A photograph of a stone staircase leading up a forest path. The path is made of large, flat stones and is surrounded by tall, mature trees with thick trunks. The forest floor is covered in fallen leaves and moss. The lighting is soft and natural, suggesting a shaded forest environment.

Forestry as an Emerging Natural Capital Asset Class:

Financing and Business Models for Forest Ecosystem Services

Peter Adriaens, PhD PE

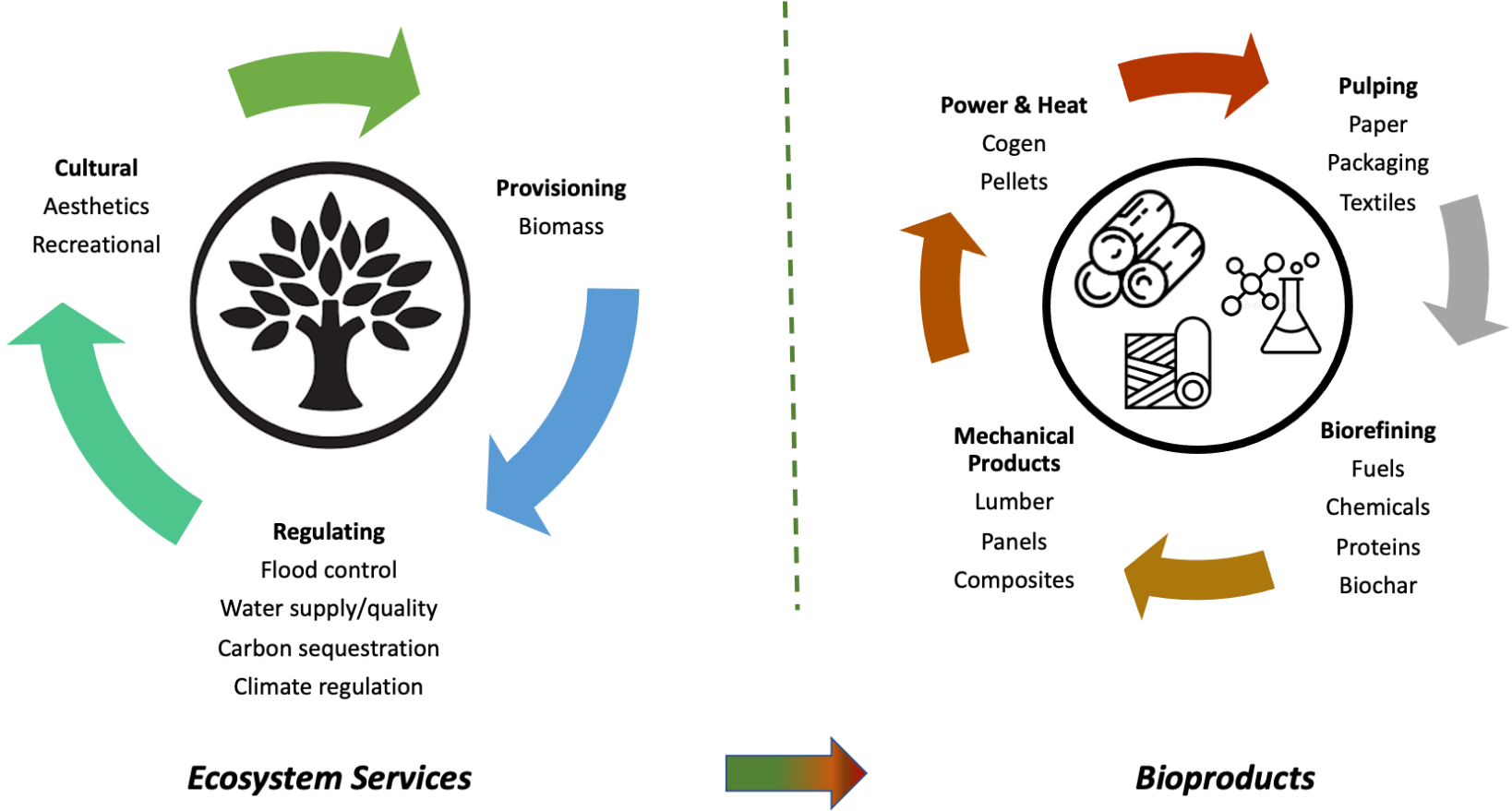
Director, Center for Digital Asset Finance

The University of Michigan – Ann Arbor

www.difin.io

Objective

To review business and financing models in production- and conservation-oriented forest projects and explore innovation opportunities for GLIP



Value Proposition

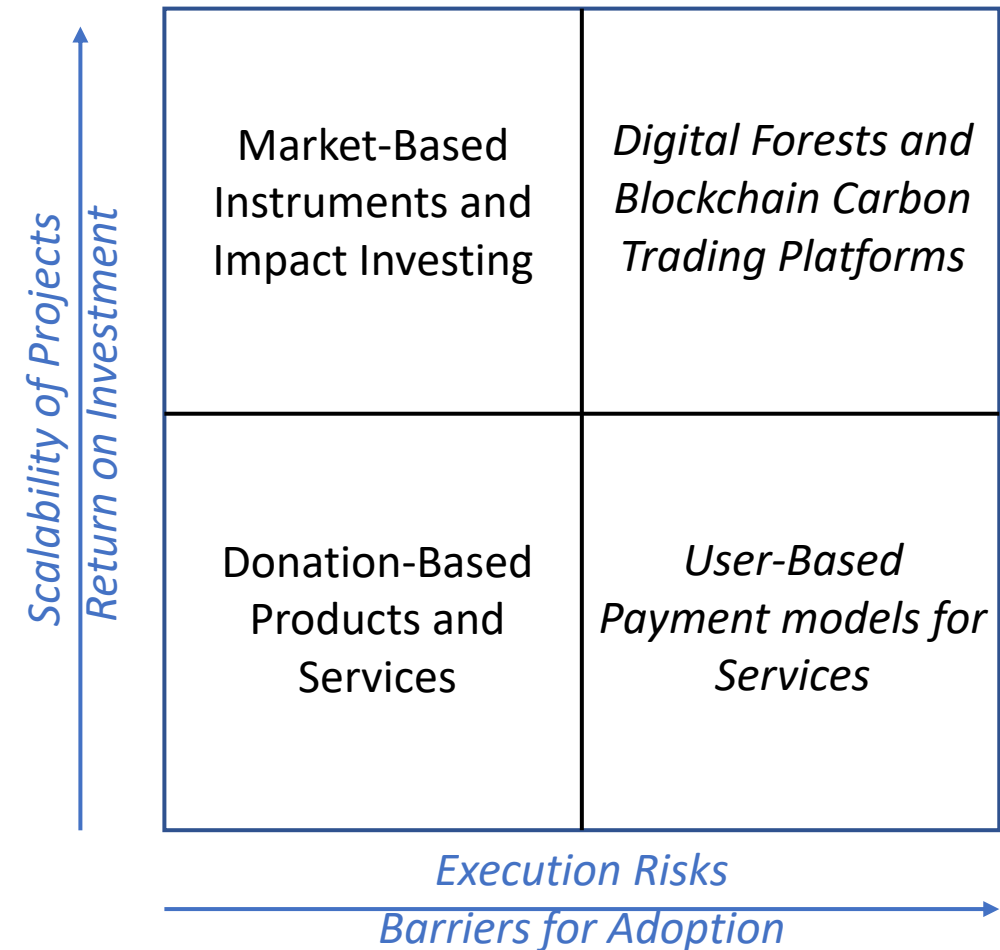


"Forest-related Nature-Based Solutions (NBS) could generate US\$800 billion in annual revenues by 2050, worth US\$1.2 trillion today in NPV terms, surpassing the current market capitalization of the oil & gas majors."

Framework of Analysis

Map the **barriers to integration** of new forest ecosystem products and services (risk) vs. **scalability** of projects (return).

- Barriers:
 - New legislative frameworks,
 - Dependence on government subsidies,
 - Execution of user-driven services, and
 - Education for integration of digital technologies
- Scaling factors:
 - Bespoke vs platforms
 - Fixed price vs market-based pricing (and trading) mechanisms



Risk-Return Product Mapping

1. Donation-Based Services: A mechanism where governments reward land (forest) owners for voluntary conservation activities
2. User-Based Payment Systems: These are forest conservation products or services that are funded through user fees or taxes levied for various permits or directly paid to projects.
3. Market-Based Instruments: Rely on verified outcomes valued in buyer-supplier markets though limited issuance of credits, including conservation banking and forest offset projects. Projects based on market instruments are often invested through (green/blue, conservation, or sustainability-linked) bonds or other impact financing instruments.
4. Digitized Product and Service Platforms: Integration of web 3.0 technologies to tokenize and bundle ecosystem services benefits of similar quality, such as carbon offsets, water or biodiversity credits for easy tradability, better MRV (monitoring, reporting, verification) and provenance certification. Engage third party technology providers to implement and broker.



Results – Forest Ecosystem Services



◀ Forests for water in Catalonia

Strengthening the link between forests and water to diversify the financing of forest management.

Spain



◀ Club GREY HORSE: Multiple ecosystems services via forest renters

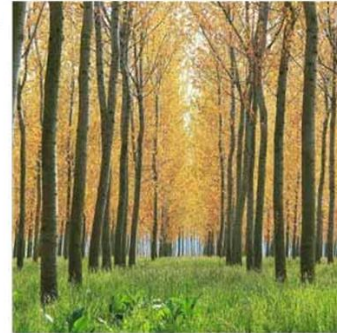
Multi-purpose lease by one lessee on a rented forest plot, to increase the economic efficiency of forestry.

Russia

▶ ECOPAY Connect: Forest-habitat biodiversity payment scheme

Linking social and ecological benefits with economic aspects through the spread of FSC® certification.

Italy



▶ Landscape and Recreation Value Trade

Compensation for forest owners for voluntarily enhancing the provision of landscape and recreational values.

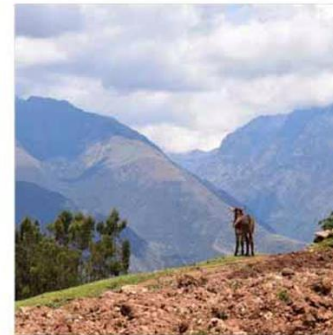
Finland



◀ The Mushrooms of Borgotaro IGP

Online platform to improve commercialisation of recreational permits for wild mushrooms' collection.

Italy



◀ Paying for watershed services to cities in Peru

Reward for restoring ecosystems of a micro-watershed around a near-city lake via an increment in the urban water tariff.

Peru

Source. SINCERE (Spurring INnovations for forest eCosystem sERvices in Europe)

Results – Forest Ecosystem Services

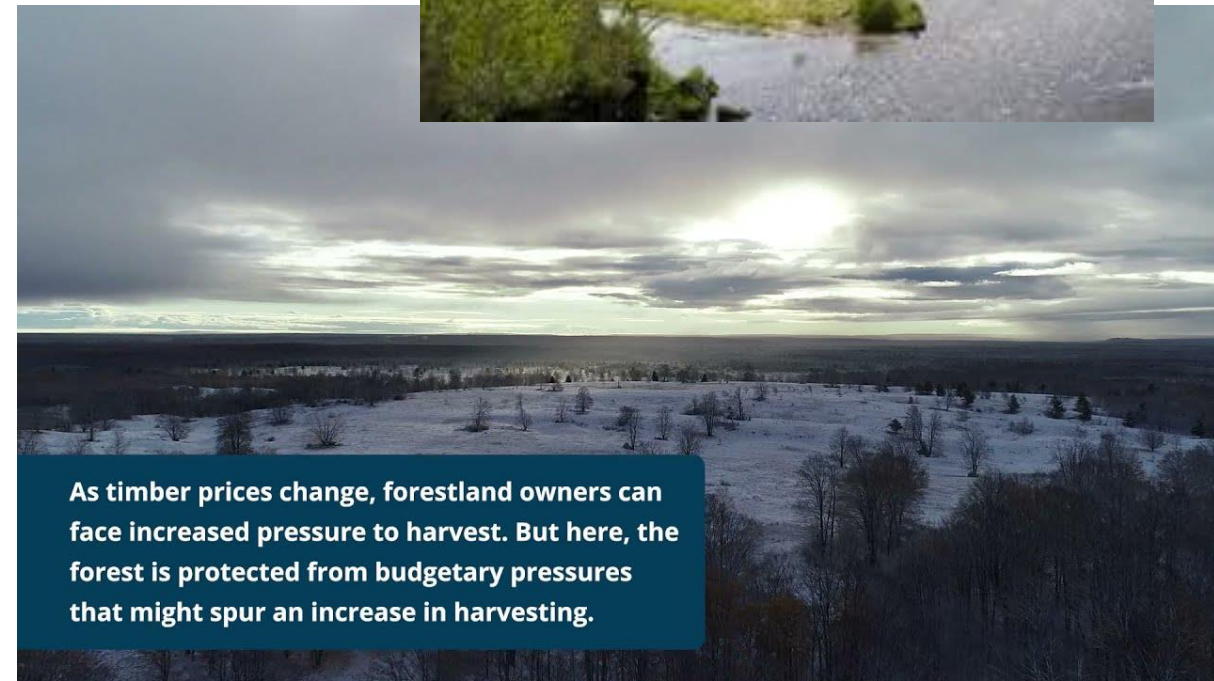
In Michigan, the 100,000-acre Big Wild Forest Carbon Project was developed to create a portfolio of carbon offset credits generated from sustainable forest management activities.

Completed in 2022, with DTE Energy as the first buyer of carbon offset credits for the first decade (1M metric tons of CO₂-e). Total duration is 40 years.

Revenue generated will be invested in Michigan's Department of Natural Resources sustainability, climate change adaptation, or mitigation efforts.

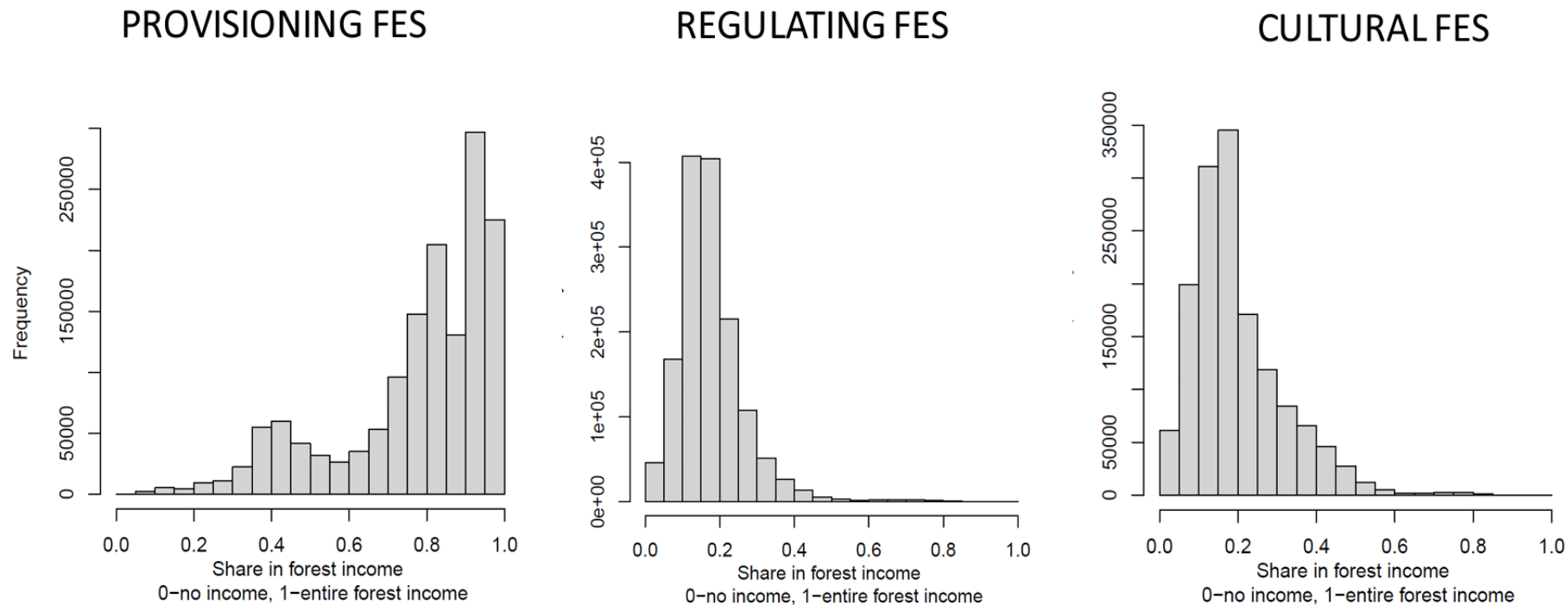
The project uses the American Carbon Registry's (ACR) Improved Forest Management Methodology, which is specifically designed for non-federal U.S. forestlands. The carbon offset credits generated from the project are registered with the ACR

Source. Bluesource



As timber prices change, forestland owners can face increased pressure to harvest. But here, the forest is protected from budgetary pressures that might spur an increase in harvesting.

Income Distribution: Forest Ecosystem Services (FES)



- ✓ Provisioning: Production-oriented services (energy, timber, game)
- ✓ Regulating: Watershed, climate (carbon), air quality, habitat services
- ✓ Cultural: Spiritual, education, healthcare services

Source. *Incentives for Forest Ecosystem Services in Europe: connecting science, practice and policy Conference (2021)*

Results – Forest Ecosystem Services

| Business Model | Adoption Rate | Legislative Lift | Scalability Potential | Implementation Cost | Investment Return |
|-------------------|---------------|------------------|-----------------------|---------------------|-------------------|
| Donor-driven | Low | High | Low | Low | Low |
| User fee-driven | Medium | Medium | Medium | Medium | Low |
| Market-driven | High | High | High | High | Medium |
| Digitally-enabled | Low | Medium | High | High | High |

Conclusions

1. On-boarding of multiple types of projects could be piloted under auspices of the GLIIP, depending on forest ownership, local priorities, cultural values, requirements for forest owner compensation, and targeted opportunities to engage broad stakeholder ecosystems.
2. Given the wide range of use cases and business models that can be considered, it will be plausible that a 'cottage industry' of FES can be explored with different objectives and local needs.
3. If carbon storage and forest carbon offsets are considered as a primary economic opportunity, the regulatory requirements and MRV processes are well known (but inaccurate). Digital forests create a technological leadership and impact investment opportunity for the Great Lakes region.





American Forest Foundation, Family Forest Impact Foundation
\$10,000,000 Taxable Series 2022A (Green Bonds)

June 2023



“(FFCP) is going to maintain the place for 20 years, pay my light bill, insurance, and taxes. Plus, a little bit left over for other things I might want to do [on the land].”

GMF-enrolled landowner in Huntingdon, Pennsylvania



Family Forest Carbon Program (“FFCP”)

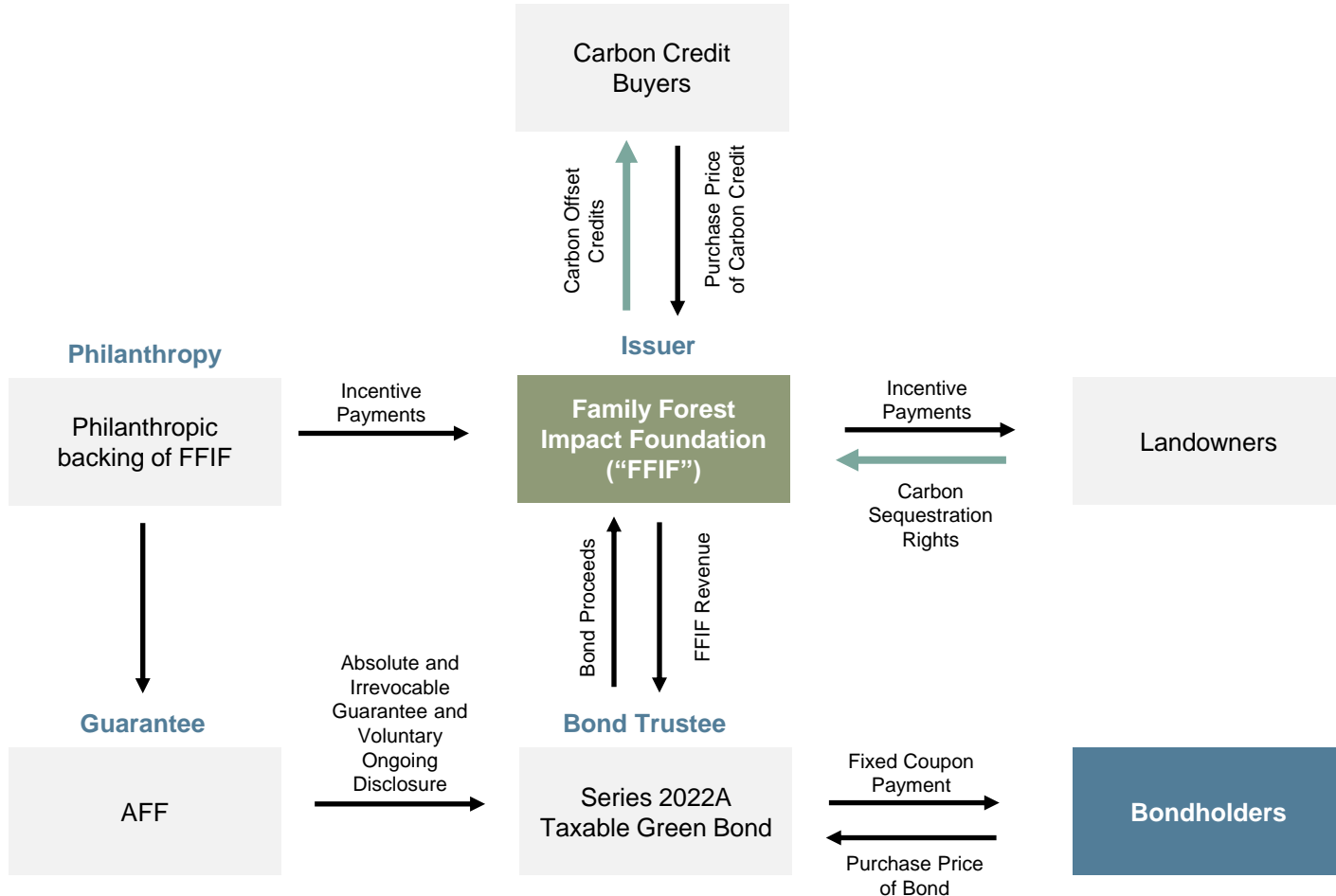
Producing high-quality forest carbon credits through an innovative methodology

- FFCP provides **technical assistance** and **financial incentives** to small landowners to adopt specific practices that **improve forest health** and **increase carbon sequestration** and storage
- By quantifying and monetizing the carbon benefit of those practices, FFCP aims to identify a sustainable and scalable model for improving conservation outcomes on family-owned forests
- FFCP was developed around an innovative forest **carbon accounting methodology**, created by AFF, TNC, and Terra Carbon
 - This reduces the cost of engaging landowners in carbon markets while also enhancing the accuracy, integrity and credibility of carbon measurements
- The development of a scalable mechanism to incentivize better management of forests could lead to **significant climate mitigation** and **democratize access to voluntary carbon market revenue**
- FFCP aims to simultaneously deliver meaningful co-benefits in the form of improved wildlife habitat, clean water resources, and sustainable wood supplies for strong rural economies



FFIF Green Bond: Flow of Funds

Debt service is funded by sales of carbon credits and guaranteed by AFF



FFIF Transaction: Overview

First IG Offering Solely Dedicated to the Development in the US Voluntary Carbon Offset Market

Transaction Overview

- On July 7th, 2022, Morgan Stanley served as Sole Bookrunner for the Family Forest Investment Foundation (“FFIF”), a wholly owned subsidiary of the American Forest Foundation (“AFF”), a Washington, DC based not-for-profit organization
- FFIF issued \$10 million Series 2022A taxable bonds (the “2022A Bond”) to capitalize the Family Forest Carbon Program (“FFCP”), which will serve to drive ESG investment in nature-based climate change mitigation activities
 - Family forests represent the largest portion of America’s forest land with over 300 million acres owned by individuals and families
 - FFCP executes on a strategy of marketable impact, aligning the ecological, social and economic benefits of conservation practices with market forces seeking direct investment and tangible mitigation on ESG priorities (e.g., carbon offset market)
 - The FFCP leverages the strengths of AFF and its implementing partner, The Nature Conservancy (“TNC”)
- Proceeds from the sale of the bonds are used to catalyze this first-of-its-kind carbon offset program:
 - Enrolling over 500 family landowners in FFCP, covering an area of 92,000 acres of Appalachian forestland
 - Providing incentive payments to participating landowners to engage in sustainable forestry, expected to result in 2.3mm tons of CO² being sequestered by 2044
 - Fund monitoring, reporting and verification of FFCP practices, including high quality, third-party verified carbon offsets to be sold in the voluntary carbon market, from which sale proceeds will be used to repay debt service on the bonds and other FFCP operations



FAMILY FOREST IMPACT
FOUNDATION

\$10,000,000

**Family Forest Impact
Foundation, LLC Bond**

*(a wholly owned subsidiary of the
American Forest Foundation)*

Taxable Series 2022A

(Green Bonds)

Rating: Baa1 (Moody’s)

Guaranty:



Sole Bookrunner:

Morgan Stanley

FFIF Transaction: Structure and Results

230% oversubscription and ESG orders

- The 2022A Bond is the first obligation under FFIF's **Master Trust Indenture (MTI)**, structured to permit flexibility in capital plan management, including bespoke security provided behind individual supplemental notes as the program expands
- AFF was established in 1941. AFF is providing an unconditional and **irrevocable guaranty** behind the 2022A Bond to provide a Baa1 rating
- The 2022A Bond received a "**Green Bond**" designation, with a Second Party Opinion providing by Kestrel Verifiers affirming compliance with Green Bond Principles
- The 2022A Bond had 34 roadshow views and three management calls, ultimately receiving **\$23 million in orders** across three different investors including **\$13 million of ESG-specific orders**



FAMILY FOREST IMPACT
FOUNDATION

\$10,000,000

**Family Forest Impact
Foundation, LLC Bond**
*(a wholly owned subsidiary of the
American Forest Foundation)*

Taxable Series 2022A
(Green Bonds)

Rating: Baa1 (Moody's)

Guaranty:



Sole Bookrunner:
Morgan Stanley

Partnership and Program Structure



Goals of the FFCP Bond Issuance

Catalyzing an accessible carbon market, empowering meaningful climate protection

- Carbon markets represent one of the **fastest growing tools to incentivize improved forest management** and provide landowners with the technical and financial assistance they need, however:
 - Small ownerships are blocked from carbon markets due to **high fixed costs** of measurement, reporting, and verification (“MRV”) of carbon benefits under existing carbon accounting methodologies
 - Furthermore, family landowners perceive carbon markets as **complex** and **uncertain**
- Through this bond issuance, **FFCP aims to catalyze a robust market** for family forest owners which will ultimately:
 - Reach **20% of family forest** owners in the U.S.
 - Place over **55 million acres** of land under improved management
 - Provide around **90 million tons** of climate mitigation annually, or roughly 1% of the total mitigation needed to limit global warming to the **1.5 degrees Celsius** target recommended by the Intergovernmental Panel on Climate Change
- FFCP aims to address traditional family forest market issues through two innovations:
 - A new **forest carbon accounting methodology** which reduces MRV expenses through statistically robust random sampling at the landscape level. This both addresses a key barrier while increasing the credibility of claims through a new approach to additionality
 - The provision of up-front, **guaranteed incentive payments** to landowners, thereby translating the complexity of carbon markets into a focus on practices that landowners can implement

FFCP Bond Issuance

FFCP represents an opportunity to achieve impact around climate mitigation and other sustainability outcomes

Use of Proceeds

- The issuance of this Green Bond plays a crucial role by funding the following:*



Outreach activities to develop program awareness



Incentive payments to adopt forestry practices that improve carbon storage and forest health



Technical assistance to landowners to enable implementation of FFPC practices



Monitoring, reporting and verification in order to generate third-party carbon credits



Marketing to institutional and corporate buyers of verified carbon credits ERPA



*Please refer to Appendix A for detailed notes on expense breakdown

Green Bond Designation

Second Party Opinion confirmation that issuance adheres to Green Bond Principles



External Reviewer: **Kestrel Verifiers**

Evaluation Date: June 24, 2022



“Based on our independent external review, the Family Forest Impact Foundation, LLC Bond Series 2022A (Green Bonds) conforms, in all material respects, with the Green Bond Principles (2021) and is in complete alignment with the Environmentally Sustainable Management of Living Natural Resources project category.”

Reporting

- *“The Family Forest Impact Foundation will provide annual reports on the status of the Family Forest Carbon Program*
- *Reports will be available on the Program’s website and will include: status of allocation of proceeds, total enrolled acreage, number of enrolled landowners, improved forest resilience and health metrics, diversity of plant and animal species, third-party verified carbon credits, and expansion of the Program into other regions”*

Impact and Alignment with United Nations Sustainable Development Goals

“By financing incentives for improved forest management practices for small landowners, the Series 2022A Bond supports and advances multiple UN SDGs, including:

- | | |
|--|-------------------------------------|
| SDG 9. Innovation, Industry and Infrastructure | SDG 13. Climate Action |
| SDG 12. Responsible Consumption and Production | SDG 15. Life on Land |
| | SDG 17. Partnerships for the Goals” |

GREEN STANDARD



Eligible Project Category:

- Environmentally Sustainable Management of Living Natural Resources



FFCP Methodology: Improved Forest Management (IFM) practice

Science-based standards guide site selection and certification

Verified Carbon Standards

- With the revenue from the sale of verified carbon credits being used to service debt, the program's success is contingent on the quality of FFCP credits and their acceptance by the market
- Utilizing Verra's official approval process, AFF and TNC have created an **innovative carbon accounting methodology** that advances the quality of forest carbon credits beyond most products currently available in the market
 - Verra is a non-profit organization that oversees the Verified Carbon Standard ("VCS")
 - Projects that are verified under VCS produce Voluntary Carbon Units ("VCUs")
 - VCUs are recognized in the market as legitimate for the purpose of carbon neutrality claims and aim to have a recognized role in the evolving space of corporate net-zero claims



Dynamic Monitoring

- Operating under VCS, FFCP will use a grouped project carbon accounting methodology that measures carbon benefits at a landscape scale, rather than isolating and tracking the specific benefit for every enrolled property
- FFCP carries out **remote compliance monitoring** at the landscape scale using Upstream Tech's Lens tool
- Although FCP also monitors compliance of landowners' contractual obligations 'on the ground, these **costs are reduced by sampling a random subset of properties**
- Properties are then matched to high-quality dynamic baselines developed from similar Forest Inventory Analysis (FIA) plots
- By managing the carbon benefit at a landscape scale, the program has **greater flexibility** to offer individual landowners shorter contracts that are more compatible with generational family planning



Initial Pilot Program in the Central Appalachians

“Growing Mature Forests”

In March 2020, FFCP launched a pilot program with landowners in the Central Appalachian region: “Growing Mature Forests” (GMF)

- When enrolled in GMF, landowners receive:
 - A free visit by a forestry professional to provide **expert guidance and consultation**
 - **Customized management plans** around specific needs
 - **Payments** to help reach unique goals
- In return, GMF requires a **20-year commitment** to engaging in sustainable harvesting practices

Program Results To Date

- As of June 2023, FFCP had enrolled **364 landowners** in the pilot, sequestering a combined **55,000 acres**, and making >\$13 million in landowner payments.
 - Through GMF, **FFCC validated and refined its sustainability hypotheses**, refining its financial strategy regarding landowner enrollment and technical expenses



Diversity, Equity & Inclusion

In addition to its climate mitigation and biodiversity goals, FFCP addresses important issues of equity

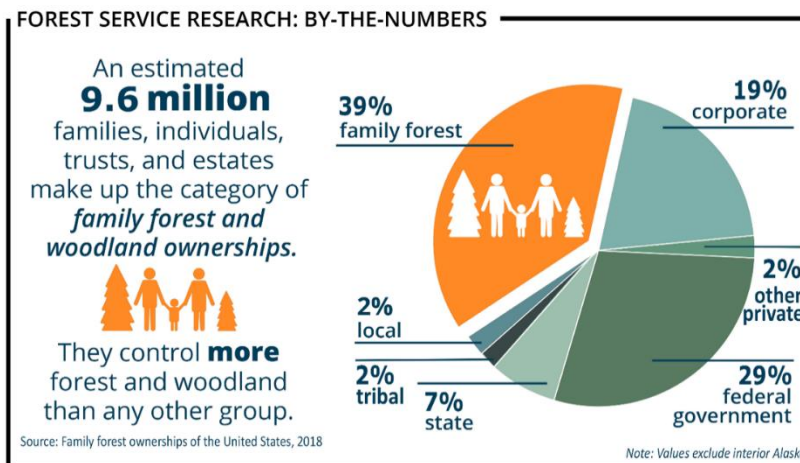
- Engaging underserved and underrepresented audiences, FFCP **empowers ownership within populations that have historically struggled to maintain their legacy**, providing access to additional revenue streams through the carbon markets
- FFCP gathers information regarding landowner demographics and cultural dynamics, particularly with respect to **race, gender, and socio-economic status**, defining certain landowner groups as for “Special Emphasis”
- The enrollment of such groups is prioritized, with FFCP setting an **annual goal of Special Emphasis Group participation**, reflecting their true respective representation in any given region
- Funds are earmarked for additional marketing resources, technical assistance and additional support in the services of enrolling Special Emphasis Groups, including **\$335,000 of this Green Bond’s proceeds**



Family Forest Owners

Family owners control a large share of the total acreage, yet manage a small share of forest carbon projects

- Small forest owners are **the largest forest owner class** in the U.S., owning 39% of forestland, but representing less than 1% of current forest carbon projects
 - Collectively, such owners manage approximately **272 million acres** of forests, an area roughly equivalent to the states of Texas and California combined
 - More than 80% of family-owned forests are less than 1,000 acres in size. With landowners facing **technical and financial barriers** to implementing sustainable management, these forests are susceptible to conversion to other land uses and degradation
 - These properties represent a critical financial asset, and management activities will often occur in conjunction with a life event requiring additional funds or along with intergenerational transfers
- With an 80-year history and national network of local partners, AFF has established credibility and trust as the **leading national conservation organization focused on family forests**
- AFF's flagship program, the American Tree Farm System, currently has **69,000 landowners enrolled**
 - Over the past five years, AFF has delivered targeted conservation outcomes on over 355,000 acres across a further 8,000 landowners





Innovative Finance for Forestry

Exemplary Forestry Investment Fund &
Detroit Tree Equity Partnership

June 29, 2023

Quantified Ventures works with pioneering organizations to design, capitalize, and scale investible solutions that improve the wellbeing of people and planet.



Delivering Return on Investment (ROI) + Impact



Design



Capitalize



Scale

Across 2 Groups and 10 Solutions



Environment and Resilience



Health and Human Services

Certified



This company meets the
highest standards of social
and environmental impact

Quantified Ventures specializes in designing innovative and scalable solutions



Structured and replicated the first-ever **Environmental Impact Bond** financing green infrastructure to deliver social and environmental outcomes in urban areas



Launched the first subsidiary, ReHarvest Partners, that **stacks carbon and water quality outcomes** to pay farmers to implement conservation ag best management practices through the Soil and Water Outcomes Fund



Developing an innovative **family focused recovery health outcomes fund structure to sustainably scale capacity to provide Social Determinants of Health and health-related social services** that will lower costs and improve health outcomes





CONSOLIDATE the project and impact narratives

- Quantify impacts, using existing reports and data
- Streamline the narrative to its core components
- Produce a technical memorandum and summary sheet

STRATEGIZE on the quickest path to your goals

- Build on your existing strengths and incorporate creative and innovative approaches
- Be vigilant and pivot quickly towards new opportunities

CONNECT to our network of capital providers and partners

- Find the partners that play the roles you need in your new strategy – technical expertise, investment, grants, etc.
- Workshop your capital strategy

SUPPORT your deal team and project team

- Build knowledge and capacity in your typical service providers to incorporate innovative approaches
- Create documents that enable getting creative capital

Capture Project Revenues

Calculating projected environmental, health, and economic project outcomes and determining the potential to ***borrow upfront with the sale of those revenues repaying the principal.***

Leverage Project Outcomes

Quantifying the projects' impacts, identifying which organizations benefit, ***securing financial support from those beneficiaries,*** and creating financial tools to facilitate transactions, when necessary.

Assess Appropriate Governance

Assessing appropriate governance structure(s) comprised of community and government entities that are empowered with the legal authority to ***engage in contract agreements, solicit public funds, and pass-through funding for target investments.***



Detroit Tree Equity Partnership

September 29, 2022

DRAFT 9.29.22

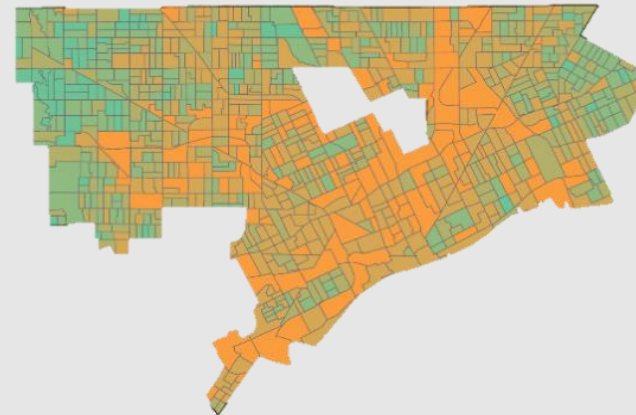


Detroit Tree Equity Partnership

Creating jobs, improving public health, addressing inequity, and building revenue by supporting the people and places of the City of Detroit.

Detroit's Tree Distribution

A map of tree cover is too often a map of income and race.





Detroit Tree Equity Partnership Value Proposition

- Invest \$35 million over an initial 5-year period
- Plant over 75,000 trees
- Train and employ over 350 Detroit residents



\$1:\$2

\$1 spent on DTEP generates \$2 in traditional economic activity



\$61MM+

In local economic activity over the 5-year DTEP pilot phase



\$3MM+

Additional annual property tax revenues from DTEP trees at maturity



Project Outcomes: 75,000 tree pilot

By planting 75,000 trees over 5 years, DTEP offers environmental, social, economic, and health benefits

Environment

Carbon:

- 152,000 tons of carbon sequestered over 40 year project cycle.

Stormwater:

- 75,000 trees can reduce the stormwater runoff in Detroit by 303 million gallons over 40 years.

Energy Savings:

- \$12 million saved in residential energy costs in 2022 dollars.

Health

Urban Heat Island:

- Street trees decrease temperature within 30 meters by 0.4-3.0°C
- Studies show that 1°C increase in temperature can increase all-cause mortality rates by 3-5.5%.

Asthma:

- Rate of childhood asthma decreases by 25% for every additional 340 trees per sq mile.
- Childhood asthma prevalence is 74% higher in Detroit than the rest of the state.

Economy

Economic Activity:

- Generate \$76 million in local economic activity and
- Support on average 108 jobs annually
- \$23 million in household earnings.

Property Value:

- Studies show that street trees add nearly 1% to property values.
- In Detroit, the DTEP program would generate an additional \$1.2 million in annual property tax revenues.

Investing in Shared Returns

Public funding

Inflation Reduction Act of 2022

\$1.5 billion for urban reforestation projects

Bipartisan Infrastructure Act of 2022

\$240 billion for environmental justice projects and \$47 billion for climate resilience projects

Philanthropy with long term benefits

Shared savings from program's widespread benefits

Improved health outcomes (reduction in asthma-related ER visits)

Reduction in flooding impacts

Economic activity + local job retention

Investments with ESG returns

Carbon credits

Locally generated carbon credits to offset corporate emissions

Stormwater credits

Financial partnership with utilities and other flood-impacted entities

DTEP: Exploring Investments in Shared Returns

Public funding

Inflation Reduction Act of 2022 **pending*

Bipartisan Infrastructure Act of 2022 **pending*

City of Detroit Public Works
\$500K/year

State Appropriation
**pending*

Philanthropy

Foundations, Detroit-area businesses \$1.15MM

Economic Development

New Markets Tax Credits
\$3.3MM

Revenues

Carbon credits
\$3.1 MM

Untapped Outcomes

Job creation
~150 new jobs

Stormwater runoff
84.4M gallons of avoided runoff

Public Health
10% increase in tree canopy = 10% decrease in asthma rates

Exemplary Forestry Investment Fund

Maine's North Woods is the core of the largest remaining mixed temperate forests¹ in the world, but underperforms ecologically and financially



Exemplary Forest Management aligns financial incentives with the long-term ecological needs of timberland, wildlife, and local stakeholder groups



Maine's North Woods are Globally Significant, and Need Patient Management

Problem

Too much of Maine's North Woods are **underperforming both ecologically and financially.**

Solution

Exemplary Forestry: Extend rotations, put value onto the land rather than extracting value from the land.

Opportunity

Leverage **Impact Investment** to create a pathway for financial and environmental returns to work in tandem.

What We're Doing is Simple



We **purchase** timberland and protects property with conservation easement



Employ Exemplary Forestry techniques



With time, **increase** timber stocking levels and growth rates



Focus on **Improving** carbon stocks, wildlife, and recreation opportunities



Aim to **capture** returns from land conservation and carbon



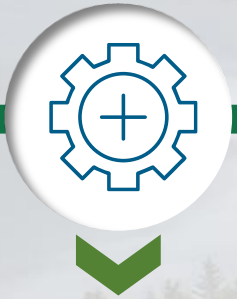
Goal to **capture** returns from timber stocking improvements and quality and land appreciation

Exemplary Forestry + Time = Greater Environmental and Financial Value



What's Unique?

Maine Specific



Focus on specific, nationally significant ecoregion with a history of conservation that is facing significant future threats.

Smaller Parcels



Targeting 3,000-20,000 acre parcels that are too small for large TIMOs, and challenging for land trusts and community forests.

Modernized Practices



Guided by science-based forest management guidelines (Exemplary Forestry Standards) vs. investor timelines.

Local Management



Maine Mountain Collaborative is a coalition of local conservation and forestry organizations in partnership with local land trusts.