precedent and intent to harvest, when compared to those in a BeZero-identified control area, given the level of harvesting activity observed in the two areas (Figure 3). However, this recent harvest activity is highly variable, and it is not assured that recent harvesting rates would have been sustained under business-as-usual. Evidence of clear-cut harvesting within the project area before the project start date introduces some stand-level adverse selection risk, where landowners enrol all of their forested land as required, but after having harvested merchantable stands.

Our in-house dynamic baseline compares changes in canopy cover in the project area to those observed in statistically matched control pixels in the wider landscape that are under pressures similar to those of the project area but have no carbon project intervention (the control area). The control pixels are restricted to forested land with the same land designation as the project area. In this instance, control pixels exclude protected areas, conservation easements, state conservation lands and managed areas, and other carbon projects, and are limited to a 50-km radius.

Pre-project analysis indicates that the project area experienced some level of harvest activity, as evidenced by tree cover loss events (Figure 3) and declining carbon stock density. The control area displayed more stable carbon stocks and slightly lower harvest levels, suggesting the project area was historically managed more intensively than otherwise comparable non-project lands. While this supports the view that project landowners are engaged in harvesting, the pattern is episodic and could reflect opportunistic harvesting behaviour, making the counterfactual harvesting behaviour more difficult to infer. The observed decline in forest loss between 2022 and 2023 could suggest the early effectiveness of project activities. However, there is a risk that the elevated harvest levels in the four years prior to the project start date would have been followed by a period of limited harvest activity, even without the project.

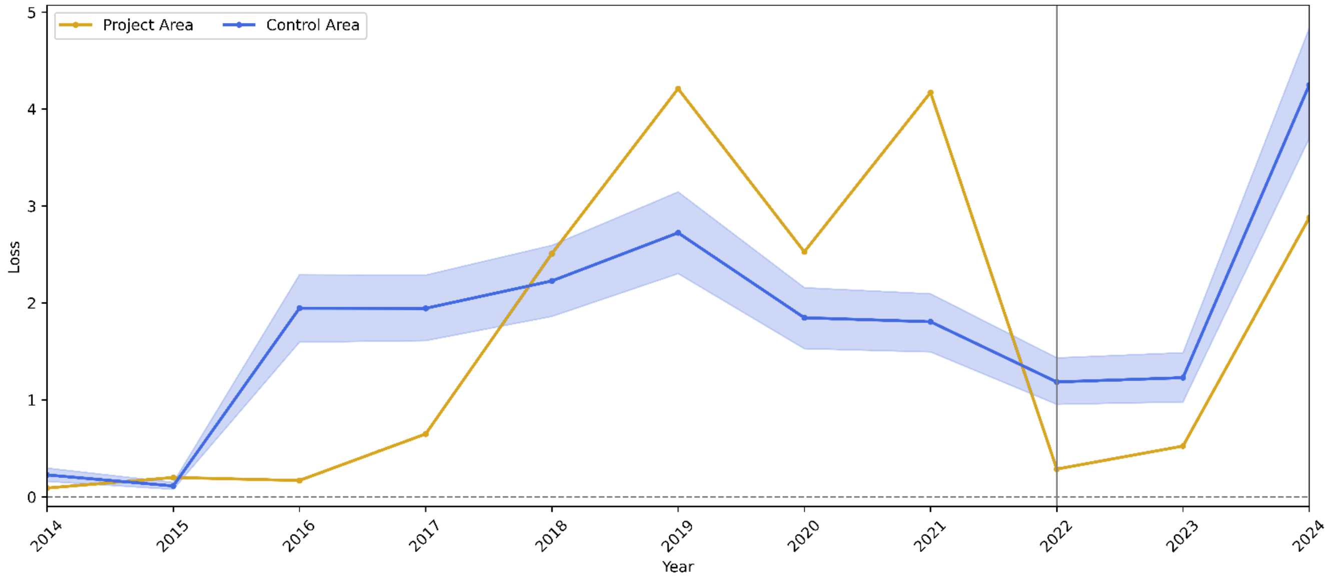

Figure 3. Annual forest loss rate (% pixels with > 10% canopy cover reduction) before and after the project start year, compared for the project area (yellow) versus BeZero's statistically matched control area (blue). BeZero's dynamic baseline monitors control pixels in the wider landscape that are under pressures similar to those of the project area but have no carbon project interventions. Loss events (including degradation/thinning) are defined as >10% reduction in canopy cover at the 0.09-hectare spatial resolution, derived using data from Planet Labs.

Alternatives to the proposed project

Sawmill infrastructure across the southern USA continues to expand, supporting scheduled harvests for sawtimber. The sector is operating below full utilisation and since 2016 U.S. mills have increased capacity by around 3.7 billion board feet per year. Near-future projections from USFS indicate modest growth with the south expected to remain the country's core timber production hub. Analysis of 13 southern states from 1999 to 2023 shows that although the number of mills declined, individual mill capacities increased [8]. Virginia and North Carolina have dense mill networks with access to over 100 mills within 150 km of the project area, while Mississippi and Louisiania also show reliable access despite fewer mills. Our analysis of the Forisk Mill database indicates that the total planned harvest under the baseline scenario is less than 4% of the regional mill capacity (within 150 miles of the project area). This is supported by price data in Virginia. Average pine sawtimber prices have remained relatively stable over the past decade, with modest long-term declines followed by a rebound in 2024–2025 (Figure 4). This stability indicates that even as supply capacity increased, market conditions continued to support harvest at commercial age. Therefore, access to mills is not a limiting factor. These conditions suggest no market or logistical barriers to harvest in the without-project scenario, which provides landowners with a continued economic incentive to harvest mature stands on schedule.

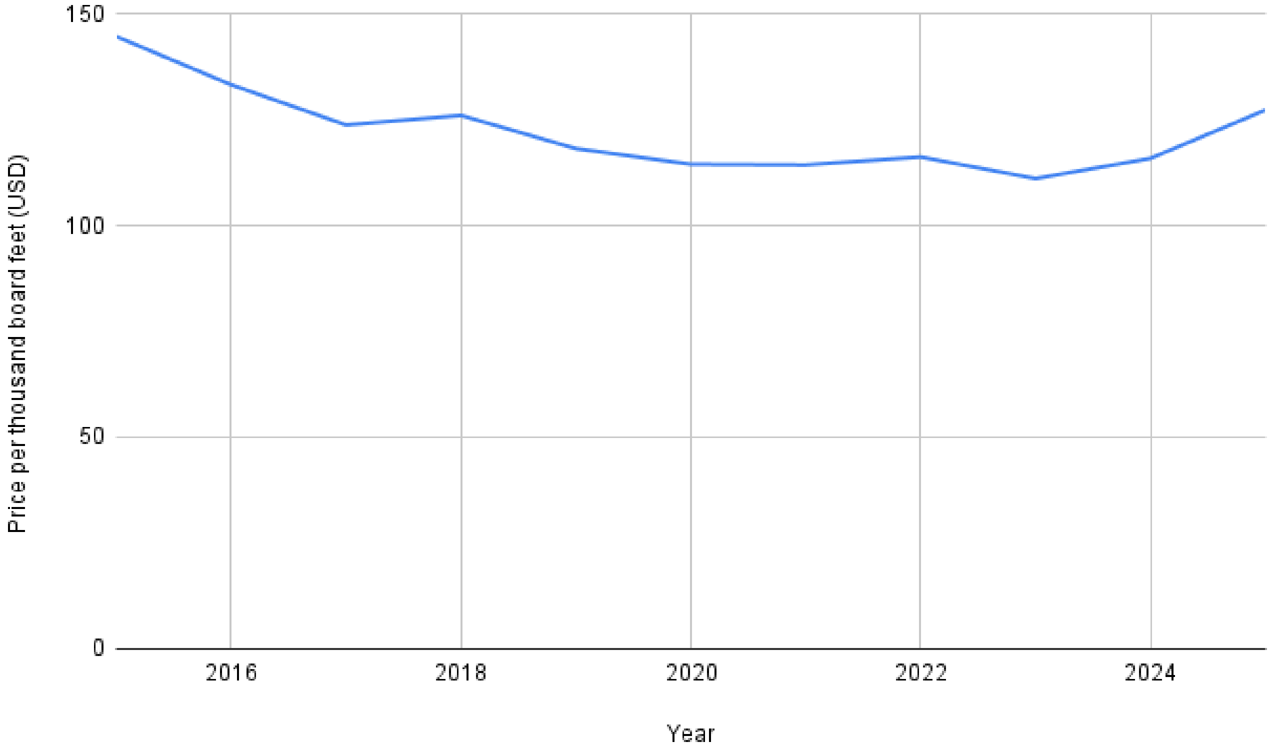

Figure 4. Average pine sawtimber prices in Virginia 2016 to 2025. Data from TimberMart-South.

Pulpwood markets are variable. Pine pulpwood stumpage averaged USD 7 t^{-1} in Q3 2023, 31 % below its 2022 peak after eight consecutive quarterly declines[9,10]. Since 2021, 24 mills have closed or reduced wood consumption across 13 southern states [8]. Peer-reviewed studies on southern pulpwood prices indicate that prices are driven mainly by pellet-mill proximity. The project's area contains stands predominantly for sawtimber as well as pulp or paper. Therefore, while weak pulpwood markets may dampen short-term harvest incentives for some products, this is unlikely to materially affect harvest behaviour in the project's context.

Project effectiveness

There is some low risk to the project's additionality from project effectiveness. This is due to evidence of clear-cut harvesting within the project area, introducing some uncertainty. Thinning is permitted under the project as a continuation of pre-project practices and, therefore, some low levels of harvest and loss are expected. Following the project start date in 2022, forest loss rates declined and remained below pre-project levels through 2024 (Figure 3). However, harvests in the project area have been variable, and the observed decline may involve a business-as-usual lull in harvesting rather than a causal outcome of the project.

Evidence of clear-cutting during the project deferral period introduces some risk for the project's effectiveness (Figure 5). Despite an initial decline in tree cover loss observed in 2022, there is a notable spike in loss in 2023-2024, in both the project and the surrounding area (Figure 3), with rates exceeding those in surrounding comparable areas. We find evidence of clear-cutting after the project's start date, totalling 190 hectares, equivalent to 3% of the total project area. Clear-cut events during the deferral window indicate that the project has not been fully effective in deferring harvests. However, the clear-cut area was identified through the project's tree cover inspection and enforcement mechanism and further supported by a manual inspection of the landowner's property conducted by a third party engaged by the project developer, and issuance from the relevant stands was subsequently cancelled, partially mitigating this risk. Nevertheless, crediting for unharvested stands in the presence of harvests on other stands introduces some risk of stand-level adverse selection within ownerships in spite of the requirement to enrol entire ownerships in the project.

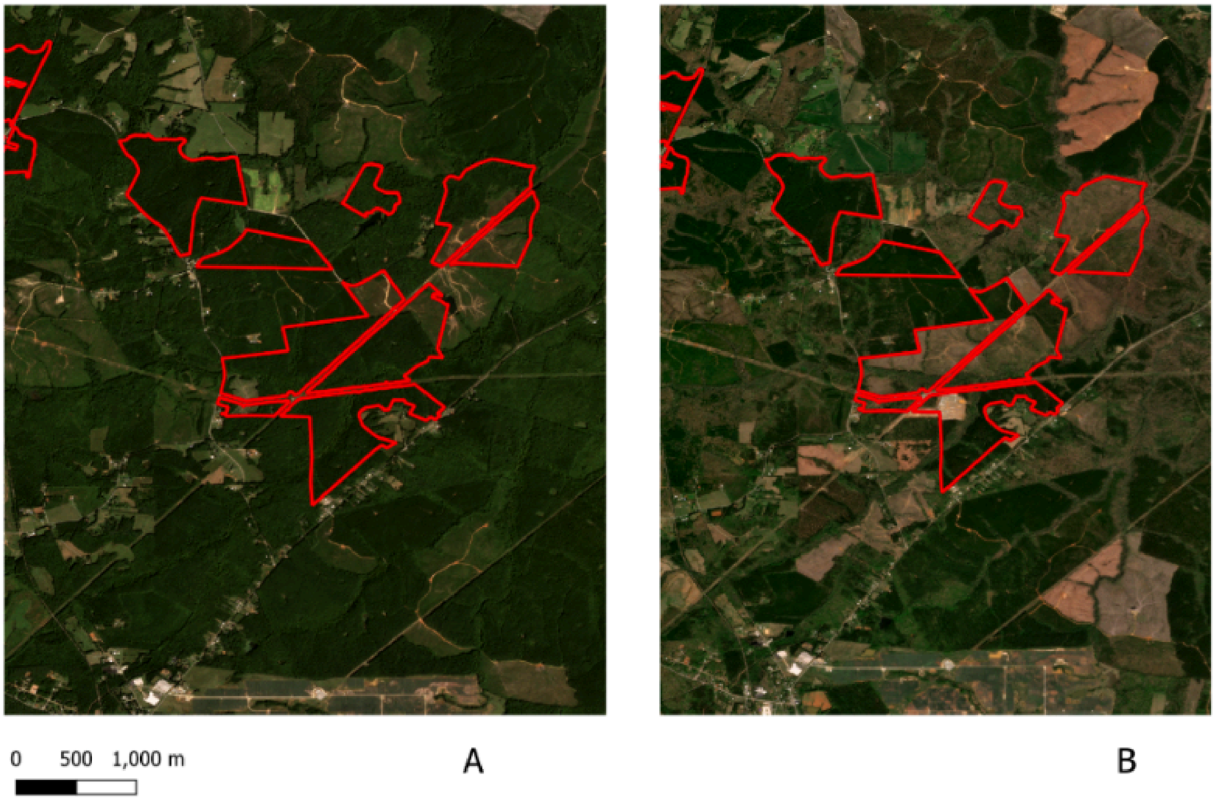

Figure 5. Satellite imagery from July 2022 (A), after the project start date, to July 2025 (B) (PlanetScope quarterly basemaps) showing an example of clear-cutting within the project boundary in Virginia.

Financial analysis

Prior consideration of carbon finance

ICR304's evidence shows that carbon finance was considered before the project's implementation, presenting a low risk to the project's additionality. Project design work to meet the standards bodies' requirements and outreach to landowners occurred before the project's official start date in June 2022. In addition, the project proponent, Sky Harvest, was created in 2022 to develop carbon offsetting projects.

Investment analysis

The project requires carbon finance to sustain landowner participation and compensation. By enrolling and deferring timber harvest, landowners may face immediate financial needs, as well as opportunity costs from not harvesting and uncertainty in future timber prices. In such cases, carbon revenues are essential to overcome these barriers, providing the only incentive that makes deferral financially attractive for landowners.

However, there is a significant risk that landowners receive carbon revenues despite having no plans to harvest during the crediting period. To address this, the project conducts an economic analysis that compares the net present value (NPV) of harvesting under the baseline scenario with that of deferring harvest. Landowners are eligible to enrol in the project only when the NPV of deferral is negative, indicating that they would otherwise be financially better off harvesting. This approach somewhat limits the additionality risk, as landowners would have no other incentive than carbon revenues to defer timber harvest.

Implementation has been supported through a grant, yet this funding cannot be used for landowner compensation. A USD 4 million grant was awarded by the U.S. Forest Service in 2024, which has been used to cover much of the setup and early-stage costs. However, grant funds cannot be used to compensate landowners, meaning credit revenue is essential to fulfil contractual obligations and maintain enrolment. Overall, the project is well capitalised, but the need for carbon revenues to fund landowner payments creates carbon finance dependency and therefore does not introduce a high risk.

Legal and policy

Policy support

National and regional policy is not a main driver in the project's activities. Favourable policy support exists across all four participating states but presents a low risk to the project's additionality. Favorable property tax structures for forest land in multiple US states lowers property tax burdens and may alleviate pressure to manage forests for net present value on short rotation lengths, but do not necessarily incentivise or replace project activity[11].

North Carolina, Virginia, Louisiana, and Mississippi have all implemented policies to encourage riparian buffer conservation. Virginia is the only state that turns this into a direct monetary benefit; the Riparian Forest Buffer Tax Credit reimburses 25% of the foregone stumpage when the landowner leaves a streamside strip unharvested. Louisiana's Scenic Rivers Act is a regulatory act that bans commercial clear-cuts within 100 feet of every designated scenic river in the state. Mississippi's Scenic Streams Stewardship Programme and North Carolina's river-basin Riparian Buffer Rules rely on voluntary easements or watershed-specific buffer regulations that can restrict harvesting and bring tax benefits, but there is no harvest-dependent payout[12].

In Virginia and North Carolina, there are Forest Stewardship Programmes (FSP), a Forest Development Plan, and an Environmental Quality Incentives Programme. Participation in these programmes can lead to improved silvicultural practices and influence landowner management decisions, including harvesting behaviour, however, uptake has been limited and none of the project area is enrolled in these programmes[13].

Approximately 103 hectares (1.6% of the project area) fall under a U.S. Army Corps of Engineers easement, but we have no evidence to suggest that this easement restricts or prohibits the activities modeled in the project's baseline. A further 170 hectares (2.7%) are under a conservation easement, managed by Virginia Outdoor Foundation, which permits commercial forestry under best management practice[14].

Collectively, these policies may alleviate cash flow pressures and mandate certain management practices but do not generate positive revenue or restrict the baseline activities claimed by the project. Most of the project area remains ineligible for river or stream focused policies. Across the majority of the project area, the dominant incentive for project activities, delayed harvest, has not been driven by state policy.

Carbon accounting: ‘ a ’

ICR304 has a high likelihood of accurate carbon accounting. Modelling of long-term carbon dynamics on project properties appear broadly appropriate, and species-level carbon stocks are estimated using an established modelling framework. However, the primary source of uncertainty relates to assumptions around counterfactual landowner harvest schedules, alongside market leakage. Other factors, including local calibration of the FVS model, species selection and minor carbon pools pose only a very minor risk to the project’s carbon accounting.

Direct accounting

Baseline scenario

The project’s inclusion of approximately half of the stands in the baseline eligible for near-term harvest is appropriate. This is supported by project documentation and BeZero’s analysis of the 2024 forest inventory data, which found 47% of basal area below 10 inches DBH - near or below merchantability limits of 9 inches for softwood and 11 inches for hardwood[15]. This indicates that many of the stands were not commercially viable from 2022 to 2024. Project documents indicate that the project has appropriately excluded such stands from its crediting calculations.

The project applies a harvest delay deduction to reduce baseline risk, although uncertainty remains regarding how accurately this captures real-world harvest behaviour. Recognising operational constraints such as contractor availability, scheduling, and tree marking, which mean that harvest cannot occur instantaneously[16], the project implements a stand-based deduction factor ranging from 5% to 40%, with an average harvest delay factor of 13.8%.

The project developer provides evidence of historical harvesting behaviour across approximately 90% of the project area prior to project commencement, supporting that landowners are indeed engaged in forest management and commercial forestry activity. The largest landowners operate as businesses intended to generate timber revenue, with up to 49 employees. In fact, the largest landowner, accounting for 84% of the credits, is a commercially active and ongoing logging company, a full-scale commercial enterprise that has operated for more than 40 years. However, the available documentation does not demonstrate a clear intent to harvest on the schedules assumed in the baseline, such as a harvest schedule for the next five years or time-bound forest management prescriptions. This introduces material uncertainty in the assumed harvest deferral timeframe. Under the project’s tonne-year accounting framework, even small errors in assumed counterfactual harvest timing can have large consequences for the total atmospheric impact delivered by the project. For example, if an assumed 5-year harvest deferral is actually a 4-year harvest deferral, then roughly 20% of the claimed impact would be illusory.

In light of this issue, the project does not uniformly assume that all deferrals are fully five years long. The deduction applied to each stand is determined by the percentage change in NPV between the project and baseline scenarios. This percentage change in NPV is used as a proxy for the strength of the landowner’s incentive to harvest. A larger positive NPV change indicates a stronger financial incentive to harvest in the near term, implying a shorter expected delay and therefore a lower deduction. Conversely, a smaller NPV change suggests weaker harvest pressure, a longer expected delay, and a higher deduction. Under this framework, a low NPV uplift of 0–4% corresponds to an expected delay of approximately 24 months and results in a 40% deduction, whereas a high NPV uplift of 20% or more corresponds to an expected delay of around 3 months and results in a 5% deduction. It is important to note that there is a real possibility that the assumed harvest delays are conservative; however, this remains uncertain and is not supported by forward-looking harvest plans or time-bound management commitments.

This approach assumes that landowners in the Southern United States adjust harvest timing in response to relative current versus expected future timber values, with stronger economic incentives associated with quicker harvest decisions and weaker incentives associated with longer delays. While economic theory and empirical evidence suggest that financial incentives influence willingness to harvest versus delay, small landowner behaviour does not always follow a purely price-driven logic, and may be driven by loss avoidance rather than profit maximisation[17]. In particular, harvesting by smaller landowners is often opportunistic or driven by unpredictable exogenous factors[1,18–20] such as divorce, retirement, and major unanticipated expenses like medical bills. Accordingly, the assumed relationship between NPV uplift and delay length may not consistently reflect realised harvest timing. Furthermore, the applied threshold bands are judgment-based and may not accurately reflect heterogeneous and unknown landowner behaviour in practice, reinforcing the residual uncertainty inherent in the applied deduction.

Small, non-industrial private forest (NIPF) landowners typically delay harvest beyond biological or financial maturity, reflecting non-timber preferences and long-term utility considerations. Foundational forestry literature shows that harvest decisions are not driven solely by timber value. Hartman (1976) demonstrates that when landowners derive amenity value from standing timber, such as recreation or aesthetics, optimal harvest age extends beyond the point of maximum timber value[21]. Binkley (1981) further quantifies this effect, finding that higher-income landowners may delay harvests by 10 to 20 years as forests provide ongoing non-timber benefits[22]. This body of research indicates that NIPF landowners manage forests as long-term assets rather than optimising for immediate financial returns.

More recent research finds that harvest delays persist due to behavioural and market-based decision-making. Silver et al. (2015) show that landowners often delay harvest decisions until favourable market conditions are met, even when stands have reached biological maturity[23]. Susaeta and Gong (2019) report an adaptive strategy where landowners are more likely to harvest when market prices meet an age-dependent reservation price, which is the specific hurdle point where an owner becomes indifferent between immediate liquidation and waiting for future price improvements[24]. The Mississippi State University Extension (2024)[25] formalises this behaviour, noting that landowners operate within a flexible harvest window driven by timber prices rather than a fixed date. Delayed harvest remains financially rational while the marginal net benefit of additional growth exceeds the opportunity cost of postponing the next rotation.

Recent market conditions in Virginia and Eastern North Carolina reduce the likelihood of opportunistic harvests. Following a post-COVID peak in late 2021 and early 2022, when Eastern NC pine sawtimber reached approximately $255/MBF, prices have declined or remained stagnant. As of early 2026, pine sawtimber prices in the South are approximately 10% below 2022 levels, while pulpwood prices have declined by up to 46%. For landowners whose forests reached economic maturity around 2022, these prevailing market conditions provide limited financial incentive to harvest, as no subsequent price increase has occurred in either sawtimber or pulp markets. This is particularly evident in Virginia, where stumpage prices have stabilised at approximately $115–$120/MBF, remaining below levels that typically trigger harvest decisions, and this is also true for Eastern NC.

Historical price dynamics suggest that extended harvest delays are structurally embedded in these markets. Significant price increases in Eastern NC and Virginia have occurred approximately every 10 to 12 years, with recent examples in 2010 and 2019-2021 (ignoring COVID) for NC, or 2015 and 2025 for VA, although VA prices have generally stagnated. Given the most recent peak in 2022 for NC, and lack of a real price improvement in VA, the likelihood of another price-driven harvest window within the next five years is limited. Combined with evidence that landowners delay harvest by potentially more than 10 years after economic maturity, this suggests that stands reaching maturity in 2022 may not be harvested until well beyond a five-year delay. This introduces a structural timing uncertainty for harvest scheduling for NIPF landowners, which constitutes a material risk to carbon accounting that is remains unaddressed with the assumption of a two-year harvest delay.

Project scenario

The project uses 100-year FVS simulations to model project and baseline carbon stock changes at the stand level. Annual stock differences are converted into present value using an equivalence ratio (33.84) and discount curve (3%). FVS simulations are run using inventory data to calibrate the projected removals and modelled growth.

Credits will be issued retrospectively, following monitoring periods that can range from 1 to 10 years. Each issuance is based on the observed change in carbon stocks between the start and end of the relevant monitoring period. Multiple monitoring periods may fall within a single crediting period. This retrospective approach may delay issuance and can make issuance timings unclear, but it can also improve the accuracy of accounting by relying on actual measured outcomes rather than projections.

Thinning is permitted during the project period, subject to a maximum of 25% of live biomass over a 10-year period, and has been disclosed by the project developers. Clearcutting is prohibited while parcels are enrolled, but may occur once contracts lapse. If material tree cover loss is detected by the project through monitoring, the landowner faces a financial penalty, and no credits are issued from the harvested timber.

Our geospatial analysis identifies patterns consistent with clear-cutting across approximately 3% of the project area (Figure 4). This activity is not clearly documented and is inconsistent with the project scenario. Unreported harvests during the deferral period introduce uncertainty and a risk to the accuracy of carbon accounting, and suggest risk around whether the project is effective at preventing harvest when landowner incentives are aligned with harvest. It is important to note that the project developer conducted a comprehensive tree cover inspection, which correctly identified harvesting activity linked to a pre-existing solar option agreement on enrolled land, and that the project design accounts for this risk in its probability of harvest calculations, incorporating parcel proximity to transmission infrastructure. All affected stands were excluded from credit issuance.

GHG conversions

Carbon stocks are calculated for each species using the FVS Southern (SN) variant, but forecasts lack a local calibration, introducing some uncertainty to carbon stocks. However, this risk is mitigated by a required true-up based on updated inventory data within a maximum 10-year period. The project uses the standard IPCC carbon to CO_2 conversion factor (3.667), consistent with 2006 IPCC guidance. Literature identifies that FVS outputs can be reliable but depend on the accuracy of inventory data, and confirmation that the model is suitable for local conditions, or that it has been calibrated with local growth data[26,27]. Both loblolly pine and yellow poplar were common species in the data used to originally parameterise the FVS southern variant, but it is not clear whether any regional changes in growth rate over the last several decades would necessitate a more localised calibration[28]. In a recent study of the FVS-SN, simulations with local calibration reduced bias in diameter growth by up to 0.4 cm over a 5- to 7-year simulation compared to uncalibrated tests or those with a non-local calibration[29]. However, the project does not apply local calibration, such as adjusting FVS-SN growth predictions using observed growth from remeasured trees on the same plot before applying the model to other trees in the plot, which introduces some uncertainty to carbon stock projections. According to information provided by the project developer, this required 10-year reassessment uses observed forest growth to reconcile modelled outputs, with any overestimation adjusted through issuance corrections, thereby largely mitigating this uncertainty on ex-ante estimates.

Long-term carbon dynamics on project properties are likely appropriate, with a low level of carbon accounting risk. The project's accounting relies on assumptions about carbon cycling after the end of the deferral period in both the baseline and project scenarios. Project Nimbus uses the USDA's FVS to simulate both post-harvest growth and harvested wood product decay (the latter through the Fire and Fuels Extension of the FVS), with a stand-level custom forest inventory as input. We find that the decay of HWP is likely accurate, and the post-harvest growth estimates appear reasonable. Going beyond the requirements set out in the methodology, the project models biomass recovery rates using input data from a stand-level inventory, site index values for each stand, and the appropriate combination of model variant and location. Softwood- and hardwood-dominated stands were modelled with distinct regeneration. Regeneration in softwood stands consisted of approximately two-thirds loblolly pine and one-third red maple, with the inverse for hardwood stands. This choice of regeneration may be suitable for some stands with a pre-harvest species distribution that would initiate the new cohort in this way, but may be inappropriate for other stands, e.g. those dominated by red maple, or with a different distribution of red maple and loblolly pine. However, analysis provided by the project developer suggests a likelihood of conservative bias in growth estimates, as the selected species generally exhibit lower growth rates than other softwood and hardwood species present in the project area, which partially mitigates this risk, though uncertainty still remains. The regeneration assumption introduces a low amount of carbon accounting risk. The model assumes an average rotation age of 30 years for softwood species and 60 years for hardwood species, with intermediate thinning applied in some stands as appropriate. As a result, the project-level recovery period averages 47 years, meaning that pre-harvest standing volume is regenerated, on average, after 47 years. This is broadly consistent with regional averages in the southeastern USA, though some residual uncertainty remains, as there is a large variation at the stand level.Although the project uses unrealistically low establishment densities, the correction of model predictions by inventory after 10 years should mitigate the resulting projection inaccuracy. Overall, this supports the view that post-harvest carbon accumulation in the baseline is likely appropriate, and that second-rotation growth is modelled in a manner that reasonably captures forest recovery dynamics over the long term.

The project estimates carbon using the FVS Fire and Fuels Extension (FFE), a standard approach that introduces a minor level of carbon accounting risk. Recent updates from the USFS FIA programme (2024) suggest that carbon stocks may be underestimated nationally by up to 15%, primarily due to higher estimates of carbon stored in branches[30]. This does not materially affect the project's credited emissions reductions, because credits are issued based on the difference between the baseline and project scenarios. As such, using the FFE default equations may either have a negligible impact on crediting, or may be modestly conservative. Harvested wood products have also been appropriately accounted for by the FFE and do not introduce additional risk. However, including unmeasured pools introduces only minor residual uncertainty. The project includes aboveground biomass, belowground biomass, harvested wood products, standing dead wood, forest floor litter and debris, and forest shrubs and herbs in its carbon accounting pools. The accuracy of the minor carbon pools for the project stands is untested because the project's custom inventory only measures trees, so there is some limited risk of misestimation for these additional pools. However, these pools represent a relatively small share of total carbon stocks, which further limits their impact on overall carbon estimates. There is some indication that the downed woody debris pool can be marginally underpredicted by some variants[31]. Soil organic carbon (SOC) is excluded. This exclusion is generally conservative, since SOC is unlikely to change significantly under a removals-based IFM scenario.

Project Nimbus employs a field-based inventory protocol consistent with standard forestry practices in the USA, which therefore does not introduce high risk. The project is stratified by stand and determines sample size dynamically to achieve a 10% margin of error. Sampling protocols are based on fixed-radius 0.04-hectare plots, with tree diameter measured at breast height and plot coordinates recorded using sub-metre GNSS. Tree heights are measured with a laser hypsometer, and site productivity is estimated by consulting foresters. The estimate of timber volume is determined with a maximum sampling error of 0.51% at the 90% confidence level. The DBH measurement procedures and the handling of non-standard tree forms follow the U.S. Forest Service's Forest Inventory and Analysis (FIA) Field Guide, a nationally recognised standard for consistent forest measurement and data collection.

Leakage accounting

Activity displacement

Project Nimbus assumes no activity shifting. This does not introduce any significant risk to the project's carbon accounting. The project requires landowners to submit all of their land to the project area. Forest areas excluded from the project were screened out by the proponent as non-additional and are therefore unlikely to be harvested. Therefore, we find the project is unlikely to cause activity displacement and consider activity displacement a low risk.

Market leakage

ICR304 applies an average leakage deduction of 30.4%; however, the underlying leakage dynamics associated with short-term harvest deferrals remain uncertain and are not well characterized in the literature. The project goes beyond methodological requirements by applying a stand-based approach, under which the leakage deduction factor ranges from 5% to 80% across individual stands, resulting in an average leakage deduction of 30.4% across all project instances. These deduction factors are derived from the share of a county's total merchantable biomass located on project lands, with higher shares indicating that a greater proportion of harvestable biomass is contained within the project boundary and, therefore, a lower assumed likelihood of leakage. Under this framework, leakage deductions decline as the share of merchantable biomass attributable to the project increases, ranging from 80% when 0–9% of county biomass is removable to 5% when 80–100% is removable, with intermediate stepped deductions. By imposing high deductions where timber supply is abundant, the project reduces leakage risk.

However, the best available science remains insufficient to precisely characterize leakage dynamics from IFM projects in general, and this limitation is particularly relevant for the 5-year harvest deferral implemented in Project Nimbus. The project's county-level approach reflects the assumption that timber price dynamics are predominantly local, rather than national or global, due to localised supply-and-demand interactions between forest owners and nearby mills, transportation and logistical constraints, species-specific characteristics, and local regulatory conditions that shape harvest operations and economics. However, market leakage may extend beyond the county level, with displacement to other counties, states, or potentially transnational markets[32,33]. Typical haul distances for roundwood exceed the typical scale of counties in the southeastern United States.

The available literature on leakage in IFM does not focus on projects with terms as short as five years. As such, commonly cited benchmark leakage rates may not be directly applicable to Project Nimbus, given its short term deferral period. However, given the possibility for renewals and new geographically proximate sign-ups under the project, we still find some relevancy in the literature focusing on longer-term extended rotation projects. While some research suggests leakage rates of approximately 20% for removals-only projects[34], more recent peer-reviewed research estimates substantially higher rates, approximately 59% for temperate natural forests and 38% for temperate plantations[35], which are materially higher than the leakage deduction applied by the project. While these estimates are likely to decline over long time horizons, as forests and forest managers adapt to harvest deferrals and market shocks, evidence suggests that leakage is materially higher in the initial years following harvest deferral. Other literature examining leakage from USA timber harvesting indicates probable leakage rates of up to 80%[32], particularly where project activities result in long-term reductions in harvest volumes, which may not apply in Project Nimbus depending on patterns of re-enrollment. In addition, a global modelling study finds that highly productive and valuable timber regions, such as the southeastern US, tend to experience higher levels of leakage [35], but again the applicability to Project Nimbus is uncertain, both because of the short-term nature of the contract and because of the fine-grained spatial approach taken in figuring the project's leakage deduction. One study found that leakage rates from US forest offset programmes could range from 75% to 78% of reduced supply when both domestic and global leakage are accounted for in the generalised equilibrium model[33], but yet again the relevance of these findings to Project Nimbus remains uncertain.

Southern pines dominate the project area, in particular loblolly pine; other notable species include red maple and yellow poplar. These primary merchantable species are widespread across the southeastern USA, and red maple is the most common species nationally[36]. The wood products resulting from the baseline scenario include two-thirds softwood lumber and one-third hardwood lumber. The species in the project area are widespread, which may increase the possibility of leakage at scales larger than one county.

Permanence: ‘ aa ’

Credits issued by ICR304 have a very high likelihood of permanence. We find a very high likelihood of permanence for Project Nimbus. The project issues credits retrospectively based on observed sequestration and applies a tonne-year accounting approach, using a 34:1 ratio to quantify temporary storage. While the project does not explicitly define a commitment period in physical terms that enable apples-to-apples comparisons with most other carbon projects, BeZero’s analysis finds this ratio yields physical equivalency of cumulative radiative forcing over approximately 28 years. This structure eliminates technical reversal risk post-issuance. However, there exists uncertainty around how accurately the tonne-year approach reflects physical equivalency, particularly given the current evidence base and the difficulty in validating long-term carbon dynamics in tonne-year projects.

Technical risks

Carbon stock integrity

Minimal technical risk of reversal. Project Nimbus uses a version of tonne-year accounting to establish an equivalency claim between temporary carbon storage and emission offsetting. Because credits are issued only after the temporary carbon storage is achieved, there is no technical risk of reversal after issuance. Any risk of undetected reversal prior to issuance is here treated as a carbon accounting risk, as it would reflect a problem with pre-issuance monitoring issuance. Therefore, standard permanence risks such as fire, drought, etc, do not apply to Project Nimbus (they could potentially pose delivery risks, or carbon accounting risks if inadequately monitored, but not permanence risk).

Forward crediting structure

Tonne-year accounting decisions yield a 28-year commitment period in terms of physical equivalency. To support offsetting claims, Project Nimbus assumes economic discounting at a rate of 3% annually to claim equivalence between the economic or social impact of short-term carbon storage and non-temporary carbon emissions over very long time horizons (one million years) at a ratio of 34 tonne-years to offset one tonne. BeZero does not take a view on the validity of this economic claim. We do note that elsewhere in the market (for example, when converting methane emissions to carbon dioxide equivalent), it is standard to focus on equivalency of undiscounted cumulative radiative forcing. Applying this logic to Project Nimbus, we find that the selected ratio of 34:1 yields physical equivalency of cumulative radiative forcing over a commitment period of roughly 28 years. Therefore, following a standard of physical equivalency, we view the commitment period of Project Nimbus to be 28 years. Both the tonne-year benefit and a claim of physical equivalency over a 28-year time horizon depend on how forests re-grow on the project properties after harvest, and how carbon cycles through harvested wood product pools.

Risk mitigation instruments

Risk buffer and mitigation

Project Nimbus does not contribute credits to a buffer pool for permanence, which we view as generally acceptable for ex post tonne-year projects. However, this approach does not provide a mechanism to mitigate credits if future monitoring or advances in science determine that forest regeneration following project activities is faster than anticipated in the project's FVS modelling. In addition, the project applies a 1.57% deduction at issuance to address permanence risk.

Project execution risk: ' Low '

ICR304 presents a ' Low ' risk of failing to be fully implemented and reach operational stabilisation. Project Nimbus faces low execution risk across the current rated vintage. This is partly driven by the majority of the project already having successfully carried out project activities for 3 of the 5 years of the committed deferral. Additionally, due to the nature of the project activities, the project has low technical risk, low operational risk, and low financial risk.

Table 5. Structured risk feedback for Project execution risk.

RISK IMPACT [4]	COMPONENT	MITIGATION STRATEGY	FEASIBILITY[5]
Project execution risk: Current: **Low** → Potential: **Very low**			
+	Natural hazard risk *Low fire and pest risk, but moderate cyclone and drought exposure, introducing some project execution risk.*	Incorporate ongoing natural hazard risk monitoring and mitigation strategies	High

Technical risk

The project presents low technical risk, although the issuance timeline remains unclear. The project involves low-complexity activities centred on delayed timber harvesting, with no major land use change. Situated on commercially managed forestry land in the USA, project activities started in 2022, and there is evidence that project activities have been carried out successfully thus far. Credits are issued retrospectively, following monitoring periods that can range from 1 to 5 years. Each issuance is based on the observed change in carbon stocks between the start and end of the relevant monitoring period. Multiple monitoring periods may fall within a single crediting period. However, the timeline of issuance is unclear.

Legal and regulatory risk

Legal and regulatory risk is assessed as low. The land is privately owned by six landowners, with carbon rights contractually assigned to Sky Harvest. The USA presents a low jurisdictional risk for forest carbon projects. Project documentation briefly acknowledges that potential policy changes could affect the project, though no mitigation strategy is outlined. Since the project is already three years into the deferral period, this risk is limited. However, the proposed shift to a developer-led approach, subject to review by an ICR-approved validator, may introduce uncertainty around future crediting.

[4] Mitigation strategies are ranked in order of their potential impact on the risk factor. +++ = Potential to boost risk factor score by three or more notches, ++ = Potential to boost risk factor score by up to two notches, + = Potential to boost risk factor score by one notch, = = Minor impact.

[5] **Feasibility:** The ease of implementing the respective mitigation strategy considering: time, cost, complexity and effort required. High = Very feasible

Financial risk

Financial risk is generally low, though dependence on credit sales remains important. To date, the project has incurred approximately USD 1 million in upfront and development costs over its first two years of implementation, with a further USD 168,000 expected for the 2025 vintage. Once the initial issuance is completed, annual recurring costs are projected to average around USD 300,000.

To support implementation until carbon revenues are sufficient to cover operating expenses, the project has secured funding from a range of sources. The largest contribution is a USD 4 million grant awarded by the USA Forest Service in 2024, complemented by USD 600,000 in private capital and USD 250,000 in loans. Together, these funds substantially cover both the upfront investment and early recurring costs. However, the USA Forest Service grant cannot be used for landowner payments. As such, revenue from credit sales is essential to meet these obligations. Delays in credit issuance could increase the risk of landowner dissatisfaction, potentially undermining project execution.

The project's unit cost analysis states that credits must sell above USD 12.30 per tonne to break even. This is below recent IFM average market prices of USD 16 per tCO_2e in 2023. Market uncertainty is still a risk due to the project's planned transition to a proprietary methodology, which could impact credit acceptance and value.

Overall, financial risk appears relatively low. The project benefits from sufficient funding to support implementation, with the majority secured through a non-repayable grant. This reduces exposure to debt and eases pressure on future cash flows. Nonetheless, the project's successful execution still depends on the sale of carbon credits to ensure landowner commitment to the project.

Project proponent's past experience risk

The proponent's past experience risk is low, though the implementation track record is limited. Sky Harvest was founded in 2022 and does not have a track record of carbon project implementation. Project Nimbus is Sky Harvest's only carbon project. While its employees have some prior experience in land-based carbon sales in the region, execution at scale remains unproven. This does introduce some low-level risk to the project.

Operational risk

Operational risk is low, though exposure to natural disturbances remains. Once the project is set up, the operational footprint is limited, with monitoring focused on a combination of on-site inventory and remote sensing. The simplicity of activities and the low-cost monitoring framework limits the risk of project failure.

The project's tonne-year delivery depends on maintaining deferred harvests for the duration of the 5-year crediting period. Natural disturbance factors such as fire, cyclones, and drought present varying levels of execution risk that could undermine the project's ability to sustain aboveground carbon stocks during this deferral window. As the project is already three years into the deferral period, a significant portion of the tonne-year delivery window has already elapsed, largely mitigating the natural risks outlined below.

Natural risks

Fire

There is low risk to the project's carbon stocks of substantial fire activity between 2022 and 2027 based on current fire trends. Analysis of fire data between January 2001 and April 2024 detects burned area within the project boundaries in only one year, 2006, which affected 230 hectares, representing less than 4% of the project area (figure 6). Since 2012, active fire detections have peaked in 2017 (10 detections) and 2024 (7 detections), though no additional burned area was recorded. Within a 50 km buffer zone around the project area we observe an annual burned area in forests of 0.1%, translating into low risk from forest fires. Moreover, the risk of significant loss from fire is mitigated due to the project's wide geographic distribution and parcelisation, which limit the potential for spread. However, the project does not have formal fire mitigation strategies in place.

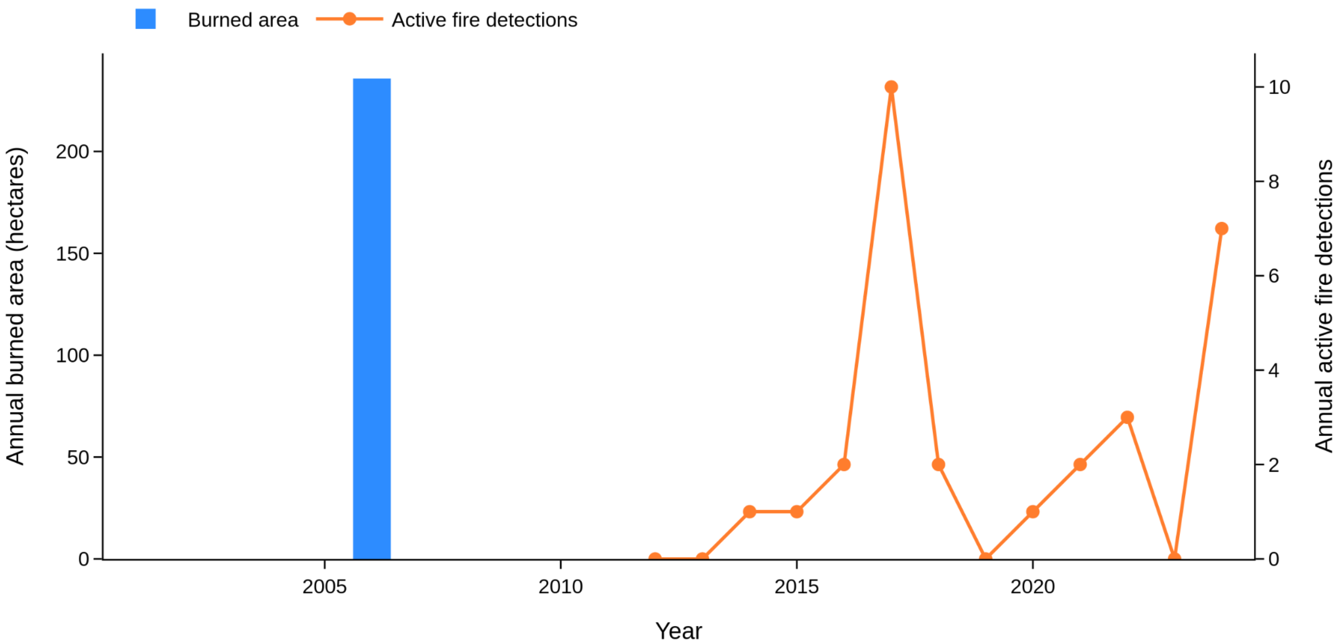

Figure 6. Burned area (bars) and active fire detections (lines) before and after the project start date. Burned area captures the spatial extent of burning, while active fire detections reflect the count of hot pixels at satellite overpass. Data from NASA (MODIS MCD64A1 and VIIRS VNP14IMG).

Extreme weather

The frequency of cyclone activity across the project area presents a moderate project execution risk to the project's carbon stocks. This risk is mitigated due to the project's parcelisation and geographic distribution, reducing the risk that a singular loss event will affect the entire project area. Historical cyclone data from the IBTrACS dataset indicate that the ICR304 project area has experienced frequent tropical cyclone activity. Between 2000 and 2023, more than 60 cyclonic events were recorded within a 50 km radius, including several tropical storms and Category 1–3 hurricanes. Notable examples include Hurricane Isabel (2003), Hurricane Charley (2004), and Hurricane Laura (2020), each of which brought high wind speeds near the project boundary. This frequency of tropical cyclone activity indicates an elevated risk of wind-related disturbance, which may undermine the permanence of aboveground carbon stocks.

Extreme weather events such as hurricanes affect all four of the project's states. Hurricane Katrina alone in 2005 downed an estimated 320 million trees across the southeast states, including

Louisiana and Mississippi[37]. Hurricane Isobel affected Virginia, causing canopy damage in hardwood plots in coastal Virginia[38]. The majority of the project area in Virginia is located along the border with North Carolina, not along the coastal plains, therefore posing a moderate risk to permanence.

Increasingly warmer sea-surface temperatures across the Atlantic increase the likelihood that hurricanes will reach Category 3 or above intensity before landfall in the southeastern USA. Projections show that a 2 degree C warmer climate would increase category 4-5 storms by an estimated 13%, therefore increasing the risk in the future[39].

Periods of moderate drought within the project area present a moderate project execution risk to project carbon stocks. According to the self-calibrating Palmer Drought Severity Index (scPDSI), drought conditions in ICR304 have intensified over the past two decades. The project area has experienced an increasing trend in drought, with a period of severe drought in 2008. The project area is also experiencing more prolonged drought, as well as an increase in intensity, experiencing a sustained drought cycle from 2020 to 2025 (figure 7). While mean annual precipitation has remained relatively stable at approximately 1120 mm, the mean annual temperature has risen from 14.7°C in the 1980s to 16.1°C (2020–2024).

Loblolly pine has shown reductions in growth under drought conditions, particularly in young plantations[40], and linked drought to decreased stem growth and increased mortality[41]. Shortleaf pine is also considered sensitive to drought during early stand development. Oaks tend to have intermediate drought tolerance; however, multi-year droughts can also limit radial growth[42]. Climate projections for the southeastern USA show continued warming trends with the potential for increased drought frequency and severity.

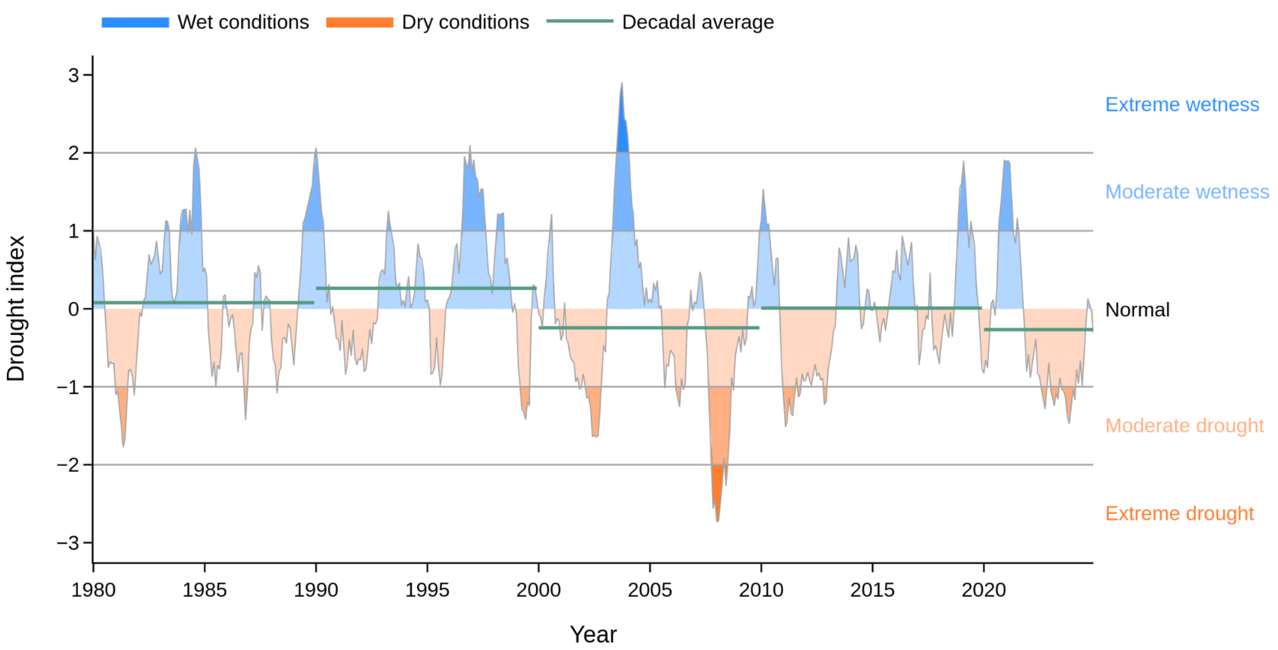

Figure 7. Drought conditions before and after the project start date. Calculated according to the self-calibrating Palmer Drought Severity Index (scPDSI), which measures the balance of precipitation and potential evapotranspiration, moderated by soil water holding capacity. Values are relative to typical climatic conditions for the project area, and therefore cannot be compared across projects. Constructed by BeZero using data sourced from ECMWF (ERA5-Land) and ISRIC (SoilGrids250m).

Pests and diseases

The project's carbon stocks face low risk to project execution risk from pests and diseases, with impacts varying by species and site. Loblolly pine (*Pinus taeda*), the project's dominant species, is exposed to the southern pine beetle (*Dendroctonus frontalis*)[43]. U.S. Forest Service models indicate that on average, 6.5% of the basal area in the project is at risk from southern pine beetle[44]. A reported outbreak in 2024 damaged 30,000 acres of loblolly pine across multiple states, including Mississippi[45]. Risk is largely mitigated through thinning and species diversity[46]. Engraver beetles and drought-driven sawfly outbreaks have caused regional damage in Mississippi and Virginia, increasing regional drought trends are likely to increase drought-driven outbreaks.

In hardwood stands, red oaks are periodically defoliated by the forest tent caterpillar (*Malacosoma disstria*). While mortality is rare, growth declines have been recorded during large outbreaks, especially during drought. American beech (*Fagus grandifolia*) is susceptible to beech bark disease, caused by *Cryptococcus fagisuga* scale and *Neonectria* fungi, leading to stand degradation in parts of Virginia.[47]

Overall, despite species and site specific pressures we find low risk to project execution from pests and disease. Some risk is mitigated from diversity of tree species and parcelisation of the project area. In addition, the limited size of the project area that may be affected by these pests and disease.

Reference documents

1. *BeZero Carbon ex ante Rating methodology*
2. *Project PDD*
3. *Monitoring report (01/06/2024 - 31/05/2025)*
4. *Carbon accounting spreadsheet*
5. *Evidence of Timber-Economics Land Management for project parcels*

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