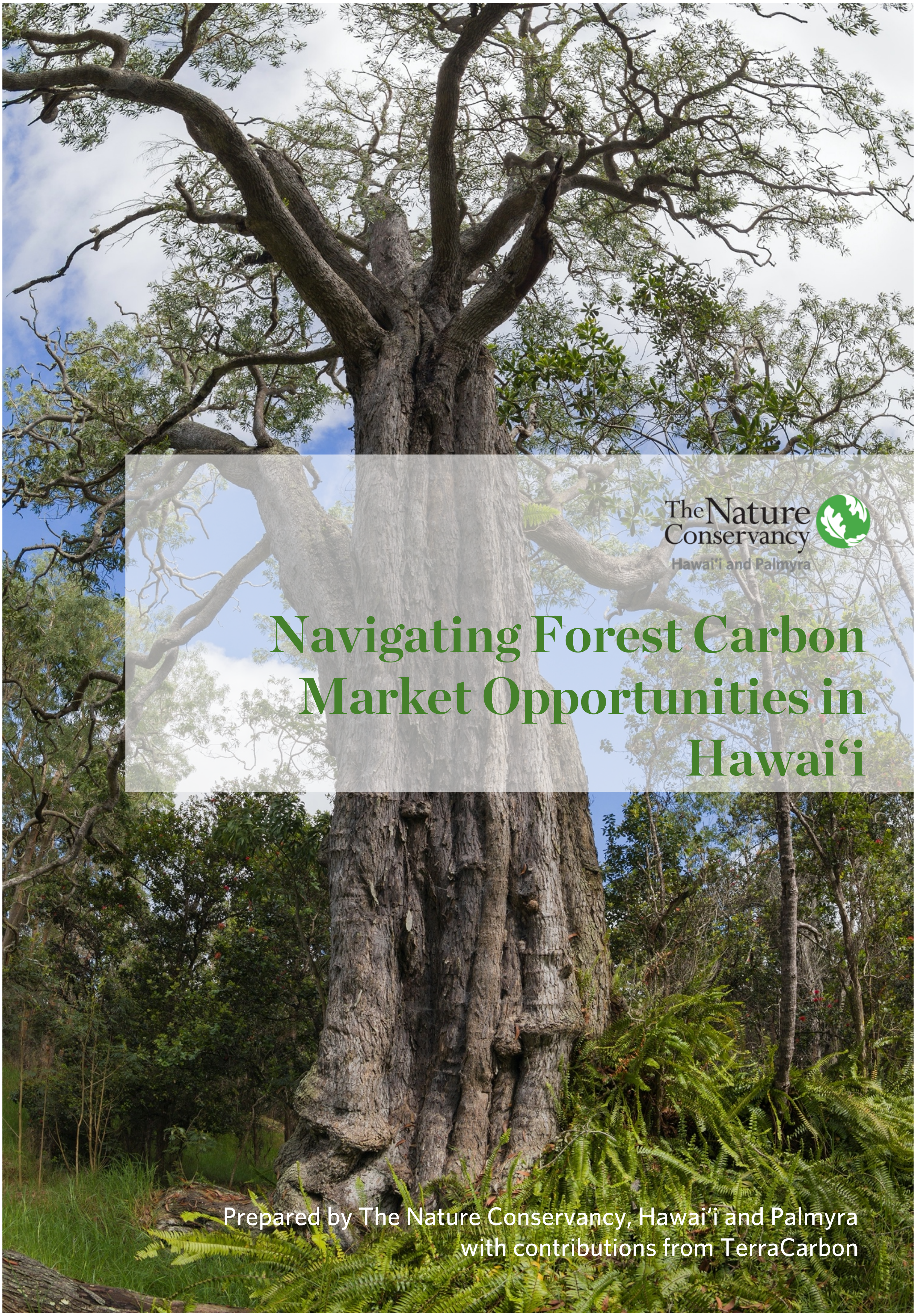

The Nature Conservancy
Hawaiʻi and Palmyra

Navigating Forest Carbon Market Opportunities in Hawaiʻi

Prepared by The Nature Conservancy, Hawaiʻi and Palmyra
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Cover photo: Alvis Upitis


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Executive Summary

The Nature Conservancy (Conservancy) strongly embraces a global goal of net zero greenhouse gas (GHG) emissions, and as an organization aims to help reduce emissions and increase sequestration by 3 billion metric tons of carbon dioxide per year by 2030. These ambitious goals require the continued pursuit of solutions that benefit biodiversity, sequester carbon, and reduce risks to people most vulnerable from a changing climate. Diverse perspectives, active debate, and collective efforts make carbon markets an ever-improving climate mitigation strategy.

Carbon markets provide financial incentives for landowners to modify harvesting practices or to restore degraded lands, so that the lands sequester increased carbon. As such, a primary factor for determining eligibility for participation in the markets is additionality, meaning a project activity or intervention will mitigate more GHG emissions than the business-as-usual scenario (i.e., baseline). Carbon projects can help meet emission reduction obligations.

Landowners in Hawaiʻi are not yet participating in carbon markets, but a statewide estimate of GHG reduction potential from Hawaiʻi's land sector highlights the opportunity forest carbon presents, and there is broad interest in understanding the potential of carbon markets as a sustainable and economically viable land use strategy in Hawaiʻi. To explore this potential, the Conservancy initiated the Kona Hema Carbon Project as a pilot to consider whether and how carbon offsets could be developed for Hawaiʻi through an Improved Forest Management (IFM) carbon project on the voluntary market. While an internal Conservancy assessment confirmed the Kona Hema pilot met the stringent requirements for participation in the carbon market and registry, the Conservancy determined not to continue the project due to its own institutional character and management history as a conservation organization. These factors are important considerations for potential carbon projects.

Our learnings from Kona Hema are shared in this report, along with case studies that explore potential IFM carbon projects under other public and private land owner and use scenarios. The report also highlights the potential for Afforestation/Reforestation/Revegetation (ARR) projects in Hawaiʻi and offers recommendations and next steps to advance a process through which protocols can be refined and local, national, and global markets can be urged to evolve, so that carbon credits become more viable for Hawaiʻi suppliers.

The statewide estimate of GHG reduction potential from Hawaiʻi's land sector highlights the importance of incorporating natural climate solutions such as carbon credits in state climate policy to accelerate Hawaiʻi's commitments to support the Paris Agreement and the US Climate Alliance, among other policies, such as the Sustainable Hawaiʻi Initiative.

The experience from the Kona Hema pilot project and other information shared in this report strengthens our collective understanding and efforts to leverage the power of carbon markets and other natural climate solutions to meet climate goals for Hawaiʻi and the planet. Scaling up these efforts—and getting them right—will be essential to reducing emissions in the near term and to funding the low-carbon future we need. The Conservancy is committed to achieving these goals.

Key Learnings and Findings

- There is a pressing need for more Hawaiʻi-specific guidance on best practices for koa forestry.
- There are a number of climate-related initiatives that provide the policy opportunities and enabling conditions to advance carbon markets and natural and working lands as a climate mitigation strategy in Hawaiʻi.
- Participation in carbon markets requires meeting and adhering to stringent qualifications, as well as significant financial investment.
- The potential for scaling IFM activities as a climate mitigation strategy in Hawaiʻi is limited due to factors related to land ownership and use status and supply and demand for koa.
- ARR project opportunities were found to be more numerous and to better address the challenges facing Hawaiʻi's native forest ecosystems than IFM projects, although they are not without complexity.
- A statewide carbon accounting framework could be developed to estimate GHG reduction based on a variety of natural climate solutions, like reforestation and serve as a jurisdiction-wide framework to account for progress over time at the state and county/island scales.

Why Forest Carbon Markets?

Our planet faces dual crises: rapid climate change and biodiversity loss. The climate emergency requires myriad solutions. We need to dramatically transform the global economy to reduce emissions from all sectors, including energy, transportation, manufacturing, construction, and land use. We need global and national policies and agreements to reduce emissions and remove harmful subsidies that slow progress. We need leaders around the world to act ambitiously and courageously. We need all parties to appreciate and value nature's role so that restoration and improved management can maximize the contribution that nature makes to mitigating climate change.

To avoid catastrophe, global leaders have agreed that net zero GHG emissions by 2050 is a planetary imperative. Science led by The Nature Conservancy shows that Natural Climate Solutions (NCS) have the potential to contribute up to a third of the climate mitigation that the Paris Agreement indicates is needed by 2030 and are thus an essential component of the response to the climate crisis. Of the twenty natural pathways identified globally, the greatest climate mitigation potential lies in our forests (Griscom 2017).

The rapidly evolving carbon markets and the use of carbon offsets have the potential—in combination with other strategies—to meaningfully mitigate the impact of GHG emissions, as well as provide valuable conservation co-benefits for people and nature.

Offsetting provides one tool for difficult-to-decarbonize sectors to address their currently unavoidable emissions in the near-term. These sectors must simultaneously pursue the technological innovation, operational practices, and resource management needed for delivering longer-term transformations. A 2016 study by Forest Trends showed that companies who offset are more likely to have stronger climate targets and to invest more on internal decarbonization than companies who don't offset.

What is a carbon offset?

A carbon offset, also known as a carbon credit, generally refers to an investment in carbon storage to offset, or compensate, for a buyer's unavoidable GHG emissions. Carbon offsets were established as a way to help meet emission reduction obligations and are available through both compliance carbon markets and voluntary carbon markets, typically in the form of a certificate or permit. Carbon offsets are generated through projects that maintain or increase the capacity for carbon storage, and one carbon credit represents the reduction of one metric tonne of carbon dioxide or its equivalent in other GHGs. The ability to sell carbon offsets or credits provides a financial incentive for landowners to increase carbon storage by keeping trees in the ground or planting new trees.

What is a compliance market?

Compliance carbon markets are markets through which regulated entities obtain and surrender emissions permits (allowances) or offsets in order to meet predetermined regulatory targets. These markets are driven by mandated caps on GHGs and operate at large scales.

What is the voluntary market?

The voluntary carbon market offers carbon offsets that are not purchased through compliance carbon markets to meet predetermined regulatory targets. The markets were established to meet voluntary demand for carbon offsets by companies and individuals (voluntary buyers) that take responsibility for offsetting their own emissions. They also serve entities that purchase pre-compliance offsets before emissions reductions are required by regulation.

The voluntary market is rapidly evolving and growing, spinning off innovations in project finance, monitoring, and methodologies that also influence regulatory market mechanisms. For example, the voluntary carbon market has spawned its own standards, registries, and project types beyond the scope of existing compliance market mechanisms. In turn, in recent years governments worldwide have increasingly turned to voluntary carbon market mechanisms—particularly standards and registries—to inform the development of or serve as compliance instruments themselves (https://www.ecosystemmarketplace.com/marketwatch/carbon/.)

What are carbon registries?

Registries are institutions that track the generation, ownership, and trade of verified and certified carbon offset credits within a market, making the information available to regulators, the public, and other market participants. A comparison of program requirements for two widely used and approved registries—the American Carbon Registry (ACR) and the Verra Verified Carbon Standard (VCS)—is included in Appendix 1.

What types of projects are eligible to participate in voluntary carbon markets?

A primary factor for determining eligibility is additionality, meaning a project activity or intervention will mitigate more GHG emissions than the business-as-usual scenario (i.e., baseline). Broadly classified, there are three types of forest carbon projects eligible to participate in voluntary carbon markets:

- ✦ **Improved Forest Management (IFM)** centers on modifying existing management practices to increase sequestration or avoid emissions of forest carbon stocks (e.g., reduced harvest levels, extended rotations, reduced impact logging, liberation thinning).
- ✦ **Afforestation/Reforestation/Revegetation (ARR)** centers on deliberate interventions to facilitate natural regeneration (e.g., planting trees, fencing to exclude livestock and feral animals).
- ✦ **Avoided Conversion** focuses on avoiding conversion of forestland to non-forest uses (e.g., development).

Opportunities for IFM and ARR projects exist in Hawai‘i. In contrast, opportunities for Avoided Conversion are limited due to high opportunity costs (i.e., real estate values), so that is not discussed further. A summary of the opportunities for implementing and scaling IFM and ARR projects are included in Table 1.

How are carbon offsets and additionality measured?

Carbon projects adhere to stringent accounting methodologies to ensure the highest integrity in accounting for the generation and trading of carbon credits. Additionality is measured from a credible baseline, plausible from logistical and market perspectives, and robust accounting throughout a project’s life cycle, including science, peer review, and documentation supporting validation of the project design and periodic monitoring, reporting and verification (MRV). The costs required for this accounting—often totaling ~$350,000 over the first 10 years of implementation—are significant and are covered by the landowner.

Forest Carbon in Hawai‘i

Landowners in Hawai‘i are not yet participating in carbon markets, but a statewide estimate of GHG reduction potential from Hawai‘i's land sector highlights the opportunity forest carbon presents (Selmants et al. 2017). There is also broad interest in understanding the potential of carbon markets as a sustainable and economically viable land use strategy in Hawai‘i. Integrating these types of natural climate solutions into state climate policy can help to accelerate progress on Hawai‘i's commitments to support the Paris Agreement and the US Climate Alliance, and on other policies such as the Sustainable Hawai‘i Initiative.

To explore this potential, the Conservancy initiated the Kona Hema Carbon Project as a pilot to consider whether and how carbon offsets could be developed for Hawai‘i through an IFM carbon project on the voluntary market, including participation in the American Carbon Registry (ACR).

Table 1. *Summary of eligible forest carbon activities relevant to Hawaiian landscapes*

Project type	IFM	ARR
Project action	Stop logging, reduce harvest levels, designate reserve areas, manage competing vegetation, conversion of plantations to natural forest conditions	Tree planting, facilitated natural regeneration (e.g., livestock and feral animal exclosures), adding tree components to existing production agriculture (for example, shade grown coffee)
Applicable standards and methodologies*	ACR, VCS, CAR	ACR, VCS
Current land cover/land use	Native and non-native forests	Non-forest, grazing lands, tree/agricultural lands, former forested watershed lands
Potential for scaling in Hawai‘i	Low	Medium/High

*ACR (American Carbon Registry), VCS (Verra Carbon Standard), CAR (Climate Action Reserve).

Improved Forest Management Projects

As mentioned above, IFM projects center on modifying existing management practices to increase sequestration or avoid emissions of forest carbon stocks (e.g., reduced harvest levels, extended rotations, reduced impact logging, liberation thinning). Therefore, projects can only qualify for IFM if the ability to conduct—and by extension avoid or reduce—timber harvest is retained.

The four case studies that follow explore opportunities and challenges for potential IFM projects in Hawai‘i, based on the most common types of forest ownership and use.

Viewing Potential IFM Projects Through A Carbon Lens

IFM projects center on modifying existing management practices to increase sequestration or avoid emissions of forest carbon stocks.

Buyer confidence in carbon markets is ultimately dependent on the integrity of the applied science underpinning reporting and the additionality measured from a credible baseline. In IFM, credible baselines are represented by the business-as-usual scenario (i.e., what would have happened in the absence of the project activity) and drive the accounting of project carbon benefits. Baselines should be developed based on forest management practices over the past 5-10 years, unless a credible argument can be made that the most likely outcome with the carbon project would be a change from historic management. An alternate highly rigorous approach is to use a dynamic baseline methodology.

High-integrity projects require a valid baseline scenario, which we define as a good faith credible estimate supported by scientific and other relevant and credible evidence of the most likely scenario that would have happened without the carbon project intervention, taking into account the nature, magnitude and timing of land use changes. A key to ensuring only high-integrity credits reach the market is guaranteeing those reductions wouldn't have happened without the carbon project. In other words, ensuring the "additionality" of the reductions the credits represent.

The Conservancy encourages scrutiny based on plausible landowner actions and recommends prospective project developers and project owners look beyond what is required by markets to trade credits. It is also important to ensure you are using an accurate and up-to-date baseline (see case study 2) to demonstrate the actual climate benefits of the carbon project and credit sale transactions. Ideally, the baseline should have built in self-correction mechanisms (i.e., be continuously or periodically adjusted to reflect the influence of external factors like policy, markets and climate change impacts).

Case study 1: Kona Hema Preserve (The Nature Conservancy)

Property details: Kona Hema Preserve is an 8,256-acre property on the leeward side of the island of Hawai‘i that can be easily accessed via an established road network.

Land use: Prior to its acquisition by the Conservancy (1999-2003), the property was used for grazing and logging. Following acquisition in 2003, feral animals were removed and excluded from the preserve's three units, and restrictive conservation easements were put in place from 2003-2007 that would permit a pilot project to demonstrate sustainable koa forestry.

Harvest risk: Low—no timber harvest has taken place since the Conservancy acquired the property.

Project activity: Sustainable koa forestry pilot.

Project start date: Ideally, a carbon project start date and baseline would be established in conjunction with a change in management, marked by land acquisition, establishment of a conservation easement, or forest certification. However, neither acquisition nor establishment of conservation easements qualify as valid project start dates in this case because they exceed the allowable limits for retroactive project registration of ACR and VCS of three and five years, respectively. Therefore, the baseline for a carbon project at this site must include ownership by the Conservancy, as well as the restrictive easements placed upon the property. Under the ACR methodology, a Kona Hema Carbon pilot start date should coincide with a change in management that is clear, specific and substantive (e.g., designating new reserve areas, reducing pre-existing allowable annual cuts, etc.) and formalized in an updated forest management plan or conservation easement.

Project baseline: Under the ACR methodology, it would be assumed in the baseline that the Conservancy would manage the project area to maximize net present value (NPV; i.e., profit) at a 4% discount rate (deemed relevant to non-governmental organizations), while complying with easement restrictions.

Easements covering Kona Hema stipulate that even-aged management (i.e., managing for uniform age) can be used only if (1) the State Forester agrees it has a long-term environmental benefit, (2) no more than 15% of area is cut within any 10-year period (measured on a rolling basis), and (3) no clearcut can be greater than 10 acres. The easements further stipulate that any timber management demonstrate consistency with "recognized sustainable forestry criteria [that] are current at the time of exercise and generally accepted by professional forest managers" and that harvests be limited to "a quantity equal to or less than the quantity that can be removed from the property annually in perpetuity on a sustained yield basis...calculated on an annual or periodic basis."

In addition, with the Rapid ‘Ōhi‘a Death (ROD) quarantine constraining exports, it is not plausible to assume significant commercial harvests of ‘ōhi‘a in a baseline scenario at this time.

Considerations and conclusions: The Conservancy's Kona Hema Carbon pilot met the requirements of ACR because a staged transition of existing natural stands, via collections of < 10-acre group selections, to intensive koa plantations managed on a sustained yield basis was consistent with the conservation easement and the Conservancy's intent to acquire the property to demonstrate sustainable forestry, providing a valid baseline scenario under the ACR methodology. However, this scenario conflicts with the Conservancy's 20-year history of ownership and management and does not reflect the Conservancy's fundamental institutional commitment to conservation, and those factors—management history and institutional character—should also be incorporated into a project baseline.

Thus, in the case of the Kona Hema property where the Conservancy did not have a history of timber harvest, the baseline scenario should reflect the established 20-year business-as-usual scenario with conservation-driven management meeting the intent of the conservation easement and the Conservancy's mission. At most, a credible baseline could include limited selection cuts as part of a newly introduced uneven-aged management regime (justified on the basis of koa approaching commercial size at approximately age 40 years), however, this would be of such limited extent as to likely render an IFM project of this scale (~6,000 forested acres) inviable without substantially higher carbon prices. *The Kona Hema property is thus not well-suited for development as an IFM project.*

Kona Hema Carbon Project Advancements

The Kona Hema Carbon pilot helped build a knowledge base of carbon project potential and implementation in Hawaiʻi among public and private partners. It also built the capacity and expertise of a local forestry company who conducted the first forest carbon inventory in Hawaiʻi specifically designed to meet the exacting standards of the carbon market (Kona Hema Carbon Technical Report 2022).

Forest carbon inventory is the foundation for accounting and reporting carbon credits, which require highly accurate and precise field measurements like those conducted at Kona Hema. Dry and mesic forest carbon stocks at Kona Hema yield aboveground live tree biomass estimated to average ~118 tons of carbon dioxide (t CO2) equivalent per acre, compared with statewide average stocks of Hawaiian dry and mesic forests of 27 and 73 t CO2 equivalent per acre, respectively (USFS FIA data, collated by Climate Action Reserve). Thus, forest carbon stocks at Kona Hema well exceed average forest carbon stocking in Hawaiʻi. Annual forest sequestration for 3,364 acres of some of Kona Hema's older forests is estimated at 1,563 tons of carbon dioxide per year. Further, the forest carbon inventory established a permanent sample plot network at Kona Hema that will serve as an investment in the development of new and more cost-efficient approaches to monitoring forest carbon, including remote sensing techniques such as aerial LiDAR or light detection and ranging (2022).

As part of the effort to further forest carbon science at Kona Hema, the pilot project also developed a site-specific yield curve for koa plantations at Kona Hema, developed from Baker and Scowcroft's (2005) published stocking tables for leeward Hawaiʻi. Knowledge of forest growth and yield is essential to developing accurate baselines, and is challenged in Hawaiʻi by the lack of applicable published growth and yield models. The approach piloted at Kona Hema can serve as a model to inform projections of forest carbon growth in other areas of leeward Hawaiʻi.

Additionally, through a partnership with the University of Hawaiʻi Shidler School of Business, the pilot project produced a market analysis to explore the value of a Hawaiian carbon credit on the voluntary market (University of Hawaiʻi 2020).

Case study 2: Private, non-industrial koa plantation

Property details: Here we consider a hypothetical 3,000-acre property of commercial-aged koa plantations managed for production with excellent access via an established road network.

Land use: The plantations were established 35 years ago, to be managed on a commercial rotation, formalized in an existing management plan. The property is subject to no legal constraints on timber harvest.

Harvest risk: High—there is clear evidence to substantiate a near term harvest risk that could be avoided by a project activity.

Project activity: The project activity could involve, for example, acquisition of the property by a conservation organization and establishment of a conservation easement that limits or prohibits timber harvest.

Project start date: Coincides with acquisition, establishment of conservation easement, and updated management plan

Project baseline: As explained above, the ACR methodology sets the baseline as the management regime that maximizes NPV for the specified landowner class. Here, the landowner is classified as private non-industrial, and the relevant discount rate for deriving the baseline scenario is 5% (i.e., the methodology assumes that a private non-industrial landowner is seeking a 5% return). Harvest in the baseline scenario is then scheduled to take place at the time in which percent annual growth in standing timber value falls below 5%, anticipated at approximately age 40 years.

Annual growth is modeled for the koa stands from the project activity start date, and it is determined that the baseline harvest that maximizes NPV at a 5% discount rate takes place at year 5 (when the koa stands are 40 years old; 2022 = year zero) (Table 2).

Year	Stand age (in years)	Volume (MBF/ acre)	Net harvest revenue ($/acre)	NPV ($/acre)
0 (2022)	35	5.95	$8,927	$8,927
1 (2023)	36	6.40	$9,597	$9,140
2 (2024)	37	6.84	$10,266	$9,312
3 (2025)	38	7.29	$10,936	$9,447
4 (2026)	39	7.74	$11,605	$9,548
5 (2027)	40	8.18	$12,275	$9,618
6 (2028)	41	8.43	$12,647	$9,437
7 (2029)	42	8.68	$13,019	$9,252
8 (2030)	43	8.93	$13,391	$9,063
9 (2031)	44	9.18	$13,763	$8,872
10 (2032)	45	9.42	$14,135	$8,677
11 (2033)	46	9.57	$14,358	$8,395

Table 2. *Demonstration of optimal harvest schedule in baseline scenario for example property 2: private non-industrial koa plantation, with yields of well-managed koa grown in deep soil with sufficient rainfall (JB Friday, unpublished). Net timber revenue $1.50 per board foot, discount rate = 5%.*

As noted above, a credible baseline scenario should be informed by management on the property in the past 5-10 years, unless there is a compelling reason that past management is not predictive of future management. In this case, because this is an even-aged 35-year-old plantation, past management has likely been very minimal. However, in the absence of a carbon project, it is reasonable to assume future management will be very different. In addition to the ACR NPV maximization baseline approach, the Conservancy encourages expert consultation and/or management on similar plantation properties in the development of the baseline.

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Once the baseline management regime is established, forest growth and harvests in the baseline scenario are modeled for a 20-year period (as specified in the ACR methodology). In this example, net carbon benefits are not generated until the rotation harvest occurs in the baseline scenario at year 5 (2027) and are accounted in the year of harvest as the gross emission (stock loss) minus the 20-year long-term (LT) average, which is applied as a "floor" to the baseline (Figure 1). After the LT average is reached, baseline emissions are set to zero and net carbon benefits can only be generated by growth in the project.

Considerations and conclusions: This scenario is representative of an ideal property for an IFM project in Hawai'i. The project activity could further involve supplemental plantings of native tree and understory species to increase diversity and structural complexity and further build forest carbon stocks, potentially above the projected koa plantation yields (brown curve) in Figure 1.

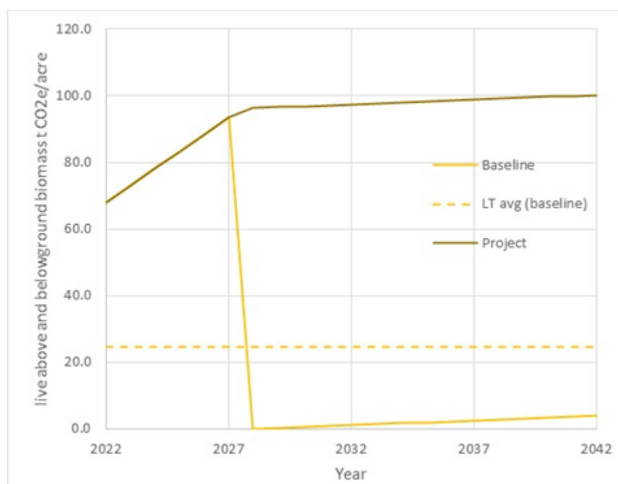

Figure 1. *Twenty-year baseline and project (actual) projection for example property 2: private, non-industrial koa plantation.*

Case study 3: Small, non-industrial private forest (NIPF)

Property details: This 200-acre property features mature natural forest stands, well-stocked with commercial-size koa greater than 12" in diameter. Access is sufficient to facilitate a timber harvest.

Land use: The property is zoned for commercial forestry and is subject to no relevant legal restrictions.

Harvest risk: High—there is clear potential for profitable near-term harvests.

Project activity: TBD, as part of aggregate project (e.g., ACR Programmatic Design Approach (PDA) or VCS Grouped Project), as independent projects of less than 2,000 acres are not financially viable due to significant fixed project development and MRV costs.

Project start date: The project start date would ideally be set by establishing a conservation easement on the property, and/or by formalizing a change in management, codified in a new or updated forest management plan. Any changes in management establishing a project start date should be clear, specific and substantive (e.g., designating new reserve areas, reducing pre-existing allowable annual cuts, etc.).

Project baseline: The project baseline would involve commercially driven management, with near term harvests of koa.

Considerations and conclusions: The fixed carbon project costs for a 200-acre property equate to a per acre cost of $1,750, while carbon revenue per acre is estimated at ~$200 per acre (similar to that estimated for the Kona Hema pilot). For gross revenue to exceed costs, projects would have to be ~1,000+ acres (Figure 2). For perspective, 84% of registered forest carbon projects are on properties >1,000 acres and 57% of projects are on properties >5,000 acres (Figure 3). In Hawai'i, 99% of private family forest lands are less than 100 acres (Figure 4).

***Figure 2.** Equivalent per acre project development and MRV costs plotted against property size; assumes total $350,000 costs in the first 10 years of implementation*

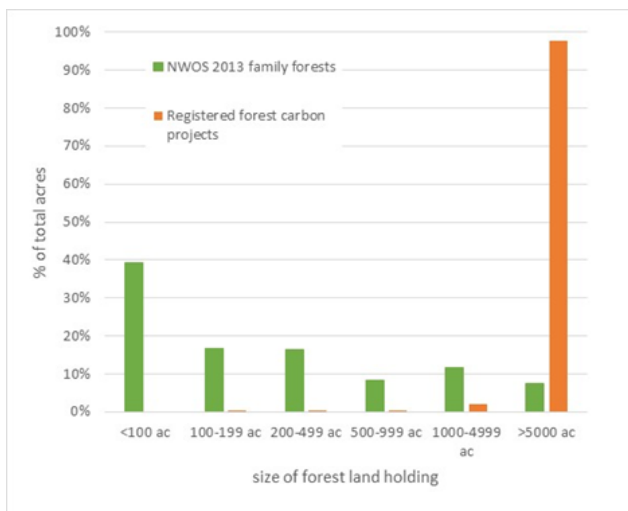

***Figure 3.** Size distribution of private family forest lands in the continental U.S. (source: USFS 2013 National Woodland Owner Survey) and of registered forest carbon projects (source: 2019 review of public registries).*

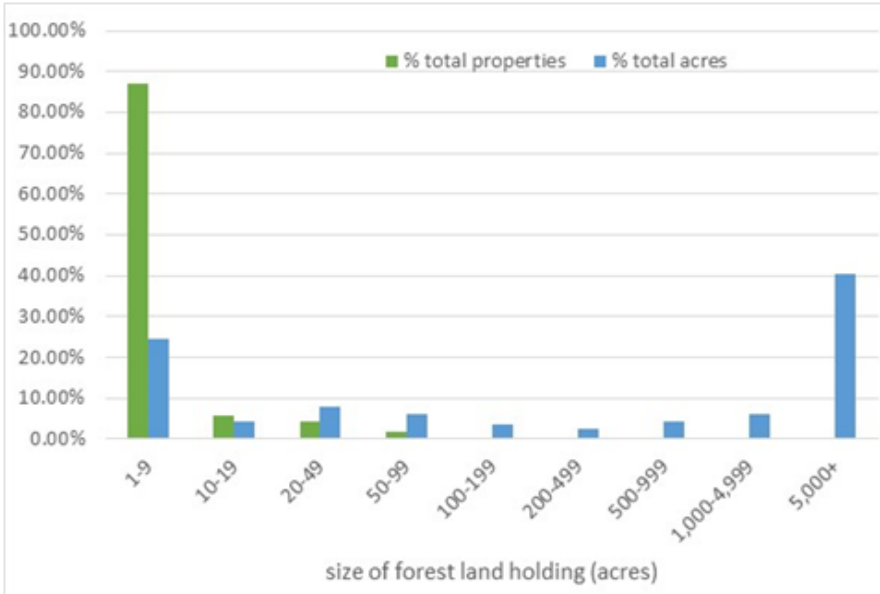

Figure 4. *Size distribution of private family forest lands in Hawai'i (source: USFS 2013 National Woodland Owner Survey).*

Aggregating multiple small holdings into a single project to spread the fixed project development, registration and MRV costs across a larger area offers the ability to achieve economies of scale in Hawai'i. Both the ACR and VCS standards permit aggregation of independent holdings under a single registered project, and further permit such projects to incorporate new land holdings over time into a single growing project, known as a Programmatic Design Approach (PDA) and Grouped Project under ACR and VCS, respectively. Such aggregated projects provide efficiencies in registration and MRV, allowing for a single project registration and MRV based on a distributed sample network across the population of properties (without the need for intensive sampling in each). Over time, new properties are periodically incorporated into PDA and Grouped Projects via a simplified registration process, validating pre-established eligibility criteria for addition of new land holdings. In landscapes composed of many small, private holdings, these aggregated arrangements are the most effective way to achieve impacts at scale.

While aggregate projects offer clear efficiencies in project administration and reporting, they require additional outreach and engagement efforts and legal agreements that address questions of ownership, revenue sharing, and shared responsibilities related to long-term reporting commitments and liabilities related to potential reversals (e.g., due to a participant leaving a project, or a catastrophic natural disturbance), termination, and dispute provision. Often, aggregate projects are best arranged with one entity taking on a coordinator role, such as the principal ACR Project Proponent. These arrangements may take various forms, for example:

The Project Proponent could be responsible for developing and managing the project, while landowners retain title and ownership of carbon credits generated from their forestland and pay their share of registration and ongoing costs; or

The Project Proponent could assume full legal and financial responsibility to develop and manage the project and market and sell carbon credits, while the landowners transfer title and ownership of carbon credits to the Project Proponent in return for a share of proceeds from the sale of carbon credits, distributed by the Project Proponent.

Aggregate Project Checklist

Carbon projects are complex and technical. Developing successful aggregate projects add to the challenge. Based on Conservancy experience at Kona Hema, we recommend embarking on this process by:

- ✓ **Identifying key criteria to use in selecting potential landowner parcels** before initiating landowner engagement activities.
- ✓ **Engaging landowners in transparent discussions early** and allowing time to build trust among all parties.
- ✓ **Understanding each landowner's management objectives** to ensure a good fit within a carbon project.
- ✓ **Obtaining accurate and representative forest data**, especially as related to baselines (e.g., from a previous forest inventory), to evaluate the carbon potential of forest parcels in the early phases of project assessment.
- ✓ **Developing and using a contract term sheet** with landowners interested in participating in a carbon project, while outlining the key legal elements of a carbon project.
- ✓ **Providing landowners with clear and simple information**, including an explicit set of obligations and responsibilities of each party involved in a transaction, when finalizing the legal agreement explore the value of a Hawaiian carbon credit on the voluntary market (University of Hawaiʻi 2020).

Case study 4: State of Hawai'i Forest Reserve

Property details: A 2,000^{+}-acre State Forest Reserve with sufficient road access.

Land use: The State Forest Reserve System is managed by the Hawai'i Department of Land and Natural Resources' (DLNR) Division of Forestry and Wildlife (DOFAW), whose mission is to "… responsibly manage and protect watersheds, native ecosystems, and cultural resources and provide outdoor recreation and sustainable forest products opportunities." This reserve has a history of timber harvest by DOFAW.

Harvest risk: Medium—the reserve has commercial stocks of koa, including mature trees.

Project activity: Reduction in commercial timber harvest.

Project start date: The project start date would be set by a change in management, formalized in an update to the forest management plan. As above, any changes in management establishing a project start date should be clear, specific and substantive.

Project baseline: A baseline involving commercial timber harvest on a sustained yield basis could be deemed credible. However, the extent of timber harvest that could be reasonably assumed in a baseline scenario under DOFAW management should reflect DOFAW's mandate as a state agency providing stewardship of a public resource. The ACR methodology permits the use of a baseline management scenario for a public entity to maximize NPV at a 4% discount rate. This scenario, of course, assumes that the public entity is managing for a single (timber) output, which is not the case for DOFAW and many other State and Federal Forest agencies. A credible baseline should take into account any institutional barriers (i.e., political, social or operational constraints) relevant to the baseline agent, which in this case would include:

- DOFAW manages forests for multiple uses, not primarily for timber production.
- Any timber harvest conducted by DOFAW would be on a sustained yield basis.

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Thus, a true accounting of NPV should look across the full suite of outcomes DOFAW is charged to deliver from the forest reserve: well-managed and protected watersheds, native ecosystems, cultural resources and forest products. Admittedly, most of these non-market outcomes are not readily monetized and accounted in an NPV analysis, but at a minimum, any timber management scenario considered in the baseline should not result in substantial trade-offs to the detriment of other outcomes under DOFAW's management mandate. For example, large-scale clearcutting on steep slopes would result in increased overland water flow and erosion and produce net negative impacts related to watershed management. Also, any timber harvest regime that resulted in a long-term decrease in standing stocks would not qualify as sustainable and would not be a credible outcome of DOFAW's management in a baseline scenario. The credibility of the baseline should be informed by DOFAW management on this property in the past 5-10 years, or if data is unavailable, by management of comparable DOFAW properties. Ultimately, in addition to the ACR delineation of NPV, a reasonable person should find that baseline to be a good faith assertion of the most likely outcome if the carbon project were not established.

Considerations and conclusions: There are important project considerations beyond baselines on public lands. Registration of projects requires that project proponents enter into legally binding agreements with the registries concerning adherence to program rules. The terms of use in these representations have raised concerns by State legal counsel, and in some cases, have presented significant legal obstacles to registration of projects on public lands. Additionally, state legislation currently in place prohibits the sale of carbon offsets generated on public lands to private entities. Advocating for policy that supports selling carbon offsets on public lands is an important near-term need and one that is top of mind for many State agencies.

Conclusion

The potential for scaling IFM activities in Hawaiʻi as a climate mitigation strategy is limited due to several factors:

Land Ownership and Management Purpose

USDA Forest Service 2017 RPA (Oswalt et al 2019) reports that roughly half of forest land (727,000 of 1,471,000 ac) in Hawaiʻi is under reserved status (presumably some form of conservation). Most of this reserved area is likely ineligible for IFM activities, which are best directed to un-reserved areas where the ability to conduct—and by extension avoid or reduce—timber harvest is retained. Small non-industrial private forest land predominates in Hawaiʻi, with 1,155,000 acres owned by some 25,000 owners (USFS 2022, USFS 2013), some of which is under reserved status. While aggregation of these small, private holdings can make it cost-effective to participate in carbon markets, aggregation poses its own set of challenges, as outlined in case study 3.

Limited Supply and Demand

Timber production is limited in Hawaiʻi. Forest Service 2017 RPA reports zero removals of growing stock statewide in 2016 (Oswalt et al 2019), and forestry ranks only 19th statewide in economic impact (USFS 2022). Additionally, as explained above, timber demand in Hawaiʻi is constrained by ROD-related quarantines on export of ʻōhiʻa wood, which represents ~50% of all native forest in Hawaiʻi (USFS 2022). A Forest Service-led article published in 2017, states that "Current regulations require harvest of only dead and dying trees and using downed material in wood products" (Wiedenbeck and Lowell 2017). However, this practice (referred to as salvage logging) is not currently regulated or considered a sustainable forestry practice due to a lack of recruitment (Friday 2010).

These circumstances, in part, define common practice of forestry in Hawaiʻi and necessarily raise questions about any baseline scenario that involves expansive and aggressive timber harvest.

Lack of Koa Forestry Information

A credible baseline should reflect land management decisions that can be readily witnessed on similar properties, and very little is published on koa forestry standard practices. Conversations with extension agents and other State officials confirm a wide range in how individual landowners manage the harvest of koa. In most cases, it is understood that past koa extraction has been done without ensuring stand regeneration (Koa Action Plan 2010). Furthermore, there has been a lack of data to inform best practices for sustainable koa harvest. This lack of data is clearly articulated in the 2010 State of Hawaiʻi Koa Action Plan: "Currently, we have sparse information on many of the factors that determine whether a harvest is sustainable, as no koa plantation has ever been managed through a full rotation. Standards for sustainable forest management are well-developed for many timber species nationally, but do not include Hawaiian species."

Management plans, such as the one for Kona Hema, usually do not outline best practices for koa forestry. Instead, they set max limits and suggest a consultation with a forester to determine best practices for a specific site (Kona Hema Forest Stewardship Management Plan; Giffin 2017). There is a pressing need for more Hawaiʻi-specific guidance on best practices for koa forestry.

Afforestation/Reforestation/Revegetation Projects

As mentioned above, ARR projects center on *deliberate interventions to facilitate natural regeneration* including direct activities (e.g., planting trees, broadcast seeding) and indirect activities (e.g., activities that permit or facilitate natural regeneration, like herbivory exclosures). Like for IFM, projects can *only* qualify for ARR if they are contributing to additionality, meaning that additional carbon will be sequestered above and beyond the business-as-usual scenario or what would have happened without a carbon project.

An assessment by the Conservancy in 2017 found that approximately 60-70% of private lands and 30-40% of public lands across Hawaiʻi have reforestation potential (Figure 5), representing a more promising opportunity for impact at scale.

Figure 5. *Reforestation potential of historically forested areas in the Hawaiian Islands shown in green.*

Centuries of damage to Hawaiʻi's native forests put ARR projects in greater alignment with the challenges effecting Hawaiʻi's native forest than IFM projects. Likewise, opportunities for ARR projects appear to be more numerous than for IFM projects (TNC 2019). However, there are potential complications with ARR projects, including high upfront costs and long-term time horizons. In Hawaiʻi, both managing and growing a forest require protecting trees from threats such as grazing animals, invasive plants and animals, and disease. Managing these threats can require substantial upfront investment in the form of fencing and invasive species control. In contrast to IFM projects that center on existing forests, ARR projects center on growing a forest—a process that takes time, often decades. Consequently, ARR projects—which require the same high upfront management costs but with a longer return on investment—can be at a competitive disadvantage to IFM projects in the near term as trees grow.

However, as trees mature, they sequester increased amounts of carbon and reforestation can deliver greater climate and ecosystem benefits (Pugh et al 2019), thus having the potential to make reforestation a financially attractive climate investment.

New VCS ARR methodology

A new forest carbon accounting methodology applicable to ARR project activities has been developed under VCS and is expected to be approved and released in mid 2022. The methodology is applicable to all ARR activities that do not take place on organic soils or wetlands and result in an intentional manipulation of the water table or in tidal wetlands. The methodology has opportunity for broad impact in Hawai'i as it can be applied to a range of forest ecosystems, including managed plantations and restoration of native forest intended for conservation purposes. It is also applicable to a wide range of restoration activities, including bare earth planting, enrichment planting to restore degraded forests, and facilitated natural regeneration via livestock and feral animal removal and exclosures.

The carbon accounted in the project boundary include woody (tree and shrub) above and belowground biomass, herbaceous biomass, dead wood, harvested wood products, litter, soil organic carbon, non-CO_2 emissions from biomass burning and N_2O emissions from nitrogen fertilizer.

The central quantification approach uses traditional plot-based sampling methods, scaling biomass per unit area estimates to the project level using GIS data of project area boundaries. The methodology uses a quantitative "performance benchmark" approach to demonstrate additionality and set the crediting baseline. The performance benchmark is calculated from observations of business-as-usual transitions from non-forest to forest cover in areas comparable to the project area. This ARR methodology is promising as it appears to have broad applicability to a variety of Hawaiian landscapes.

Recommendations and Next Steps

Advancing Climate Change Mitigation and Resilience through Restoration in Hawai'i

Development of a statewide estimate of greenhouse gas reduction potential and a carbon accounting framework for Hawai'i's forest and agricultural sectors would promote the importance of including nature in state climate policy and dovetail with Hawai'i's commitments to support the Paris Agreement and the US Climate Alliance, among other policies. Spatially explicit estimates would enable more informed decision-making about where interventions should take place and what kinds of activities would be most effective to sequester carbon and/or reduce emissions. It also enables reduction assessments to be combined with other important values such as erosion control, water security, and biodiversity to inform investment decisions and optimize both climate and other community and ecosystem benefits.

A statewide climate and multi-benefit accounting framework managed by the state, counties/islands or carbon registry could serve as a jurisdiction-wide framework to account for progress over time at the state and county/island scales. This framework would provide a standardized and programmatic way to estimate and track progress over time. It could also be used to support and evaluate the effects of a variety of policies and incentives that achieve climate benefits. Its other advantage is that it can reduce accounting burdens and expenses by transferring the responsibility of the accounting to a larger scale that can be managed by a state agency or local government. The Conservancy is currently exploring this effort with partners.

Policy Opportunities and Enabling Conditions

There are a number of climate-related initiatives that provide the policy opportunities and enabling conditions to advance carbon markets and natural and working lands, such as forests and farmlands, as a climate mitigation strategy in Hawai'i. These initiatives include state commitments and legislative policies to reduce GHG emissions and national and global initiatives that could provide incentives for the state and counties to reduce emissions through natural climate solutions. Key opportunities include:

- ✓ Passing a visitor fee (aka "green fee") to provide funding toward the management and protection of Hawai'i's natural resources;
- ✓ Assessing Hawai'i's 2045 Renewable Portfolio Standard for potential impacts or opportunities to include natural and working lands;
- ✓ Influencing Hawai'i's climate pledge in support of the Paris Agreement of 2015 to include a climate goal for natural and working lands;
- ✓ Continuing to leverage the commitments and partnerships of the Aloha+ Challenge and Sustainable Hawai'i Initiative to advance conservation that also supports Hawai'i's climate commitments; and
- ✓ Passing additional legislation similar to Act HB2493 to establish a Hawai'i Farmland and Forest Soil Health Carbon Smart Incentive Program that supports keeping forests and farmlands intact and incentivizing practices that sequester additional carbon on those lands.

Other opportunities to enhance carbon markets locally include:

- ✓ Continuing to support voluntary carbon markets by developing forest carbon offset projects in Hawai'i;
- ✓ Supporting and providing technical input in design of credible forest offset protocols that are relevant to Hawai'i's landscapes and needs;
- ✓ Monitoring barriers to include Hawai'i forest offset projects in regulatory markets outside of Hawai'i, such as California's regulatory cap and trade program (i.e., Climate Action Reserve);
- ✓ Promoting a regulatory carbon market for Hawai'i;
- ✓ Supporting equitable carbon pricing; and
- ✓ Promoting inclusion of natural and working lands in county initiatives.

Scaling up carbon markets faster—and getting them right—will be essential to reducing emissions in the near term and funding the low-carbon future we need. The Conservancy is committed to achieving these goals. The findings and information shared in this report will help strengthen our collective understanding and efforts to leverage the power of carbon markets and other natural climate solutions to meet climate goals for Hawai'i and the planet.

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Appendix 1: Comparison of Program Requirements

	ACR	VCS
Start Date	The date the project was submitted to ACR for listing review or other options listed in the ACR Standard, Appendix A Must be validated within 3 years of start date	The date activities that led to the generation of GHG emission reductions or removals are implemented – implementing management plan or changing forest practices Must be validated within 5 years of the start date
Minimum Project Term	40 years for all AFOLU (i.e., Agriculture, Forestry, and Other Land Use) projects	Minimum 30 years and maximum 100 years
Crediting Period	20 years for all IFM projects	Minimum 20 years, maximum 100 years See Standard 3.8.5 Baseline renewal every 10 years (Standard 3.2.7)
Land Eligibility	Non-federal forestland in the United States that can be legally harvested	Forestland subject to timber harvest
Natural Management Requirements	Use of non-native species is specifically prohibited	Activities that convert native ecosystems to generate GHG credits are not eligible
Permanence	Sign a Reversal Risk Mitigation Agreement—Contribute to a buffer pool based on ACR tool Update ACR tool to determine buffer pool contribution every 5 years at verification events	Complete a non-permanence risk analysis at every verification to determine contribution to VCS' AFOLU pooled buffer account

Real	No crediting of a projected stream of offsets on an ex-ante basis (i.e., before it occurs). Project verification every 5 years	No crediting of a projected stream of offsets on an ex-ante basis (i.e., before it occurs. Project verification every 5 years
Additionality	Exceeds regulatory/legal requirements Goes beyond common practice Overcomes at least one of three implementation barriers: institutional, financial, or technical	Additionality is demonstrated via the application of the methodology's performance benchmark
Leakage	Activity shifting—no leakage beyond the minimum allowed Market leakage—determined by default market leakage discount factors in methodology	Only addresses market leakage—ranges between 20% and 70% as determined in the methodology (Section 8.6)
Environmental and Community Assessments	Must develop and disclose an impact assessment to ensure compliance with environmental and community safeguards/ best practices	Required identification of potential negative environmental and socio-economic impacts Local stakeholder consultation required 30-day public comment period required
Verification	Every 5 years	Every 5 years
Aggregation/Group Projects	Yes	Yes
Forest Certification	Required—SFI, FSC, or ATFS	Required—FSC only
Sustainable Development Goals (SDGs)	Projects must disclose negative impacts to SDGs, but no particular tool or protocol	No specific sustainability objective

Sustainable Development Requirements	No requirement, but ACR can be combined with the Climate Community and Biodiversity Alliance (CCBA) Standard	Reports on environmental impact assessment, but VCS can be combined with the Climate Community and Biodiversity Alliance (CCBA) Standard, SD Vista, or the SocialCarbon Standard
Monitoring	Required to complete and submit a Monitoring Report at each verification event, at minimum every 5 years during a crediting period	Required to complete and submit a Monitoring Report at each verification event, at minimum every 5 years during a crediting period
Reversal ACR—Unintentional VCS—Catastrophic	Buffer pool covers the reversal if loss amount is less than project contribution If the loss amount is greater than the project contribution, project proponent is required to pay a deductible of 10% of the loss amount in addition to surrendering its buffer pool contribution up to the point of the loss	Credits shall be deposited in the AFOLU pooled buffer account in an amount equivalent to the additional number of buffer credits cancelled after the reversal, above what has been previously contributed by the project.
Reversal ACR—Intentional VCS—Non-Catastrophic	Project proponent must replace the total loss amount to the Buffer Pool Account	Credits shall be deposited in the AFOLU pooled buffer account in an amount equivalent to the full reversal.
Automatic Termination	Project stocks drop below baseline levels prior to the end of the Minimum Project Term	No automatic termination provision

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