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Financial Assurances for the Wilder Dam Relicense

Environmental Studies 50: Environmental Problem Analysis

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Clean Water. Healthy Habitats. Resilient Communities.

**Connecticut River
Conservancy**



In our work with The Connecticut River Conservancy (CRC), we aimed to understand and analyze The Federal Energy Regulatory Commission's (FERC) decommissioning requirements and the current state of the financial assurances policy process. We conducted thorough literature reviews and interviews with experts, discovering that not only do current decommissioning requirements merely amount to unplugging from the grid, but also that current financial assurance requirements are insufficient to cover costs associated with the lifecycle of the dam. To rectify this situation, we recommend that comprehensive financial assurances be placed on new dam licenses and licenses up for renewal.

1. Introduction

The Connecticut River Conservancy has long been committed to restoring and advocating for clean water, healthy habitats, and resilient communities to support a diverse and thriving watershed. A key part of CRC's mission involves removal of outdated and hazardous dams. To date, CRC has successfully removed twenty one dams, upgraded five culverts, and restored 424 miles of habitat. These efforts have had a positive impact on fish passage, flood resilience, dam safety, and water quality. However, the challenges associated with decommissioning and removing dams remain substantial. The financial burden of these projects is significant, with the total cost of dam removals in the U.S. from 1965 to 2020 totaling \$1.522 billion, and per-dam costs ranging from \$1 thousand to \$268.8 million, with median costs varying by dam height .

The Federal Energy Regulatory Commission (FERC) is an independent agency within the Department of Energy which regulates the interstate transmission of electricity, natural gas, and oil. Additionally, FERC is responsible for licensing the construction and operation of hydroelectric dams. The Federal Power act authorizes FERC to issue licenses “for the purpose of constructing, operating, and maintaining dams, water conduits, reservoirs, power houses, transmission lines, or other project works necessary or convenient . . . for the development, transmission, and utilization of power.” [\[2\]](#) This means that FERC holds significant influence over the management and regulation of hydroelectric projects across the United States.

Hydroelectric dams, such as those located at Wilder, Bellows Falls, and Vernon, play an essential role in the region's energy infrastructure. However, as these dams age, the need for effective decommissioning and comprehensive financial assurances becomes increasingly important. The costs and complexities associated with dam removal are influenced by factors such as dam height, annual average discharge at the dam site, and project complexity. Additionally, the ecological consequences of dam removal, such as changes to water and sediment flow and the potential invasion of exotic species, must be carefully managed to mitigate both environmentally costly and beneficial impacts.

This project focuses on analyzing FERC's decommissioning requirements and exploring the current state of the financial assurances policy process to ensure these structures are safely and effectively managed throughout their lifecycle. Comprehensive financial assurances are

crucial to address the financial burden on taxpayers, ensure thorough planning for long-term environmental restoration and socio-economic considerations, and improve enforcement and monitoring mechanisms. By requiring financial assurances as part of the 401 certification process under the Clean Water Act, states can ensure that adequate funds are available to address any environmental and safety concerns throughout the project lifecycle .

What are Financial Assurances?

A financial assurance clause of a hydroelectric dam license requires licensees to set aside funds for the following: dam decommissioning, dam failure, and/or retrofitting/adding climate adaptive infrastructure. Moving forward would require that FERC redefine dam decommissioning to require a licensee to both unplug their dam from the grid *and* to deconstruct the dam rather than “leaving project features in-place.”

Financial assurances are crucial mechanisms designed to ensure that the financial burden of dam decommissioning and associated environmental restoration does not fall on taxpayers but is instead covered by the operators responsible for the dams. Financial assurances would be used as a security measure should a dam failure occur. Although there is no way to completely eliminate the possibility of dam failure, the financial burden placed on the community and local governments would be reduced as licensees would be responsible for covering the costs- amount to be determined on a case by case basis- of damaged property, infrastructure, etc. The total costs for dam removals can range from \$50.5 million to \$25.1 billion, with significant variability based on factors such as dam height, annual average discharge, and project complexity (cite). These financial burdens underscore the importance of having robust financial assurances in place to cover these costs. They also would serve to minimize the ecological impacts of an idle dam which include but are not limited to temperature stratification, sediment accumulation, and transportation barriers. These ecological effects impact the livelihoods of community members as a result of a loss of recreational spaces or reduced populations of subsistence species.

Examples from other sectors illustrate the effectiveness of financial assurances. California has implemented strict financial assurance requirements for mine reclamation projects, which could serve as a model for hydroelectric dam decommissioning . Similarly, Michigan's increased scrutiny and financial assurance requirements for dam operators following the Edenville and Sanford dam failures highlight the critical need for such measures to prevent catastrophic failures and ensure public safety .

2. Methods

We utilized a combination of primary literature and expert opinions to formulate our report and infographic for Connecticut River Conservancy, as well as for our comment submitted to the Federal Energy Regulatory Commission. For the content of the report and infographic, we

identified two focus areas- the current state of financial assurances and the ecological and communal impacts of dams.

We began with speaking with our community partners at the Connecticut River Conservancy to understand the scope and focus of our project. Ms. Buckman and Ms. Uffer clarified how we could best aid their organization and provided resources about the process of dam relicensing. The primary resource was the Hydropower Reform Coalition's Citizen Guide for Effective Participation in Hydropower Licensing. The guide helped us understand the current state of licensing and how financial assurances might be incorporated. We were also given many helpful documents published by the CRC about the dams on the Connecticut River specifically, including an Appendix on Large Dams on the Connecticut River.

To assess the current state of financial assurances, we researched FERC publications and spoke with FERC employees. We read the transcript of the Technical Conference on Financial Assurance Measures for Hydroelectric Projects on April 26th, 2022. The conference included three panels of industry stakeholders: 1) Protecting Hydroelectric Facilities and Communities with Financial Assurance Requirements, 2) Establishing a Financial Assurance Requirement, and 3) Evaluating Mechanisms for Financial Assurance. The transcript provided a bedrock for our continued research— had FERC enacted any of the considerations they spoke about, how have the case studies referenced in the conference progressed since, etc. To our surprise, this conference was FERC's last official statement on financial assurances. We spoke with FERC wildlife professional Ryan Hansen and FERC recreation professional Rachel MacNamera to learn more. Both employees confirmed that FERC's position on financial assurances has not progressed since the 2022 conference. They were helpful in further understanding the overall process of relicensing, however, and helped explain the finances behind the Penobscot dam decommissioning.

To understand the ecological and communal need for financial assurances, we researched primary literature and spoke with Geography professors at Dartmouth college. We utilized google scholar and the Dartmouth library online catalog to find recent and trusted sources. To understand ecological implications, we consulted the information from many publications from the Journal of American Water Resources, the primary source being "Hydropower and Climate Change" and "Dam reoperation in an era of climate change." For the communal side, we read testimonials of citizens impacted by the Edenville dam failures in Michigan, in addition to tribal testimonials on dams. A 2023 study "Dams and tribal loss in the United States" was instrumental to our conclusions about how financial assurances could benefit indigenous people living by dams. We also spoke with Professor Fox and Professor Sneddon at Dartmouth's Geography Department. They showed us how their research examines the intersections of the ecology, community, and economy for hydropower. We utilized many of their publications in our report as well.

For our comment submitted to FERC, we researched FERC's comment process, read existing comments on the Wilder Dam, and spoke with Ms. Urffer and Ms. Buckman at the CRC. FERC's Guidelines on Submitting Comments was helpful in understanding how to communicate

our position advocating for financial assurances. We also read the comments submitted by the select boards of Hanover, Norwich, and Hartford, who were mostly concerned about riverside erosion and potential impact on the nearby park area. After talking with the CRC community partners, we submitted our comment!

3. Literature Review

Overview of current FERC decommissioning protocols

Currently, the FERC decommissioning protocols follow the commission protocols put in place to ensure optimal efficiency in the maintenance and care of hydroelectric facilities. For any hydroelectric projects construction or operation, the party in question applies for a license with the Commission. After this, the Commission gathers data and assesses the feasibility of developing said proposed project at the site that has been suggested. If accepted, the operating party will gain a license to operate the hydroelectric project for up to 50 years (*Federal Energy Regulatory Commission, January 30 2024*).

If there comes a time when the operating party would like to surrender the license, they must then file a request to the Commission. This request application has to be in accordance with section 6.1 of the Commission's regulations. For the application to be granted, each application must include the reason for surrendering the license, and a copy of the license and the amendments associated with the project. Particular points of interest involve the dam and its public safety, as well as its environmental resources. To paint the full picture the applicant must include all the project's features, including power plant layout, transmission lines, and how they will be disposed of.

The application must also include a plan on how to properly decommission the project. The decommissioning aspect can go one of two ways. Either to leave some of the project's features for other parties' use, or to remove the project in its entirety. Both of these options are mandatory to address the dam safety and any environmental concerns. For any projects on federal land, the operators are obligated to restore the land to a satisfactory state in the eyes of the Department. Once complete, the FERC will have 30 days to either approve or reject the decommissioning application.

Financial Assurances Policy Development

To protect multiple stakeholders who are affected by the potential hazards of dam failures, FERC has started discussing alternative features in the relicensing process to ensure that finances are available to properly conduct maintenance and potentially decommission a hydroelectric project. One of the proposed solutions is financial assurances. On the 26th of April

in 2022, FERC held a FERC staff-led conference to discuss the viability of requiring financial assurances in the relicensing process for hydroelectric projects (*Federal Energy Regulatory Commission, 2022 June 9*). Financial assurances are meant to ensure that licensees are able to carry out all the requirements in the license, and to make sure that they are able to either decommission or carry out the maintenance in a safe manner.

Post-conference, there were a few questions that emerged. What factors should be considered for the requirements to meet the financial assurances requirement (project age, safety hazards, natural resources, protection of the environment etc)? How should they protect against broader risks (aging infrastructure and climate change related environmental hazards)? How should impacts on communities be valued? Then the conference discussed aspects of the mechanism of financial assurances. How would the appropriate amount of financial assurances be determined based on risk? What methodology should be set to determine the required funding level, and should it be determined on a case-by-case scenario?

Finally, the methods of financing were discussed, and whether the licensees should use performance or surety bond (or bond bank); irrevocable letter of credit; individual trust, escrow, or remediation fund; or insurance policies or self-insurance. The issue becomes what the availability of the financial assurances are. In its March 13th 2023 Performance Budget report, Agency Performance plan, and Agency Performance report, FERC commented that after reviewing the feedback gathered from its 2021 NOI and 2022 conference, it would continue its initiative to consider financial assurance requirements for licensees.

State's 401 Certification Process

Under Section 401 of the Clean Water Act (CWA), a federal agency may not issue a permit or license to conduct any activity that may result in any discharge into waters of the United States unless a Section 401 water quality certification is issued, or certification is waived (*EPA, 2023 November 27*). States and authorized tribes where the discharge would originate are generally responsible for issuing water quality certifications. In cases where a state or tribe does not have authority, EPA is responsible for issuing certification. Some of the major federal licenses and permits subject to Section 401 include FERC

Dam Removals Effect on the Environment and Climate Change Impacts

When reviewing the incorporation of financial assurances, FERC also has to evaluate the effect the decommissioning of dams has on the environment. In a report by the National Oceanic and Atmospheric Administration in 2018 they concluded that dam removal causes severe changes to riverside plant communities (*NOAA, 2018, March 18*). As dams are removed, they are returned from reservoirs or impoundments to free flowing rivers and streams. But this dam removal causes changes to water and sediment flow. This will in turn affect the plant life that had

been growing in the reservoirs. This becomes especially prominent in shallow and sediment-filled areas that occurred after the dam's construction, some of which are over 200 years old. When this happens, there is a risk of losing wetland and river bank plant communities that provide ecosystem services, flood mitigation, erosion control, and wildlife habitat. In a study by a research team from Boston College in 2008, they observed the plant life changes after a dam removal of the Merrimack Village Dam in New Hampshire (*Lisius, G. P., Snyder, N. P., & Collins, M. J., 2018, February 7*). After almost a decade of research they found that in the wetland there was a substantial change in the vegetation community, going from one dominated by aquatic vegetation to one with terrestrial species. Furthermore, in the study they also mention a study in Wisconsin that observed an average 75% frequency of invasive species across 13 dam removal sites. In a study by Angela Bednarek from the University of Pennsylvania (*American Rivers, 2002 February*), she notes that dam removal can also have a short-term effect on turbidity and water quality issues. It is important for dam operators to take ecological impacts into consideration when decommissioning a dam, and provide proper finances to mitigate these issues. But there is a problem in evaluating the ecosystem, because it has no market value. How do you put a monetary value on the beauty of the plant vegetation around a dam? It is also important to note that climate change is going to continue to affect hydropower projects for the upcoming decades. A study by the journal Waters finds that by 2050, 61% of global hydropower will be in basins with high risk of experiencing risks for floods and droughts (*WWF, 2022, February 24*). In 2020, two Michigan dams were breached due to heavy rainfall, causing evacuations of nearby cities and causing nearly \$200 million in damages (*Michigan Public, 2022 May 6*). The American Society of Civil Engineers recently released a report card of different infrastructure in the US, giving hydroelectric projects a “D” and issuing a statement that nearly 16,000 aging dams in the US needed repairs (*ASCE, 2021*). How do you evaluate financial assurances in terms of a dam's effect on the environment, and the potential damage climate change can have on the dams? However, there is one solution through Ecosystem Valuation Methods (EVM).

There are today sophisticated and intricate Ecosystem Valuation Methods (EVM) by professional economists that could be utilized to assign value to the environment in connection to hydroelectric projects. This allows non-consumptive aesthetics, preservation, and recreational uses to also be accounted for in monetary value (*Resources for the Future, 2018 December*). Whether these EVM's should be accounted for in valuation is still a debate in the US.

Results and discussion

During our research, we realized that there has been a clear stagnation in the FERC's development of financial assurances. The conference that was held in 2022 was the last discussion that was open to the public and since then there has not been much traction on the matter. In both the FY2023 and FY2024 preview report, FERC stated that they are still considering financial assurances - and plans to further investigate its use. This was the exact same comment that was issued during the 2022 conference, highlighting the lack of progress

over the past two years. Furthermore, the questions that were being raised in that conference still need to be answered to advance the implementation of financial assurances. What will the funding look like? What factors should be considered in the assessment of financial assurances? Would there be a case-by-case scenario where each project is assessed on an individual basis, or should there be a uniform solution for all hydroelectric projects? During our interview with two FERC employees, they were very helpful in guiding us through the current decommissioning process. However, whenever we asked questions about financial assurances they would either respond that they did not know much about financial assurances - or that they wished to not comment on the matter.

FERC is facing a tricky situation. In its relicensing process it has to balance the value of the electricity output of each hydroelectric plant with the value of non-market values such as the environment, aesthetics, and recreational activities. During the time period between 1997 and 2005, FERC went through substantial reforms in their licensing process. They opted to reject non-market valuation for the ecosystem in comparison to their valuation of the electricity production capabilities of the dams. This decision has led to some heavy criticism for FERC. When the Yuba-Bear Drum-Spaulding (YBDS) hydroelectric facilities had run out of its initial 50-year license with FERC. FERC immediately relicensed YBDS, which came under heavy scrutiny (*Viers, J. H, 2011 August*). Each year, approximately 463 million cubic meters of water is expropriated from the dam. This could leave many rivers and streams in the nearby vicinity to be left barren. As mentioned earlier, climate change is going to keep affecting the safety of hydroelectric projects. With an increased risk of heavy rainfall, droughts, and tornados, the safety and stability of these dams in the event of a weather hazard needs to be secured.

When looking at America's Society of Engineer's report card, it becomes even more evident that the relicensing project for hydroelectric projects needs reshaping. There is no guarantee that operators can credibly justify that they can completely cover all the costs associated with these dams. In the case of the Michigan dams, \$200 million in coverage. Or in the case of America's Society of Engineers, that 16,000 dam operators can cover the cost for repairs and heavy maintenance of their dams. The failure of the Michigan dams is the whole reason that FERC initiated their exploratory process into financial assurances. In a staff presentation on financial assurance methods for hydroelectric projects in 2021, FERC stated: "As demonstrated by the dam failures near Midland, Michigan, in May of 2020, non- operational or non-compliant projects can pose public safety and environmental hazards in the event of a dam failure or breach. While significant dam failures have fortunately been very rare, Commission staff is aware of a number of projects that are non-operational or out of compliance with their license conditions and where licensees have stated that they cannot afford to operate or maintain the projects or implement the required environmental or safety measures" (*Federal Energy Regulatory Commission, 2021 January 21*). Furthermore, the study from the Merrimack Village Dam highlights the environmental effects that occur when dam decommissioning happens. Financial assurance adds a tool that can mandate the financial power necessary to cover for any events. Also, including the method discussed earlier, EVM's, into the relicensing process can

help dam operators protect all stakeholders affected. This will not only help the community, but the environment that is affected by the decommissioning of dams.

4. Conclusion

In our work with The Connecticut River Conservancy (CRC), we aimed to understand and analyze The Federal Energy Regulatory Commission's (FERC) decommissioning requirements and the current state of the financial assurances policy process. Through thorough literature reviews and interviews with experts, we have identified significant gaps and challenges in the current regulatory framework.

Our research revealed that the financial burden of dam removal is substantial, with costs ranging from \$1 thousand to \$268.8 million per dam, depending on various factors such as dam height and project complexity. This underscores the need for financial assurances to prevent these costs from falling on taxpayers. Additionally, we found that FERC's decommissioning protocols primarily focus on immediate logistics rather than long-term financial and environmental impacts, highlighting the necessity for more comprehensive planning and improved enforcement and monitoring mechanisms.

Financial assurances provide several advantages, such as ensuring that the costs of dam removal and decommissioning do not fall on taxpayers but rather on the responsible operators. They promote comprehensive planning and accountability, encouraging decommissioning plans that address long-term environmental restoration and socio-economic considerations. Additionally, financial assurances can mitigate risks associated with dam failures, protecting local communities and ecosystems from potential hazards, and support necessary modifications to dams to handle climate change impacts. However, implementing financial assurances can increase operational costs for dam operators, potentially leading to financial strain, especially for smaller operators. The process of assessing, implementing, and monitoring financial assurances can also create additional administrative burdens for both operators and regulatory agencies. Moreover, determining the appropriate amount of financial assurances is challenging due to uncertainties in predicting future costs and environmental impacts.

The ecological consequences of dam removal, such as changes to water and sediment flow and the potential invasion of exotic species, must be carefully managed. Our findings suggest that incorporating Ecosystem Valuation Methods (EVM) into the relicensing process can help account for the environmental costs associated with dam operations and decommissioning. Climate change poses additional risks to hydroelectric dams, including increased variability in precipitation patterns and more frequent extreme weather events, necessitating modifications such as increased spillway capacity and structural reinforcements.

The current stagnation in FERC's development of financial assurances is a critical issue. Despite the discussions held during the 2022 conference, where it was found that there was significant support for the necessity of financial assurances to ensure the safe and effective management of hydroelectric projects, there has been little progress in implementing these measures. Key findings from the conference highlighted the need for a standardized methodology to assess risk and determine appropriate financial assurance amounts, considering factors such as project age, safety hazards, natural resource protection, and climate change-related risks. Additionally, the conference identified several potential mechanisms for financial assurances, including performance or surety bonds, irrevocable letters of credit, individual trusts, escrow accounts, and insurance policies. However, there was considerable debate about the financial burden these measures could impose on smaller operators, which has contributed to the lack of clear and urgent action from FERC. Our interviews with FERC employees revealed a lack of clarity and urgency regarding financial assurances, further emphasizing the need for standardized methodologies and clear guidelines.

To address these challenges, we propose that financial assurances be integrated into the 401 certification process under the Clean Water Act. This approach would ensure that adequate funds are available to address environmental and safety concerns throughout the project lifecycle. States like California and Michigan have already implemented stringent financial assurance requirements for other sectors, which could serve as models for hydroelectric dam decommissioning.

In conclusion, implementing comprehensive financial assurances is essential for mitigating the substantial costs and ecological impacts associated with the decommissioning of hydroelectric dams. This approach will not only safeguard the environment and local communities but also provide a more sustainable and accountable framework for managing these critical infrastructures in the face of aging infrastructure and increasing climate change-related risks. Future research should focus on developing standardized methodologies for assessing financial assurance requirements and exploring innovative financing mechanisms to ensure the financial stability of hydroelectric projects.

5. Group Reflection

Beginning with the idea of a group charter, our group dynamic has fortunately been characterized by active communication and engagement. Though this seems like a prerequisite for any group assignment, we have all had the experience of having one or two group members leaving us high and dry at the most inopportune time. Laying out the expectations we had, traits we desired, and strengths we possessed put us in a position to better understand one another and determine how we would be able to best make use of each of our talents to achieve our goals. It was pleasant to see how each and every one of us was equally invested in our success not only in

turning assignments in on time but also in holding one another accountable for equal work distribution and in providing aid whenever one of us needed it. Even in times of confusion, our discussions seemed fruitful. There nary was a time we sat idle as someone was always willing to inquire about our points of confusion or ready to construct an agenda of tasks that we could be working on in the meantime.

In initiating our group work, we found the strategies regarding conducting interviews to be especially helpful. They were a staple in our findings and in orienting our dam failure (as a result of climate change) research. Our research design, best described as a synthetic study, also included an interview with our community partners as well as the industry they have had difficulty working with, FERC.

For most of us, this was the first time collaborating with a community-led organization. We were not certain of what to expect. That being said, it would be remiss not to address that there were times that certain tasks felt a bit daunting which could accurately be attributed to the pressure we felt to provide thoughtful and informative work. This was not exclusive to any singular assignment. This experience also felt a bit odd since in many other courses we have taken in the ENVS department there is an emphasis on the importance of strong community partnerships. With none of us being from the area and with little to no knowledge of conflicts faced by community members, we felt a bit like outsiders looking in. Community members do not always take too kindly to *experts* in a given field inserting themselves into the conflict plaguing their community but taking the approach of working with a community organization rather than attempting to help community members directly- whatever that may have looked like- helped to avoid this issue. Though we are grateful to have had the opportunity to work with the CRC, there are some modifications that could be made for a more synergistic process. To facilitate more frequent communication and also minimize the amount of uncertainty we felt when tackling each deliverable, setting up “checkpoints” in which we would receive feedback on our drafts and progress would have been helpful. It would also ensure that we are addressing the CRC’s concerns in the way they had anticipated. Among other challenges we faced was having a late start. The scope of our project was introduced to us later than would have been ideal.

Incorporating the debate into the course structure posed a unique challenge for all the members of the group, and while we enjoyed the opportunity to challenge ourselves to expand our understanding of financial assurances in a new medium, we found that the structure of the debate and its position in the class schedule posed a unique challenge to working on our final project deliverables while preparing a coherent and well-rehearsed final debate. We also found that the style of the debate constrained our ability to make our research fully applicable to our final research project. For the negative team, having to debate against financial assurances, and the research that was conducted accordingly, were generally not useful for our team’s end product. Additionally, the style of the debate meant that teams needed to define clearly outlined stances, which were opposed to one another. While useful in a debate context, this perspective was not the most useful when developing a fuller understanding of the issues surrounding financial assurances. While most debate styles may have this problem, if instead of a cross-ex

format, we adopted a more collaborative style that allowed for compromise, it might have allowed for the research pieces to be more useful in our final project deliverable. Nonetheless, being able to engage in a well-researched debate was an excellent experience in working on speaking extemporaneously about a topic we were all passionate about and familiar with.

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Hydroelectric Dam Relicensing and the 401 Certification Process: Education and Advocacy for the Connecticut River Conservancy

Final Report

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Introduction

In the past few years, Great River Hydroelectric (GRH) and FirstLight Power filed amended license applications to the Federal Energy Regulatory Commission (FERC) for the relicensing of Wilder, Bellows Falls, Vernon, Northfield Mountain, and Turners Falls hydroelectric facilities located on the Connecticut River. As part of the application to FERC, these companies are required to apply for Section 401 water quality certifications from the states that have jurisdiction over the parts of the Connecticut River that these hydroelectric facilities impact.

The “401 process” refers to the fulfillment of the requirements of Section 401 of the Clean Water Act, which gives states and authorized tribes the authority to grant, deny, or waive certification of proposed federal licenses or permits that may discharge into waters of the United States. In the case of the aforementioned hydroelectric facilities, the federal action catalyzing the 401 process are the amended license applications filed by the two companies. In making decisions to grant, grant with conditions, or deny 401 certification requests, certifying authorities, such as the Vermont Department of Environmental Conservation (VDEC) or the New Hampshire Department of Environmental Services (NHDES), determine whether the federally licensed activity will comply with applicable water quality requirements. These water quality standards are, per Section 303 of the Clean Water Act, required to be established by each state, territory, and authorized tribe, and thus differ by geography. Generally, though, water quality standards in every state categorize waters in each state for certain “designated uses,” including aquatic habitat, aesthetics, and recreation. Thus, certifying authorities involved in the 401 process ensure that licenses granted will allow waters to support these uses.

We were engaged by the Connecticut River Conservancy, an organization that works in New Hampshire, Vermont, Massachusetts, and Connecticut, to develop educational materials with the goal of engaging the public in commenting on the states’ 401 water quality certificates for dam relicensing. For the CRC, this public commenting period represents a critical opportunity to advocate for a number of goals related to the relicensing of the hydroelectric dams. Specifically, the CRC wants companies operating the dams to: adopt erosion control plans to address bank erosion, stabilize banks, and compensate landowners for loss of land; establish long-term monitoring and assessment of how sediment will move in the river due to operational changes over the next license; create comprehensive improvements to recreation access and provide state of the art Americans with Disabilities Act (ADA) compliant recreation amenities along the entire 175 miles of river; set the shortest possible licensing term (i.e., 30 years as opposed to 50); make immediate upgrades to fish ladders to protect impacted species of fish; prioritize protective land management, which includes conservation easements, management of terrestrial and aquatic invasives, and improvements to habitat and riparian buffers; and develop education about and protection of indigenous cultural resources related to the river. As a result, the educational materials developed in the course of this project were aimed at both educating the public about the 401 process, water quality standards, and impacts on water quality from dam relicensing and also encouraging and empowering the public to advocate for reforms during the public commenting process.

In this report, we outline our process for developing these education materials; discuss our findings related to the 401 process, water quality standards in three states—New Hampshire, Vermont, and Massachusetts—and impacts on water quality from dam relicensing; and discuss

limitations of this project and future directions it could take. We hope that the education materials we developed in the course of this process will assist the CRC in their advocacy efforts, increase stakeholder engagement in river governance, and ultimately improve the water quality in the Connecticut River watershed.

Methods and Activities Conducted

In an effort to create the most high-quality educational materials in alignment with the CRC's expectations, we used three main research and data-gathering methods on which to base our analysis:

1. Frequent, clear communication with our community partners at the CRC, Kate Buckman and Kathy Urffer,
2. An extensive review of institutional publications and peer-reviewed literature, and
3. Interviews with experts in the areas of Environmental Law and Hydroelectric Dam Ecology.

This three-pronged methodological framework provided a balance to our data collection and research, allowing our team to tap into local knowledge on pertinent, timely issues as well as grounding our recommendations with research-backed findings.

Communication with Community Partners

To ensure the most clarity and efficiency throughout our project, our team prioritized frequent communication with Kate Buckman and Kathy Urffer, our liaisons at the CRC. Serving as consultants to help them strive toward fulfilling their mission statement and increasing stakeholder engagement in the environmental governance of the Connecticut River, it was paramount to keep Buckman and Urffer in the loop during all steps of our process. On a practical level, this communication took the form of regular Zoom meetings, email updates on our progress, and email threads asking for feedback as needed.

Our team saw the creation of effective educational materials as an iterative process: in order to create a deliverable most useful for the CRC, not only was it likely helpful for the CRC to know what our plans were on a weekly basis, but it was also useful for our team to receive feedback from the CRC to create a better work-product. For example, after finishing our first drafts of our educational brochure for both Vermont and New Hampshire, our liaisons at the CRC provided incredibly useful feedback to incorporate in our next draft. For example, Urffer and Buckman shared with us a style guide for CRC communications compiled by their Communications Director Diana Chaplain, which helped us ensure the brochure's layout, style, and format matched those of the CRC's other published materials. These formatting changes might have taken us several more iterations to complete had we not maintained a constant stream of communication with our community partners, but since we were proactive in asking the CRC for feedback, it saved both our team and our community partners time and effort. Urffer also provided us with feedback related to the tone and content of the text of our brochure: "We want to go for short, pithy, exciting, urgent, and engaging text," she noted in an email, and provided us with suggestions for simplifying some of the longer, denser paragraphs of our brochure. Though it was constantly a challenge throughout our project to explain complex regulations, such as the 401 certification process and water quality standards, as well as ecologically complex topics, such as sedimentation or dissolved oxygen issues as they relate to hydroelectric dams, in the

limited space we had on a trifold brochure, Urffer’s message encouraged us to consider our audience and how to most effectively communicate our information in a way aligned with the CRC’s advocacy mission. Urffer and Buckman were also able to share with us materials that were not available in the public domain. For example, an intern for the CRC currently studying at Vermont Law School had recently produced a comparison of water quality standards in Vermont and New Hampshire which helped us to highlight the differences in these standards on our brochures for each state.

Institutional Publications and Peer-Reviewed Literature

A crucial part of our research was reviewing academic literature and other relevant sources. To cover multiple aspects of the project, we break down the scholarly research we reviewed into the three parts of our brochure which required intensive research—the 401 water quality certification process, water quality standards, and dam impacts on water quality—as well as the literature we reviewed concerning environmental communications.

To better understand the 401 water quality certification process, we primarily referenced materials from government agencies. An important resource in this part of our research was the Environmental Protection Agency’s (EPA) site published on Section 401 of the Clean Water Act (CWA), where they provide an overview of the Act, as well as the public commenting process associated with 401. This page explains that a federal agency may not issue a permit or license to conduct any activity that may result in any discharge into waters of the United States unless a Section 401 water quality certification is issued, or certification is waived (US EPA, 2019). It also provides evidence that FERC licenses for hydropower facilities are considered a “major federal license or permit” subject to the requirements of Section 401. We further leveraged materials produced by state agencies, which provided a more context-relevant background on the 401 process and information on the ongoing permitting process. The Vermont Department of Environmental Conservation (VDEC), for example, has an extensive page explaining GRH’s relicensing process, and it even includes the 401 applications they already submitted to the state (*Great River Hydropower 401 Water Quality Certification Application | Department of Environmental Conservation*, n.d.). The applications provided on the page were particularly helpful by providing information on how the company plans to mitigate harms associated with hydroelectric dam operation, such as by installing fish ladders and recreation enhancements (e.g., hiking trail, picnic areas, fishing access) at the dam site; it also describes other proposals for operational improvements designed to “create more stable reservoir water surface elevations [and] reduce the magnitude of changes and the frequency of sub-daily changes in discharge from the project.” These proposed changes gave us insight into the areas of dam operation which GRH believes are most vulnerable for criticism.

These federal and state agency sources were also helpful in providing information on water quality standards. To understand how water quality standards are set, we referred to the EPA’s page on Section 303 of the CWA, which requires states, territories, and authorized tribes to set water quality standards (US EPA, 2015). This helped us comprehend the geographic differences in water quality standards and the EPA’s review process to ensure standards do not negatively impact downstream states. Furthermore, PDFs of the water quality standards from the VDEC website provided us a starting point for understanding water quality regulations: though it was difficult to piece through the legalese at times, we were able to understand that all water quality regulations are organized by classifying waters for “designated uses” (*Water Quality*

Standards | *Department of Environmental Conservation*, n.d.). For example, one designated use is “the use of waters for the enjoyment of aesthetic conditions” while another is “aquatic habitat to support aquatic biota, wildlife, or plant life.” The EPA provides a similar page on surface water quality standards in New Hampshire, where we noticed that its water quality standards were notably more vague: for example, pH for all waters in Vermont must be maintained at a value from 6.5 to 8.5 while certain waters in New Hampshire may have any pH level “as it naturally occurs” (US EPA, 2014). This flexibility in language may lead to varied legal interpretations, a point we explore further in the Results section.

To understand how hydroelectric dams impact water quality, we consulted peer-reviewed articles and textbooks. Schmutz and Sendzimir, for example, provide an overview of the impacts of dams on river ecology, stating that primary concerns are “the interruption of river continuity (longitudinal and lateral, fish migration, sediment and nutrient transport), siltation of river bed and clogging of interstitial, homogenization of habitats, downstream river bed incision, alteration of river/groundwater exchange, [and] downstream flow and water quality alteration” (Schmutz, S., and Sendzimir, J., 2018). While this provided us with a broad and comprehensive understanding of how dams impact water quality, Schmutz and Sendzimir do not differentiate between dams and *hydroelectric* dams and also discuss some impacts outside the purview of the 401 certification process, which focuses solely on water quality. For more context-relevant sources, we reviewed an article titled “Environmental Impacts of Hydroelectric Power Plants,” which specifically discusses the environmental impacts of hydroelectric dams in the Susquehanna River (another river in the Northeast), as well as an article by Kennedy et al., which explored how the largest dams in the Connecticut River watershed have altered the natural flow of water and how operational changes could restore the ecosystem’s health. We learned from these reports that some of the ecological concerns we learned about in *Riverine Ecosystem Management* were not relevant in the Connecticut River context, such as eutrophication, while others were more prevalent, such as sedimentation, a decrease in dissolved oxygen, and thermal pollution (El-Shamy, 1977; Kennedy et al, 2018). We also referenced literature on specific environmental issues associated with hydroelectric dams, such as a report prepared for the Department of Energy titled “Assessment of Dissolved Oxygen Mitigation at Hydropower Dams Using an Integrated Hydrodynamic/Water Quality/Fish Growth Model”; although we appreciated the specificity and complexity of reports such as this, they had only limited utility for the purposes of developing our brochure, where limitations related to our audience’s scientific literacy and the limited space we had to describe these ecological concerns prevented us from describing them at length.

In developing our brochures, relying upon the literature on environmental communications was also valuable in helping us to understand our audience and how to frame the information we provided. One article described, in the context of European river restoration efforts, how residents use three distinct frames to give meaning to these projects: “(i) an attachment frame, focusing on cultural heritage and place attachment, (ii) an attractive nature frame, focusing on nature as attractive living space and the intrinsic value of nature, and (iii) a rurality frame, focusing on rural values, agriculture and cultural heritage” (Buijs, 2009). We found further evidence for such an approach in the literature about science communications; Burns et al., for example, argue in *Science Communication: A Contemporary Definition* that effective science communications produce one or more of the following personal responses to science: awareness, enjoyment, interest, opinion-forming, and understanding (Burns et al., 2003).

This literature prompted us to make our brochures more personal and helped us to make sense of feedback we received from the CRC related to the tone and aims of the brochure. Though our initial drafts of the brochures had been rather dry and purely informative, the CRC pushed us to include more language in the brochures about why our audience should care about hydroelectric dam relicensing (i.e., “these dams generate significant profits by harnessing our river’s power, so it’s only fair that some of those profits are reinvested to protect and provide access to the river!”). Such literature also prompted us to include more images in the brochure: though our initial drafts had much text and limited pictures, our later drafts included more images of the river to evoke an emotional response about the river and enhance visual appeal.

Expert Interviews

To supplement our communications with the CRC and our literature review, we also conducted in-person interviews with experts in the areas of Environmental Law and Hydroelectric Dam Ecology. As students completing our majors in Environmental Studies at Dartmouth, our group members were fortunate to have personal contacts with Dartmouth professors who specialize in issues pertinent to our project at our fingertips. To better understand the 401 process and water quality standards, we interviewed Professor Ross Jones, who holds degrees in Evolutionary Ecology (Ph.D) as well as in Law (J.D.), and lectures at both Dartmouth and Vermont Law School. Professor Jones has experience with environmental issues and energy generation in the context of the Connecticut River, as he researched scientific data and theories in environmental litigation with a focus on the effects of thermal discharge by the Vermont Yankee Nuclear Power Plant on the Connecticut River ecosystem. To better understand the impacts dams have on river ecology, we interviewed Professor Christopher Sneddon, who has extensively published on dams, including about dam removal and subsequent river restoration, as well as particularly about dams in the Mekong River Basin. Though we wanted to additionally interview Judith Houston, a Water Quality Planning Section Supervisor at the NHDES, as Urffer and Buckman suggested she could be a helpful resource, she needed to receive approval from her supervisor, who was on vacation during the time we were completing our project, in order to speak with us.

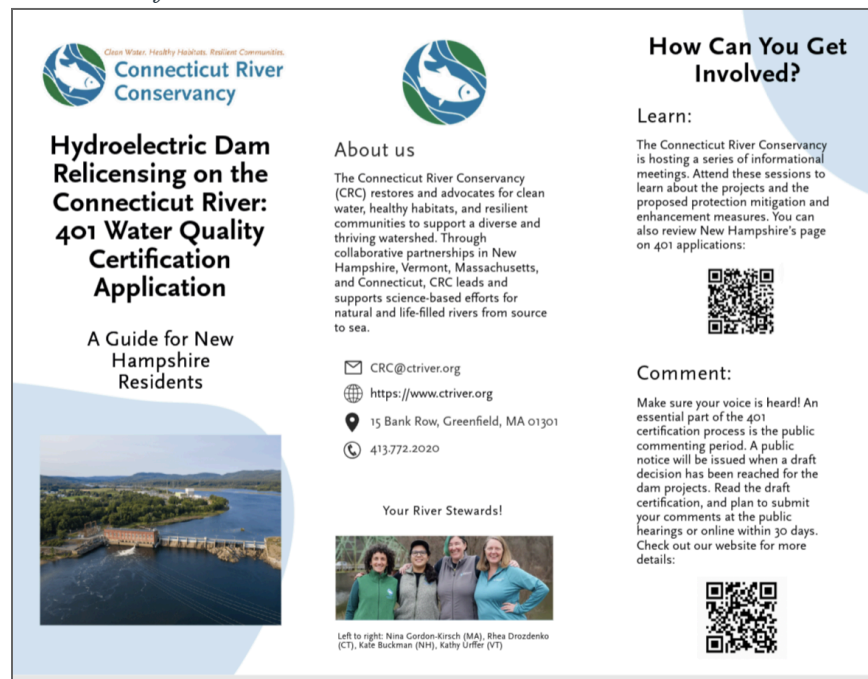
Results and Discussion

The extensive research process led to three separate deliverables: one educational brochure for each of the three states—New Hampshire, Vermont, and Massachusetts—where hydroelectric dam relicensing is taking place. The first deliverable we produced was utilized as the base for all three of the pamphlets, and differences between the states, such as the informational resources available and local water quality standards, were taken into account during a secondary phase of adjustment. Following suggestions made by the CRC in our regular meetings, we limited the text on the brochures as much as possible to allow the information to be as digestible as possible for the broader public. Thus, concision, as well as careful vocabulary and phraseology, was crucial to best communicate the more complex information. The key pieces of information we included in the first side of the pamphlet are as follows: an introduction to the CRC as an organization, QR codes for easy access to more information and opportunities to participate in the public commenting process, and a brief description of why the population living near the watershed should care about this issue. While we reviewed extensive data found regarding the intricacies of thermal pollution on biotic populations, we understood that such information would not necessarily be the most helpful to gain the attention and engagement of

our audience from a wide variety of backgrounds. Thus, the primary focus of the pamphlet was shifted to issues that impact the people more rather than the niche environmental impacts of dams. However, we included additional resources, such as links and QR codes, to make broader information available to those interested. Thus, the base of the pamphlet that all three pamphlets included was a QR code for more information, as well as an introduction to the organization and a brief section of why people should care about this issue.

The pamphlets were all organized the same way, in a tri-fold manner. The following images illustrate the final deliverable we produced, with the first image illustrating the front cover on the left, the back cover, and the outside fold on the right. These sections focus mostly on the CRC as an organization and provide resources for those interested in getting involved in the public commenting process. As shown below, the QR codes allow readers to both learn about the informational meetings to gain more information and also utilize the CRC website to learn more about the subject.

Figure 1
First side of deliverable




Note. Panels context, left to right: front cover, back cover, outside fold.

The image below shows the second side of the pamphlet shown when the pamphlet is opened fully. The first panel on this pamphlet provides background information on the dam relicensing process and a map of the five dams being relicensed. In our meetings with the CRC, it became clear that it was crucial in this background not only to provide a quick overview but also to attempt to garner an emotional response from the audience; thus, we added a final sentence to hopefully elicit such a response: “these dams generate significant profits by harnessing our river’s power, so it’s only fair that some of those profits are reinvested to protect and provide access to the river!” There are many ways for people to learn information, but this pamphlet was designed with the hope of not only providing information, but reminding residents of Vermont, New Hampshire, and Massachusetts that these dams impact their lives in a

significant way and that, because there are outlets for the public to input their opinions, they should, regardless of their opinion, participate in these public forums to engage in collective governance over the Connecticut River. The next panel goes into more detail on the 401 process to provide more information on how the Clean Water Act relates to hydroelectric dam relicensing and on the water quality standards in each state. We wanted to zoom in on what each state values in their water quality standards and how that relates to why this issue should be important for the citizens living in those states. For example, in the New Hampshire pamphlet included below, there is a segment on ecology, emphasizing the importance of the environmental aspect of halting dam relicensing, and another segment on recreation, highlighting the ways that dams may affect access to social and cultural activities. Finally, the last panel, which addresses the impacts of water quality, is organized in a manner to correspond one-to-one with the section on water quality standards: thus, it too includes one section on ecology, and another section on recreation. This organizational scheme was not only convenient but intentional, as we designed it to aid the audience in generating responses during the public commenting period, in which members of the public have the opportunity to raise questions and concerns about how the dams seeking relicensing will comply with relevant water quality standards. A member of the public might notice, for example, that water quality standards in New Hampshire require hydroelectric dams to ensure adequate access to recreational opportunities on the Connecticut River; the panel on the far right might prompt this individual to raise a concern in the public commenting about how the dam operators will increase access with the new license. In this section, although we found many academic sources detailing the negative impacts of dams on ecology, we focused on the negative impacts most pertinent to the people living along the watershed and simplified the language for comprehension.

Figure 2
Second side of deliverable

Background Information	What is the 401 Process?	Hydroelectric Dam Impacts on Water Quality
<p>Great River Hydroelectric (GRH) is applying to relicense the Wilder, Bellows Falls, and Vernon hydroelectric facilities located on the Connecticut River. As part of the relicensing process, they must apply for a Section 401 water quality (WQ) certification from the State of New Hampshire. These certifications last up to 50 years and will affect 124 miles of the river! The public commenting period of the 401 application is your opportunity to make your voice heard about the impacts of these hydroelectric dams on river ecology and recreation opportunities: these dams generate significant profits by harnessing our river's power, so it's only fair that some of those profits are reinvested to protect and provide access to the river!</p>	<p>Under the Clean Water Act, the State of New Hampshire has the right to protect water quality in the face of a federal action. The Wilder, Bellows Falls and Vernon hydroelectric facilities are about to receive a new license from the federal government to operate for the next 40 years. As part of this process, GRH was required to apply for a 401 WQ certification. Whatever is required as a condition in this certification automatically becomes part of the federal license.</p>	<p>Ecology</p> <ul style="list-style-type: none"> Dissolved Oxygen: Dams can reduce dissolved oxygen (DO) by slowing water down and trapping organic materials and sediment. DO is essential for the growth and reproduction of aerobic aquatic life, such as fish and invertebrates. Thermal Pollution: Dams can cause thermal pollution in rivers by altering water temperature patterns and releasing cold or warm water. Water temperature is a critical environmental parameter for aquatic habitats. Sedimentation: Because dams are built to store water, they also store the sediment that all rivers carry. Managing this sediment is a significant challenge for dam operators.
<p>Water Quality Standards in NH</p> <p>In New Hampshire, waters are classified based on their designated uses to ensure they meet specific quality standards for each use. Broadly, NH standards are designed to protect ecology and recreation in its waters:</p> <ul style="list-style-type: none"> Ecology: Ensures the health of aquatic ecosystems, supporting diverse fish and wildlife. Recreation: Maintains water quality for safe and enjoyable recreational activities, such as boating and swimming. <p>You can learn more about NH water quality standards here: https://www.des.nh.gov/water/surface-water-quality-standards</p> <p>Source: New Hampshire Department of Environmental Services</p>		<p>Recreation</p> <p>Dams can impede access to recreational opportunities. GRH should create comprehensive improvements to recreation access and provide ADA-compliant recreation amenities.</p>  <p>Source: EPA, <i>Riverine Ecosystem Management</i></p>

Note. Panels context, left to right: inside fold (opens fully).

The key differences between our pamphlet for Vermont, New Hampshire, and Massachusetts were the segment on the various water quality standards and their impact on water quality, as well as the informational resources available to the residents of each state. We found it crucial to emphasize these differences in our brochures because they are very impactful to the discussion of dam removal in each of these three states. While each of the water quality standards were enumerated in very detailed hundred page reports, we extracted the important differences between the water quality standards in Vermont, New Hampshire, and Massachusetts. Additionally relying on an analysis provided to us by a law school intern at the CRC, we deciphered that the main idea of each of the water quality standards is similar, but they vary in what aspects of water sources each state prioritizes and how specific the regulations are, which are summarized in the table below.

Table 1

Comparative analysis of water quality standards in New Hampshire, Vermont, and Massachusetts

	New Hampshire	Vermont	Massachusetts
Organization of Standards	Water supply use, recreation	Aquatic life, aesthetics, recreation, public water source, irrigation	Class A: aquatic habitat with aesthetic value Class B: habitat, irrigation, recreation Class C: recreation, irrigation, industrial use, habitat
Standards Included	No sewage, no radioactive substances, no pollutants, “shall be as naturally occurs”	Sludge, solids, taste/odor, color, alkalinity, pH, toxic substances, radioactive substances	Dissolved oxygen, temp, pH, bacteria, solids, color/turbidity, oil/grease taste/odor

Both Vermont and Massachusetts, for example, differ from New Hampshire in that they consider the aesthetic value of a body of water in the water quality standards. This adds a different dimension to the standards because these states must consider such parameters as water color and turbidity while New Hampshire focuses solely on other aspects of recreation and ecology. Thus, we added an additional section for aesthetics following ecology and recreation in the pamphlets for Vermont and Massachusetts. Another significant difference between New Hampshire and the other two states was that New Hampshire did not list specific standards for pH, alkalinity, and other important parameters, but rather used vague language aimed at limiting all forms of pollution as much as possible such as “shall be as naturally occurs.” The level of specificity in legal and political documents is extraordinarily telling and thus we think it is critical to consider the potential implications of New Hampshire’s much more broad and vague water quality standards than those of Vermont and Massachusetts: the vague standards in New Hampshire may give hydroelectric operators much more flexibility in navigating their compliance, and thus, it is critical for the members of the public to advocate for themselves and

the river in the commenting process in order to prevent the dam operators to exploit such flexibility. While citizens of Vermont and Massachusetts must also push for greater agency in the dam relicensing process, it is crucial to note the different priorities in each state government to help maximize the utility of the educational materials.

Conclusion

This project offers four key takeaways:

1. a cost-benefit analysis of the Great River Hydroelectric (GRH) and FirstLight dams and impacts on river ecology,
2. acknowledgment of inter-state variability in New Hampshire, Vermont, and Massachusetts water quality standards,
3. evaluation of realistic intervention measures capturable through negotiation with the dam operators to attribute greater responsibility, and
4. improved informational access of local stakeholders to the 401 Water Quality Certification public commentary process.

Through literature review, we were able to identify two primary consequences of hydroelectric dam activities on the Connecticut River on water quality and local communities. Specifically, studies have reported that hydroelectric dams reduce dissolved oxygen concentrations, increase thermal pollution, and disrupt sediment transport in waters downstream of dams by altering natural river flows (Kennedy *et al.*, 2018). Furthermore, the CRC argues that dams can impede access to recreational opportunities which must be addressed by the GRH and FirstLight with comprehensive strategies to provide ADA-compliant recreation amenities. Our education brochures dedicate a significant section detailing the impacts of hydroelectric dams on water quality to supplement the public's understanding of the ways in which hydroelectric dam activity threatens compliance with state water quality standards.

Furthermore, by developing state-specific brochures, we forestalled anticipated confusion resulting from inter-state variability in water quality standards. For example, VT and MA consider the aesthetic value of water bodies, which is lacking in NH water quality standards. The extent to which state water quality standards delineate specific guidelines for water quality maintenance is of importance, as it can influence the level of restriction the state would impose on environmentally-degrading hydroelectric dam activities. By highlighting the variable goals of each state's water quality standards with links to external sources that can provide further details, we designed our brochures in a way that can best inform VT, NH, or MA residents to submit state-specific public commentary on the relicensing of the major Connecticut River dams. Through communication with representatives from the CRC, we were able to better understand the scope of realistic and effective negotiation measures that can hold the dam operators accountable for potential downstream damage of dam activities upon relicensing. For example, by requiring GRH and FirstLight to set the shortest possible licensing term of 30 years and setting erosion control plans, CRC is advocating for ways to minimize anticipated damage and alleviate the long-term stress of dams on nearby ecology and communities.

In all, our deliverable aims to enhance local informational access to the 401 certification process. Often, legal documents are not the most reader-friendly texts for non-experts, which can function as an obstacle to citizens of VT, NH, and MA from asserting greater agency in the dam

relicensing process. Our brochure aims to highlight key insights from the 401 process to help the public navigate the legal process and ultimately call for greater public participation through the submission of their comments on the relicensing of major Connecticut River dams.

Limitations

There were a few limitations to our project, the first being the medium of our deliverable. While brochures are effective in delivering condensed, essential information to their target audience, compromises on the extensiveness of content coverage were made to enhance comprehensibility. For example, our initial drafts listed an extensive catalog of water quality standards (WQS) for New Hampshire, Vermont, and Massachusetts narrated in legal dialect. However, to maximize the accessibility of our brochures as gray literature for stakeholders from diverse, non-legal backgrounds, we condensed our description of state WQS into broad goals (e.g., “NH standards are designed to protect ecology and recreation in its waters”). This modification enhanced the visual comprehensibility and approachability of our brochure by reducing text density. While the brochure does not provide an exhaustive insight into the 401 legal framework, we include links to external sources providing further details where necessary.

Another limitation is that we focused on expert interviews to supplement our discussions with the CRC and results from literature reviews in developing our deliverables. While interviewing experts in environmental law and dam-river dynamics helped inform our analysis of the impacts of hydroelectric dams on water quality, interviewing NH, VT, and MA residents to better target local needs may have been a helpful process. Especially given inter-state variability in WQS, analyzing local needs could have been a useful endeavor for enhancing the usefulness of our deliverables. However, it is more difficult to categorize and communicate with large groups of residents, given the diverse demographic stratification of populations across the three states and associated variability in each group’s needs. Beyond outreach, identifying ways to minimize potential biases in such large-scale survey results is a big task. Therefore, we compromised by developing a brochure that addresses the essential questions associated with hydroelectric dam relicensing and adding references that can better inform the target audience if they deem further information required. This could be an avenue for future investigation, where student groups collaborating with CRC in coming years could potentially evaluate the efficacy of our brochure in informing local residents of the 401 certification process by conducting stakeholder interviews or surveys.

Finally, an interesting extension limited by the timing of our project would be to obtain counter perspectives of the hydroelectric dam relicensing process from the dam operators. Throughout our engagement with the CRC representatives, we were informed that CRC seeks to propose assigning greater responsibility to the dam operators by requiring both GRH and FirstLight to establish erosion control plans, establish long-term monitoring and assessment of sediment dynamics in the river, and set the shortest possible licensing term, among other negotiation measures. The ten-week term restricted our ability to reach out to the dam operators to explore the counterposition’s case on hydroelectric relicensing. While our brochure also functions as a promotional document that more selectively reflects CRC’s take on the Connecticut River dam relicensing, this could be a possible undertaking for future groups.

Final Remarks

Despite these limitations, we were able to successfully develop educational materials and a concrete outreach strategy centered on engaging the public in the 401 water quality certification process. This process is critical for the relicensing of hydroelectric facilities along the Connecticut River, impacting water quality standards in Vermont, New Hampshire, and Massachusetts. We aimed to break down the 401 process, making it accessible and actionable for community members with all background knowledge. The educational materials we created are designed to clarify the 401 process, explain state-specific water quality standards, and highlight the environmental impacts of dam relicensing. We believe these resources will empower residents to participate effectively in public commenting periods, advocating for measures such as erosion control, enhanced recreational access, and improved fish ladders. Through these efforts, we aim to enhance the CRC's advocacy initiatives, increase stakeholder engagement, and ultimately improve water quality in the Connecticut River watershed. We are hopeful that the materials and strategies developed during this project will provide a strong foundation for ongoing and future CRC efforts.

Group Reflections

Our group's final deliverable and collaboration effort was influenced and made possible by the lessons and topics taught by Professor Cox, Dr. Bieluch, and John Turner in this class. At the beginning of the term, Dr. Bieluch's lectures and class discussions on teamwork helped us set clear expectations from group member conduct and contributions, as well as establish our goals and values that would guide us through the project. We codified these standards in our group charter, and though we didn't end up editing it or coming back to it later in our project, our group feels that we were all conscious of the pact we formed as we worked through our project from start to finish. Throughout the project, we were heavily influenced by Dr. Bieluch's teachings about psychological safety, which aided in our collaboration efforts and ensured everyone felt comfortable sharing their ideas, questions, concerns, or mistakes (Thompson, 2009). Psychological safety helped us foster a group dynamic where we felt comfortable sharing our criticisms in a polite manner for the betterment of the group and our deliverables. This also unintentionally helped us to create a democratic leadership model for our group where decisions were made from the active contributions of each member. Each member had an equal voice in the decision-making process, which made sure that everyone felt valued and heard. Each member in our group communicated regularly and effectively throughout the term, as well, allowing for an environment where all members felt comfortable reaching out for support or clarification at any time.

Another important aspect of our group success was our equitable distribution of the workload. From the outset of our project, our objectives were clear for the term: to develop accessible educational materials which addressed the critical questions the CRC asked us to answer. By clearly defining what our project would cover and what we wanted to create, we were able to divide our workload fairly into equal sections. As talked about by Dr. Bieluch when discussing the group charter, we ensured equal and efficient participation by also dividing the workload in ways that tailored to each individual's specific strengths. But despite splitting up the work, we always came together during in-class sessions and outside of class meeting times, to ensure there was fluidity throughout the project and that every person understood every part of the project. Connecting regularly and discussing our findings also allowed us to innovate and improve on our work product, which was particularly critical for our brochure, the creation of

which was an iterative process involving much careful editing over multiple versions. We used platforms such as Canva, Adobe, Google Files, and Google Docs which allowed for all members to work simultaneously, allowing for constant feedback and communication from group members. The ability to suggest edits and comment on each other's contributions allowed for constructive criticism, which helped us refine our work and enhance our final product.

We also feel that the lectures from Professor Cox and John Turner about research methods and debate techniques, respectively, equipped us with the necessary frameworks and skills to approach our project. At the outset of the term, Professor Cox gave us an introduction to research methods, which was crucial for guiding our approach to this project. Although it was hard for our group to initially define our project as scientific research and use such a framework, we used Professor Cox's principle that "everything starts with a question," which helped us to reframe our project. Specifically, we asked ourselves, "how can we inform more communities along the Connecticut River about the dam relicensing process and the 401 certification process?" This framing helped us to formulate our subsequent research steps.

Furthermore, a key part of our research process involved meeting with two Dartmouth professors: Professor Christopher Sneddon and Professor Ross Jones. We employed interview techniques discussed in class, preparing questions that aligned with each professor's expertise but allowing flexibility to follow up on their responses. We approached each interview with the understanding that "listening is the most important skill in interviewing" (Seidman, 2009). By practicing active listening, we were able to gather the necessary information for our project.

Finally, John Turner's lessons on debate and rhetorical analysis greatly aided us in our final deliverable. The activities we conducted throughout our policy debates—namely, researching the costs and benefits of relicensing hydroelectric dams—gave us a solid foundation of information for discussing these costs and benefits in the context of our brochure. Since this aspect of research was the most intensive of our project, it was helpful to tackle this problem early on in the term and get feedback from our instructors on the validity and quality of our arguments. John Turner's feedback on oral presentation techniques was also incredibly valuable in helping us with creating a polished final presentation, especially since our group members agreed that it was rare in our experience at Dartmouth to receive feedback on the oral presentation skills which will be very important for our careers.

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**Environmental Studies 50 Culminating Project:
American Forest Foundation
Family Forest Carbon Program Funding Bottlenecks and Solutions**

Group Members: Reed Cole, Daniel Coons, Alejo Rincon, Carr Urschel

Introduction

The American Forest Foundation is a 501C3 organization whose mission “is to deliver meaningful conservation impact through the empowerment of family forest owners” (American Forest Foundation, n.d.). With areas of focus ranging from conservation initiatives, carbon market participation, education and outreach, policy and advocacy, and their Family Forest Carbon Program (FFCP), AFF at its core is a nature-based climate solution organization. At their core, nature-based climate solutions (NBS) like AFF’s Family Forest Carbon Program, take a long time to generate returns thus making it hard to present such a high-risk portfolio next to a long-term value creation model¹. With the current structuring of the American Forest Foundation, funding primarily comes from grants, philanthropic donations, and revenue from the Family Forest Carbon Program (FFCP) (N. Meehan, personal communication, May, 7, 2024). Our group seeks to expand the quantity and quality of revenue streams by engaging with outside the box financing mechanisms that counter the long-term return and risk portfolio that AFF currently has—allowing for an increase in their year-to-year cash flows, scaling up existing programs, and increasing long term project returns.

Traditionally, funding for NBS has lagged in both the private and public sectors. For example, the global financing gap towards nature protection was more than \$700 billion in 2023 with only 14% of capital for nature-based solutions being provided by the private sector (Gómez et al., 2023). This gap in capital represents a delay in private and public uptake in long-return-based investments, including ones with the inherent risks associated with emerging markets, like that of the FFCP and carbon markets in general. Groups like the World Resources Institute and COP28 Coalition are researching alternatives to unblock nature-based climate solution funding and opportunities—as this unfolds it will be crucial to understanding the broader picture of financing opportunities for AFF and why certain traditional models will not work. For example, traditional funding models have often focused on gray infrastructure rather than on natural systems, this is why public-private partnerships have often been used to develop infrastructure. From here, it is about looking into how we can orient public-private relationships towards nature-based climate solutions, like forest carbon programs (Brears, 2024).

Using research on similar industries, successful alternative financing mechanisms, and traditional models of funding, our group looks to think outside the box on how to finance and scale up AFF and their Family Forest Carbon Program. The questions we sought to research were: (1) whether there were financing approaches outside of the financial infrastructure currently at play that are a better fit for AFF while still being able to scale with the projects requiring funding. Further, (2) what are some unique funding mechanisms AFF might consider and (3) what would it take to implement these strategies moving forward? Over the course of this term, a multipronged approach of industry-specific research accompanied by interviews with AFF employees and industry professionals helped us to address our questions.

¹ This information was adapted from the AFF assignment briefing given to us by Professor Cox at the beginning of the term.

Methods

Interviews

In order to learn firsthand information on the company, carbon credit programs, funding avenues, and the larger conservation space, we engaged in interviews with Nathan Truitt, Nate Meehan, Tyler Koopman, and Peter Stein.

Peter Stein, Managing Director at Lyme Timber, highlighted several potential funding sources that could benefit AFF. Public charity easements and land trusts, such as those facilitated by the Land Trust Alliance which can be found on the LandVote.org, offer access to philanthropic funding and tax incentives. There has been upwards of 87 billion dollars approved that can be tracked through these websites within the United States—proving it to be a great route to find where money has come from in the past. Another organization brought to our attention was The Maryland Clean Water Revolving Fund which provides low-interest loans for projects that enhance water quality, aligning well with AFF's conservation goals. Stein also pointed to impact investors and foundations, such as Quantifier Ventures and donor-advised funds, which can provide targeted investments into AFF's projects, aligning with investors' philanthropic and environmental objectives. Organizations like the Oakenspace Institute and the Delaware Watershed Initiative could be potential partners for grants and impact investments focused on regional environmental projects. Green banks and syndicates were another promising avenue identified by Stein. CREO Syndicate and Tonic, networks of impact investors interested in scalable environmental solutions, could be valuable partners. Green banks like the Connecticut Green Bank, led by Leigh Whelpton, offer models for leveraging public funds to attract private investment. Stein also emphasized the importance of connections with experts like Keith Bisson of Coastal Enterprises Inc., who has expertise in community development financing that could support AFF's rural and community-based projects.

Nathan Truitt, AFF's Executive Vice President of Climate Funding, plays a crucial role in securing funding for the organization. Truitt, who has been with AFF for over a decade, has identified several promising avenues for funding. Nate Meehan, a graduate student at Washington, recently joined AFF to focus on public funding opportunities. Tyler Koopman, from AFF's finance strategy team, highlighted key partnerships with Disney and The Nature Conservancy (TNC), which have the potential for low-interest loans and strategic investments. However we learned that this was from a time of much surplus which resulted in Disney being able and willing to offer such a deal to AFF (Tyler Koopman). On the other hand, an idea posed by Tyler was that of collateralizing separate land—potentially land from foreclosures—that AFF can purchase as a guaranteed backing for risk so that financial institutions would be more willing to put money into for the Family Forest Carbon Program. This would be an innovative means of funding and would require extensive financial knowledge. We were not able to look down this avenue due to the time constraints of the class; however, if this was possible for AFF to achieve, it would

Various Avenues

After conducting extensive interviews and gathering a wealth of information, we identified several funding avenues for the American Forest Foundation (AFF) that appeared viable. To ensure a thorough examination of each potential funding source, we divided the research tasks among our team members, each focusing on specific funding mechanisms. This section provides an overview of our individual research findings.

Daniel's research focused on examining how similar industries, particularly those involved in climate solutions and long-term environmental projects, secure funding. He explored alternative funding mechanisms such as public-private partnerships, ecosystem service payments, and environmental impact bonds. These mechanisms have been successfully used in sectors like renewable energy and sustainable agriculture. For example, environmental impact bonds allow investors to fund projects that deliver environmental benefits, with returns tied to the achievement of specific ecological outcomes. This approach could provide AFF with a performance-based funding model that aligns with its conservation goals.

Reed investigated the potential of green bonds, green banks, and 506(b) private placements as funding avenues for AFF. Green bonds, which are specifically earmarked for environmental projects, offer a way to attract investors interested in sustainable finance. Green banks, such as the Connecticut Green Bank, provide a bridge between private capital and public interest by offering loans and credit enhancements for environmentally responsible projects. Reed also looked into 506(b) investments, which would allow AFF to raise funds from an unlimited number of accredited investors with fewer regulatory constraints. While all these investments have some limitations, such as the challenge of attracting investors with a long-term ROI, they remain a viable option for AFF's financing strategy.

Carr focused on private investment and impact investing, exploring how AFF could attract investors who seek both financial returns and positive environmental impacts. Initially, he identified significant hurdles in the attraction of traditional private investment towards AFF's FFCP. Later he identified potential partners among impact investors, who are increasingly interested in funding projects that address climate change and conservation. Organizations like the CREO Syndicate and Tonic, which connect investors with scalable environmental solutions, were highlighted as potential sources of capital. Carr's research also emphasized the importance of presenting AFF's projects as viable investment opportunities with clear, measurable impacts to attract private investors.

Alejo examined the opportunities available through federal funding, grants, and philanthropic organizations. He identified several federal programs that offer grants and low-interest loans for environmental projects, such as the Maryland Clean Water Revolving Fund. Philanthropic organizations, including foundations like the William Penn Foundation and the Oakenspace Institute, were noted for their potential to provide substantial grants for conservation initiatives.

Our collaborative research revealed a diverse array of funding avenues for the American Forest Foundation. By leveraging the unique strengths of each funding mechanism—whether through innovative financial products like environmental impact bonds and green bonds, strategic partnerships with green banks and impact investors, or securing federal grants and philanthropic donations—AFF can create a robust and sustainable funding strategy. This multifaceted approach not only addresses the financial challenges inherent in long-term nature-based climate solutions but also aligns with AFF's mission to deliver meaningful conservation impact.

Viability Approach

After discussing our objectives for the project with Nathan Truitt, we decided upon a deliverable where we analyzed potential funding avenues that AFF could explore. While with more time we could have explored more of each option in depth, we understood that there would be certain limitations to the level of evaluation that can occur both because of the timeframe of

the project and also due to our limited information access within AFF as students. Despite this, we set out to discern how to best assess each potential route. In the end, the group decided that the most salient approach would be evaluating the viability of the fundraising mechanism and giving it a value rating of either high, medium, or low based on the following criteria: upfront investment for implementation, research needed from AFF, and the overall implementation timeline. This criteria was determined through conversations with Nathan Truitt and what would be most beneficial to AFF. The rating criteria for a funding mechanism's viability is subjective since several factors are considered to make this determination. However, the factors that influence the rating are based on objective research and interviews.

Results & Discussion

506(b) Private Placements

In brainstorming some of the ways in which the American Forest Foundation could fix their bottleneck financing issues, and using the suggestions from Nathan Truitt, our group researched Rule 506(b) of SEC Regulation D. This rule applies to 501C(3) organizations like AFF and allows companies to raise an unlimited amount of funds and sell securities to an unlimited number of accredited investors with a few stipulations (U.S. Securities and Exchange Commission, n.d.). Under this ruling, there is no limit on the number of accredited investors one can sell to, but securities can only be sold to 35 non-accredited investors (U.S. Securities and Exchange Commission, n.d.). Any securities sold are deemed restricted securities—this means that the owners' ability to trade the security is limited, restricted (U.S. Securities and Exchange Commission, n.d.). Finally, these investments cannot be promoted or marketed to the public (U.S. Securities and Exchange Commission, n.d.).

Some of the benefits researchers associate with these 506(b) investment vehicles relate to how the offerings are not regulated by state blue-sky laws² and purchasers can self-verify their accreditation statuses—meaning GPs are not responsible for verifying accreditation (Carta, 2024). After talking with Tyler Koopman from the strategic finance arm of AFF, 506(b) investing is a great way around listing an NPO and going to a private investor without restriction. While this is the case, the same issues AFF currently has with investors regarding their ROI and risk profile still applies. Further, despite the easy path to reach investors, with the financials AFF presents and considering their long-term ROI, you would get similar returns to something in NASDAQ but with greater risk—making it not an appealing investment (T. Koopman, personal communication, May, 14, 2024).

These kinds of private placement investments are particularly useful for small business and outside the box project funding. One example of how a 506(b) investment would function is by thinking about an entrepreneur needing to raise funds. At its most simple, 506(b) placements allow people to raise capital from non-accredited investors—this could mean raising money from family, friends, old colleagues, and anyone else you have a previous relationship with (Mainshares, 2023.). Because of the strict rules about marketing—the SEC is very tight on making sure that people using this form of investment are not attempting to market their securities to accredited non-accredited investors without disclosures. The goal in the eyes of the SEC is to avoid people—in the case of the example above, our entrepreneur—building relationships as part of

² State blue-sky laws are anti-fraud regulations that require issuers of securities to be registered and to disclose the details of their offerings in order to protect investors from fraudulent and speculative investments (https://www.law.cornell.edu/wex/blue_sky_law).

their mission to raise capital (Mainshares, 2023). This means that in order to gain capital, the owner of the securities—our entrepreneur—must have known the investor well enough previously to “understand their financial position” in order to know the “reasonableness” of the investment they are making (Mainshares, 2023). This language is vague which means that disclosure and research before AFF enters into this space will be crucial if they want to legally and productively gain investors. Some examples of people AFF already has relationships with, in the eyes of the SEC, could be previous investors, donors, family members, potentially even members of the Disney and TNC teams who previously engaged with AFF.

If AFF were to investigate 506(b) investment offerings as a new financing mechanism, we suggest that they connect with donor advised funds like Veras Wealth Partners or the Vermont Community Foundation so that their offering goes to a targeted community thus limiting expenditures used to find investors who don’t understand the nature-based climate solution nature of a longer ROI (P. Stein, personal communication, May 7, 2024).

Green Bonds

Green bonds are instruments of debt that differ from conventional securities as the issuer uses the proceeds to finance projects meant to have a positive environmental or climate effect (Fatica and Panzica, 2021). Green bonds have been around since 2007 but it was not until 2014 that voluntary best practice guidelines—Green Bond Principles—were established by a consortium of global investment banks (Climate Bonds Initiative, n.d.). As the green bond market in the US and internationally has exponentially grown, as has the research and critical analysis of the positives and negatives of green bonds themselves using key performance indicators and industry research. On the positive side, many people have highlighted green bonds for their potential to act as a financing vehicle for climate adaptation and resilience investments. Their versatility and attractiveness at both the public and private level make them a powerful tool for capital to be funneled towards nature-based climate solutions and initiatives (Brears, 2024). This ‘do-good’ opportunity for investors allows improvements in corporate sustainability metrics and ESG ratings while still providing ample financial returns. Beyond the opportunity to do good with investment, a lot of environmental organizers have hope that these private funds will fill in the gaps left by inadequate public financial resources for nature-based solutions. Although the rapidly growing nature of green bonds is a positive sign of a shift towards sustainable financing, as of now, these bonds focus primarily on climate change mitigation and rarely include biodiversity or land use (Chahine and Liagre, n.d.).

In 2022, the American Forest Foundation issued a first-of-its-kind green bond to finance their Family Forest Carbon Program. The issuance of this Series 2022A \$10M taxable bond was the first green bond designed specifically to support the future generation of nature-based carbon credits (Breen, 2022). Financing provided through the green bond enabled the FFCP to work on its goal, originally set in 2020, to reach 20% of family forest in the US by expanding to over 55 millions acres of land contributing to 90 million tons of climate mitigation (Breen, 2022). While at the time this green bond provided needed economic stimulus for AFF, in interviews with community partners it is evident they do not have enough capital to harness debt to issue another green bond (T. Koopman, personal communication, May, 14, 2024). Researchers have often highlighted green bonds for their potential to act as a financing vehicle for adaptation and resilience investments, but people continue to challenge and remain skeptical about the ability for green bonds to channel private sector funding towards nature-based climate solutions (Tuhkanen, 2020). Some of the same issues AFF has faced with attracting private

investment—regarding consumer confidence—green bonds also face as it applies to the overall tangibility of projects (Tuhkanen, 2020). Green bonds have been a successful tool to attract investment in environmental projects but as it currently stands, nature-based climate solutions do not benefit from mission-aligned capital in the way renewable energy projects have been able (Mason et al., 2023). That being said, while green bonds have worked in the past and stand as promising tools for the future, AFF should consider pursuing alternate financing avenues in order to fix their cash flow issue.

Green Banks

Federal government investment into nature-based climate solutions is simply not enough, leading many companies like AFF to investigate private capital. The issue historically with private capital has been that private investors and big banks have often been dissuaded by the risk and return structures. One way that NBS organizers have sought to work around the disinterest of these actors is through green banks (Mason et al., 2023). According to a report by authors at the Duke University Nicholas Institute for Energy, Environment & Sustainability, “green banks and community lenders are designed to fill gaps in the financial marketplace and step into uncomfortable or perceived risky markets and make them more comfortable” (Mason et al. 2023, 5). Green banks creatively adapt and apply common financing tools to produce socially responsible capital. Some of the ways green banks do this is through: mobilizing debt and equity providers, matchmaking capital to viable projects, providing bridge financing for federal and utility incentives, and aggregating viable projects to create investable products (reducing transaction costs) (Mason et al., 2023). Using traditional financing tools allows green banks to be the bridge between private capital and expanding public interest in clean and sustainable projects (Turrentine, 2022). One of the main issues that AFF faces when it comes to traditional financing is the nature of their risk and long-term returns, green banks can be used to actually take on and manage this perceived risk (Turrentine, 2022). Green banks can work to make private lenders feel more secure in environmentally responsible investments through loan loss reserve funds, loan guarantees, and credit enhancements—therefore assuming a portion of the risk (Turrentine, 2022).

One of the current limitations to green bank financing is that they have historically been focused on the clean energy transition, renewable projects, and green development in a way that excludes nature-based climate solutions by targeting gray infrastructure. Peter Stein from Lyme Timber pointed our group in the direction of the Connecticut Green Bank. Connecticut Green Bank is one of the oldest and most mature green banks and is a leader in the fight to get community lenders and green banks on board with nature-based climate solutions (P. Stein, personal communication, May 7, 2024). In 2021, Connecticut Green Bank incorporated NBS into its core finance model which legislatively allowed the bank’s mission to explicitly include environmental infrastructure in its mandate with a specific fund to support such products—potentially like AFF’s FFCP (Mason et al., 2023).

While the Connecticut Green Bank is just the tip of the iceberg on an expanding solution with high potential for AFF, it is necessary for AFF to stay up to date on new legislation and practices that continue to expand these avenues. As of April 2024, the Biden Administration launched a new network of sorts of green banks through the Justice40 initiative as a part of the Greenhouse Gas Reduction Fund to make sure that there are ample available low and zero interest loans to fund climate and clean projects especially in underserved communities (Ionescu,

2024). Ultimately, green banks and community lenders are a great and low-cost avenue for AFF to explore getting involved with in order to create more consistent and scalable capital.

Federal Funding & Grants

The American Forest Foundation (AFF) has demonstrated success in securing grants to support its mission of promoting sustainable forest management among family forest owners. In recent years, AFF has been awarded two significant grants, underscoring its capability to attract substantial external funding (Nathan Truitt). However, the potential for securing additional grants remains vast, particularly through platforms such as Candid.org. This platform, known for its extensive database of grant opportunities, requires considerable human resources to explore and manage effectively. Therefore, our strategic recommendation is to expand its team dedicated to grant acquisition. By hiring additional personnel focused on relationship management and grant applications, AFF can enhance its capacity to secure more grants and, consequently, further its operational and expansion goals.

Federal funding represents another viable avenue for AFF. Like grants, securing federal funds demands diligent effort in building and maintaining relationships with key stakeholders and staying informed about relevant legislative developments. AFF's past success in this arena is exemplified by the \$150 million it received from a trade and conservation agreement between the United States and Canada (Molpus, 2020). These previous examples of funding prove the latent potential of grants and federal funding as a source for AFF and its Family Forest Carbon Program.

There has been notable growth in the realm of grants and federal funding in recent years, specifically through initiatives like the Inflation Reduction Act and other federal investments in climate solutions (IRA). Over the past 37 years, there has been a consistent investment averaging around 5 billion dollars annually in this sector (Land Vote). This funding strategy has proven effective as it supports partnerships between government entities and various charitable organizations. These collaborations are pivotal in addressing and alleviating the financial challenges faced by the American Forest Foundation. The goal is to harness these resources as a way to find sustainable solutions thus moving past the financial obstacles that hinder environmental efforts.

In addressing the critical need for sustainable funding for carbon credit projects, particularly through the American Forest Foundation's Family Forest Carbon Program, it becomes evident that government grants and foundational support present a more strategic and sustainable financing mechanism compared to other alternatives. Foundations such as the Bill & Melinda Gates Foundation, the Bezos Earth Fund, and significant legislative measures like the Inflation Reduction Act have historically provided robust financial support tailored to advance environmental sustainability. These grants are instrumental not only in terms of financial resources but also in fostering long-term commitments to ecological and social objectives, aligning perfectly with the goals of AFF.

The U.S. Environmental Protection Agency (EPA) and the U.S. Department of Agriculture (USDA) annually allocate substantial funds to support environmental goals and sustainable rural development. These agencies' funding is crucial for underwriting the comprehensive costs associated with setting up, certifying, and managing carbon credit projects. Such projects require significant initial investments for ecological assessment and legal compliance that many private entities might deem too risky without the assurance of initial grant support. Moreover, the structural advantages of grants from entities like the National Fish and

Wildlife Foundation (NFWF), and legislative frameworks provided by acts such as the Inflation Reduction Act, ensure that family-owned forests are not only participants in the carbon market but also beneficiaries of a system that values ecological health and sustainability. These grants typically cover a wide array of needs from research and development of sustainable forestry practices to the implementation and monitoring necessary for generating verifiable carbon credits.

In contrast to other financing options—such as private capital, government grants and foundational support—utilizing grants and federal funding align closely with the mission-driven approach of AFF. They provide a stable, reliable, and mission-aligned source of capital that ensures the Family Forest Carbon Program not only thrives, but expands its reach and impact in mitigating climate change through sustainable forestry practices. This makes government grants and foundational support not just a funding option, but the optimal choice for fostering environmental stewardship and community resilience within the framework of the American Forest Foundation.

Philanthropy Organizations

After talking with Nathan Truitt from AFF, there were two identifiable forms of philanthropic gifts that AFF has received and put to use in recent history: traditional capital gifts and low expectation investments. The term ‘low expectation investment’ signifies a separate entity issuing a loan, or investing a certain amount of capital, with either a uniquely low investment return expectation or interest rate when applied to a loan. Through conversations with members at AFF, it is apparent that the further capture of philanthropic investment is not a reliable source of year-to-year income. Further, increasing marketing efforts can interfere with stipulations present in the legal/financial framework of the 506(b) investing, should AFF decide to further pursue that funding avenue. Therefore, philanthropic funding is a welcome and positive source of funding for AFF, yet further effort to pursue increased philanthropic gifts is not recommended as a use of their current time and labor resources.

The William Penn Foundation is a notable philanthropic organization dedicated to improving the quality of life in the Greater Philadelphia region through grantmaking in education, arts and culture, and the environment. The foundation's environmental grants focus on watershed protection, which aligns with AFF's mission to promote sustainable forest management. AFF could explore collaboration opportunities with the William Penn Foundation, particularly in initiatives aimed at enhancing water quality and forest health. However, given the foundation's regional focus, this partnership might be more strategic for projects within or impacting the Philadelphia area. The Open Space Institute (OSI) is another significant player in land conservation philanthropy. OSI manages various funds centered around land protection, including the [Appalachian Landscapes Protection Fund](#), which seeks to protect landscapes that are critical for climate adaptation. OSI provides capital for land acquisition, easements, and stewardship, making it a valuable potential partner for AFF. Engaging with OSI could provide AFF with access to funds specifically designated for long-term land protection and climate resilience projects. Nonetheless, similar to other philanthropic sources, reliance on OSI for consistent annual funding might not be sustainable. AFF should consider OSI's funding opportunities for specific projects that align with mutual goals rather than as a primary, ongoing funding source. In conclusion, while partnerships with organizations like the William Penn Foundation and the Open Space Institute can be beneficial for targeted projects and specific

initiatives, AFF should remain cautious about heavily investing time and resources into pursuing increased philanthropic gifts as a consistent funding strategy.

Private Sector Avenues

The realm of private investment is a crucial sector of liquid capital that the sustainable realm must take advantage of in order to propagate a global green transition. In order to ensure the future success of not only the FFCP, but the foundation as a whole, improvements must be made in AFF's ability to secure private investment in their projects. However, there lies a significant roadblock to securing funding from traditional investment sources such as venture capital and private equity firms.

Through extensive interviews with Nathan Truitt and Tyler Coopman, it was made clear to our team that the realms of green venture capital and sustainable private equity were more focused on ventures that resulted in returns over a traditional 5-10-year investment window. The typical target investment return rate (IRR) for a private equity firm is between 20-25%, meaning that they would make back the totality of their investment with an added profit of roughly 20% (The Spaventa Group, 2024). When speaking with the financial teams at AFF, their internally projected returns were much closer to 10%, abnormally low for a private sector investment. Additionally, their financial projections showed five to ten years of significant negative returns in regards to the FFCP before even beginning to create profits from the carbon credits and begin to realize profits for outside investors.

This low return-high period paradigm is a significant challenge our team evaluated when considering AFF's attraction of outside investors. While we found low viability for the efficacy of AFF pursuing investment from traditional private sector investors, suggestions during our meeting with Peter Stein led us to investigate the realm of impact investing. Two investment avenues stood out from our research—mission-driven financial intermediaries, such as Capshift, and conglomerates of impact investing firms such as the Creo Syndicate and the Toniic group.

Our group found these three firms representative of possible solutions for the funding bottlenecks that are currently facing AFF. Beginning with Captshift: the firm was founded by MissionPoint Partners and aims to connect impact investors and fund managers to viable investment opportunities (Capshift, 2023). By establishing a positive relationship with Capshift, and other impact-related financial intermediaries, AFF could look to capture revenue from investors willing to accept lower returns on their investments in exchange for evidence of sustainable change.

The Creo Syndicate, a NYC headquartered 501(c)3 public investment charity, aims to invest nearly 1 trillion dollars of capital in sustainable space to combat the climate crisis by 2025 (CREO, 2024). Similarly, the Toniic Group—a conglomeration of asset owners, high-net-worth individuals, and investors—seeks to address the United Nations Sustainable Development Goals (SDGs) while investing capital (Toniic Institute, 2023). Our research and interviews with AFF have found that impact-related investment firms are funding sources that AFF has yet to fully explore. Our group's consensus is that there is a relatively high viability for AFF to increase its funding for the Family Forest Carbon Program by exploring one of the previously mentioned funding avenues in the private sector.

Additional Researched Avenues

Name	Description	Viability
NFWF America the Beautiful Challenge	Streamlines grant funding opportunities from the private and federal sector to conservation and restoration projects across public and private land	<i>High</i>
Growing Climate Solutions Act of 2021	Intended to help reduce barriers into voluntary environmental credit markets for farmers, ranchers, and private forest landowners.	<i>Medium</i>
Greenhouse Gas Reduction Fund	Funded through the Inflation Reduction Act to leverage private capital for clean energy and climate projects that increase sustainability and reduce pollution.	<i>Low</i>
USDA Regional Conservation Partnership Program	A partner-driven approach to conservation that funds solutions to natural resource challenges on agricultural land through aggregated funding.	<i>Medium</i>
Community Forest and Open Space Conservation Program	Communities can acquire land through qualified NPOs with USFS funding that conserves forests whilst still providing public access and recreation.	<i>Low</i>

Figure 1. This figure lists other funds and programs that we looked into but not as in depth as our solutions. Using the application and grading scales from each program's website, we were able to subjectively create a rating on the viability of AFF pursuing this funding avenue—on a scale of low to high. While these options are fairly traditional in nature, having more information and research on a variety of grants and programming can't hurt AFF in the long run.

Conclusions

In the search to find the most suitable funding pathways for AFF, there were several options that proved to be most prudent and beneficial after conducting our analysis. Four potential options were selected based on their viability and alignment with AFF's current

structure, as well as their potential to create an impact for the FFCP. The first option is the continuation of Federal funding through grants and tax credits. The American Forest Foundation has used this method throughout their history, minimizing the barriers to entry in applying for grants. Potential areas of growth for AFF in this space include increased manpower and research to expand the amount of grants received. The continuation of Federal funding would have a medium impact on the funding of AFF. They would be able to continue business as usual, with the potential to dedicate extra resources to their programs.

The second option AFF should consider is impact investing. Impact investors would be able to loan capital to AFF with the expectation of a lower return on investment over a longer period of time. This would be beneficial for both parties since the investor would be aligned with an organization they have deemed to be satisfactory at achieving their environmental mission. For AFF, they would have access to capital at a rate lower than the market with more favorable conditions when paying the loan back. There are several barriers to entry that AFF would need to put resources into to enter the space. One aspect that seems the most challenging would be developing connections with the investors and the research required to find groups that align with AFF's objective. Once these barriers have been addressed, AFF appears to have the capacity required to process and handle the transaction. This would make impact investing an option that has medium viability and medium impact. This is mainly due to the fact that AFF would have a fiscal liability on their books from the loan, albeit at a lower rate.

The third option AFF should pursue is Donor Advised Funds (DAF). DAFs provide large sums of money through donations from a syndicate of philanthropic groups or families. Since the funding is in the form of donations, AFF would have no fiscal liability and would be able to use the money at their own discretion. This method of funding has similar barriers to entry as impact investing. The American Forest Foundation already receives funding through different philanthropic causes, so processing donations from DAFs would not pose any excess pressure on them. The viability for this method would be medium but has the potential to have a high impact on AFF. Since the donations carry no interest rate, there would be no associated risks for AFF when using the funds.

The final option AFF could use is 506.B investments. This process would allow for AFF to raise capital through securitization. They would be able to have accredited and non-accredited investors put money towards the FFCP, allowing the program to generate returns for those investors as it continues to scale. Hypothetically speaking, this program has the potential to generate large sums of capital for AFF, but realistically, this would not be the case in a reasonable time frame. AFF would need to hire new staff with expertise in this space, conduct research to best understand how to operate and gain maximal funding, and have several upfront fixed costs to pay. This would make this option a low viability due to the several barriers. The impact of this method is medium since it has the ability to provide a large amount of capital if it were to be utilized in a best case scenario, however this would take a large sum of capital for AFF to achieve. While our research and recommendation do not offer a comprehensive view of all the options available to AFF for funding, it does provide more advantageous solutions to help with the FFCP as they seek further funding.

During our research we identified and faced several limitations. First, through the research and interviews we conducted with AFF and several of their team members, it does not appear that they have the bandwidth and capacity to pursue funding in the time frame they desire. In order to solve this funding problem, AFF would need to increase the amount of funding they are currently receiving. The carbon market is partially to blame for some of the

problems that AFF face. Over time, these problems may alleviate, allowing AFF to increase their capacity to find funding, thus helping grow the FFCP.

The second limitation we found involved AFF's current partnerships with philanthropic groups and NGOs. After discussing AFF's relationship with different philanthropic groups, it appears that these relationships are relatively minor and act as a patchwork to cover expenses. If these relationships could be deepened, it would allow for more funding to enter AFF. The American Forest Foundation has a partnership with The Nature Conservancy tailored for the inception of the Family Forest Carbon Program. Based on our conversation with Nathan Truitt of AFF, the relationship is currently in an advisory role and TNC does not appear to be interested in putting any capital into the project. Finding partnerships that are willing to inject capital into AFFs projects would be beneficial for future growth.

The third limitation we found involved the developing and evolving market of carbon credits. There are some industries and regions that have regulations, where other regions do not. The standards upheld in these regions create asymmetries in the market because of the inherent differences in standards. There are several different carbon credit certifiers in the carbon market that have different quality standards. This imposes challenges on both the supply and demand side that make price discovery hard. More universal standards would allow for a more efficient carbon market. There is limited support from financial institutions, like green banks, that offer funding to carbon credit organizations. As more financial institutions begin to extend credit to firms in the carbon market, it should help facilitate growth of the firms. The summation of these external factors places pressure on AFF, who are already viewed as a risky investment, making it hard for them to attract capital.

Group Reflection

Throughout the term, the material we covered in class directly contributed to and augmented our ability to complete this report. Beginning with the ideas presented by Dr. Beiluch, her in-class discussion and brainstorming activities regarding physiological safety within the group allowed us to foster a productive and effective communication strategy, involving a shared spreadsheet workflow, which helped keep our team on task throughout the term. Additionally, her notes on in-group conflict processing helped us navigate our work distribution throughout the term by using detailed outlines for both the debate preparation process and the final presentation project. The group charter document was a salient framework to help us establish our roles and practices at the beginning of the term, but as the term progressed we primarily relied on our shared workflow document to delegate the division of work. Overall, Dr. Beiluch's collaboration prep helped our group complete our work in a more streamlined fashion.

The analysis and methods lectures presented at the beginning of the term helped our group structure the framework for the evaluation and collection of information for both our final project and our in-class debate. Our interviews were primarily focused on directing our research toward avenues that the AFF staff thought would be the most opportunistic, therefore they did not include significant amounts of sampling or empirical data collection. That being said, the in-class discussion of being aware of confirmation bias was an especially helpful reminder when evaluating funding avenues with low viability that we hoped would work: including much of our groups efforts to find traditional private investment opportunities that would benefit AFF.

Lastly, the preparation process for the in-class debate helped us substantially augment our knowledge of both green bonds and alternative funding sources going into the last stages of the

final group presentation. Having to apply the research and argumentative skills that we had amassed from previous ENVS classes here at Dartmouth in the more formal format of a structured debate was a new experience for all of our group members. We felt that the more pointed way of thinking that arises from the formal debate structure led to more specific research that later benefited us in writing this report, and additionally the skills we practiced in the presentation of the practice debate and official debate presentations led to further success when presenting our findings to the professors and AFF members at the end of the course.

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Forest Frontiers:

The Story of AFF's Family Forest Carbon Program's "Lost Landowners"

ENVS 50 - AFF Supply Final Report

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Introduction

The Carbon Market and the development of carbon projects that produce transferable credits has provided a valuable mechanism to incentivize the protection of forested areas that would otherwise be degraded by activities including timber thinning, clear cut logging or other land development projects. That being said, these kinds of carbon sequestration projects have historically targeted large land plots held by organizations like large nonprofits and government agencies. In efforts to progress towards the change needed to reach goals of net zero carbon being publicized by many corporations and federal leadership bodies, small landowners need to be incorporated into these carbon market programs. When considering the investments of time and energy being made to enhance research, technology, policy and financial support for this climate change mitigation strategy, now is the time to support small landowner uptake.

In 2020, The American Forest Foundation (AFF) launched the Family Forest Carbon Program (FFCP) in partnership with The Nature Conservancy (TNC). This program is unique in its prioritization of making the benefits of enrolling land in high quality carbon credit projects accessible to landowners who own relatively small plots of forested land (> 30 acres). Since its origination in Pennsylvania, the program has gained traction and expanded to Maryland, Massachusetts, Michigan, Minnesota, New York, Vermont, West Virginia and Wisconsin. In efforts to continue expanding enrollment, increasing the sequestration capacity of private forest land to help meet national net zero carbon goals, the AFF is interested in better understanding the preferences of eligible landowners who decide against enrolling their property. These “lost landowners” either decided against enrolling their land in any carbon program or chose to bring their business to competing organizations that offer a similar product including NCX, Family Forest Works or Finite Carbon by CORE Carbon.

Because the carbon markets are a relatively new solution to increasing carbon sequestration globally, there is limited research about the lived experience of small landowners navigating the enrollment process. Also, cost-benefit analyses are difficult to perform in efforts to investigate the positive environmental and financial outcomes these kinds of programs promise because of the long time scales associated with contracts. Given these knowledge gaps, this research strives to help better understand the barriers to entry small landowners experience when reviewing the Family Forest Carbon Program as an option to make preserving privately owned forests for carbon sequestration purposes more financially feasible.

In reviewing the topics that partners at AFF wanted to better understand, we were able to more clearly define the three central research questions of our study:

1. What are the main reasons why landowners choose not to enroll in the Family Forest Carbon Program?
2. Why may landowners choose to enroll their land in an alternate credit program?

3. What specific changes could be made to carbon project contract offerings (length, payback model, penalties, etc) to better address landowner needs?

By providing more insight into the decision making processes of lost landowners, the results of this study are intended to be used to help inform the policies and strategies AFF upholds when formulating their carbon credit program contracts.

Methodology

Through key informant interviews and semi-structured interviews with AFF's lost landowners, this study strives to uncover the answers to the research questions listed above. In efforts to inform ourselves on this topic before conversing directly with landowners, we conducted five, thirty minute semi-structured interviews with academic experts who have spent portions of their careers evaluating carbon credit programs. These initial interviews were conducted over zoom with a simple interview protocol (See Appendix I) that asked questions like "what do you think are some of the major barriers to small landowner engagement?" and "what are some of the benefits and challenges you see in trying to implement quality carbon projects with private small landowners?" After completing the generalized protocol, the interviewer asked more person-specific questions that pertain to the informant's research and experience studying concepts relevant to carbon markets. These interviews were either recorded or loosely transcribed in a notes document for further analysis of key statements. The trends brought up in this initial interview phase were used to deepen the researchers' understanding of the carbon market system and inform the interview protocol questions employed when conducting the second round of interviews with lost landowners.

A sub-sample of lost landowners had provided their contact information in an AFF exit survey and indicated that they were willing to talk further about their experience with the FFCP. From this list of sixty contacts that were reached out to via email, ten agreed to participate in further questioning via phone call. The remaining interviewees were contacted through cold calling individuals on a larger lost landowner database provided by AFF. These landowner phone interviews ranged from about fifteen to thirty minutes, depending on the length of responses, and followed an interview protocol provided by AFF (See Appendix II). The protocol started with introductory conversation and questions to build a friendly rapport and get background on the land and its owner in general. Then, the protocol transitions to three main inquiry sections: (1) understanding the decision, (2) exploring alternatives, and (3) gathering additional insights. The first section explored reasons behind choosing not to enroll and comparisons with competitors. The second section offered a list of alternate scenarios asking interviewees if each different offering would have removed barriers to participation, making it more likely for them to sign a contract. Section three zoomed back out to ask more general questions about the interviewee's experience interacting with AFF representatives and outreach materials, further probing about the potential for future interest. Additionally, in efforts to get a larger sample size, we expanded our outreach strategy to asking directly about why landowners from the lost landowners list did

not enroll via email or text. We received four responses through this method that helped us to further summarize the experience of landowners, although much more simplified.

We went about analyzing the recordings and fieldnotes from each interview to draw out key quotes and get at the root causes of the landowner's choice not to enroll. Each interview response to the questions of why they did not enroll was compared with the survey results they had already provided through AFF's exit survey, to add a deeper understanding to their response. The results from the interviews are grouped by the interviewer that conducted the participant specific outreach and broad conclusions are then drawn about the general consensus across all respondents.

Results

I. Key informant interviews

To begin, we spoke with Dr. Richard Howarth, a Dartmouth professor of Environmental Studies and chair of the Department of Environmental Studies. Professor Howarth's interview brought up two points that influenced our interview protocol and how we proceeded in talking to lost landowners. Firstly, Professor Howarth expressed his support for carbon easements instead of carbon credits. Easements, tools for rewarding landowners to practice varying levels of conservation and carbon sequestration on private land, often manifest themselves in tax-credit programs that provide landowners a tax reduction for enrolling and maintaining some sort of contractual agreement. Secondly, Professor Howarth noted that it is necessary to build and maintain local connections with community members, governments, and environmental organizations to establish trust with potential landowners. He mentioned that especially in the Northeast, where land conservation is often community-driven and apprehension of working with "outsiders" with a perceived lack of local knowledge could be a hindrance.

Next, we interviewed J.T. Erbaugh, a member of Dartmouth's Environmental Studies Department and a social scientist employed by The Nature Conservancy (TNC). In his interview, Erbaugh explained how TNC uses satellite data to create a "manufactured counterfactual" that is tracked overtime to best predict the additional sequestration capacity of the forest land being assessed. This "flexible baseline" methodology of assessing forestland is pivotal to communicate to landowners when they are weighing their program options because this comprehensive use of data from across the U.S. helps to more concretely confirm the additional carbon uptake for which credits are awarded. Many landowners may not understand that this is why AFF's FFCP offers uniquely high quality credits that can be sold for more in the markets. In responding to questions about skepticism towards carbon markets, Erbaugh believes that having more transparency in contracts about time horizons, profits, and revenue is essential to getting landowners to feel confident in their decision to commit to reduced impact logging practices.

Upon conducting a literature review, we were lucky enough to be put in contact with Alisa White, a former Dartmouth student who conducted her 2017 senior honors thesis research on forest carbon offsets and small-scale forestry in Vermont. At the time, programs to enroll

small landowners into carbon markets were more theoretical. The largest concerns landowners voiced to Ms. White were the binding nature of contracts (specifically how it would affect their children's land inheritance) and how much additional active management would be required on their land. Landowners were specifically concerned about how much active land management would be required in comparison to Vermont's current use tax program. Participants additionally worry about government involvement and potential penalties on landowners. While carbon markets have evolved exponentially, such concerns remained important when crafting our research questions and strategies.

Next, we spoke with Dr. Morgan Peach, an ecosystem scientist at Dartmouth College with a focus on land management. Dr. Peach noted that owners of eastern woodlands may have a strong incentive for residential development, especially in areas of housing shortages. He encouraged us to consider the large differences in state-to-state tax systems and how this would impact enrollment in programs like AFF. Dr. Peach expanded on varying land management desires including carbon credits, property tax reductions, communal forest use, and others. This helped us contextualize AFF's programs in the scope of many alternatives. Lastly, Dr. Peach provided advice on the interviewing process, highlighting the importance of understanding a landowner's positionality.

We also spoke with Dr. Maron Greenleaf, a cultural anthropologist and legal scholar studying the intersections of the environment and economy during the ongoing climate crisis. Dr. Greenleaf's research primarily focuses on the Brazilian Amazon, where issues such as monitoring and reporting costs, and the lack of secure land titles complicates the implementation of carbon markets. During our interview, Dr. Greenleaf emphasized that high monitoring and reporting costs, combined with issues like insecure land titles complicates the implementation of such programs in Brazil. She also raised critical questions for us to ask about the commodification of carbon, including who benefits and how it reshapes relationships with the land and communities. She also highlighted the importance of organizations taking on administrative burdens to support small landowners while ensuring that emissions reductions are effective, and applauded AFF for their contributions. Dr. Greenleaf ultimately stressed that "the urgency of reducing emissions militates for putting more money into forest conservation and restoration because trees are crucial for carbon sequestration."

Lastly, we had the privilege of conducting an in-person site visit to Betsy and Tim McKay's 130-acre forest land plot in Peacham, Vermont. While their land in Peacham is not enrolled in the FFCP, they own a similar stand in Gill Hall, Vermont which is currently enrolled in AFF's carbon credit program. Tim, who spent his career working for the Natural Resources Conservation Service (NCRS) under the US Department of Agriculture, was able to provide us with valuable insights into how he and his land alike have benefited from the FFCP. We gathered a number of key takeaways from our conversation that influenced our interviews with "lost" landowners and our associated research. Firstly, Tim noted that AFF's selectivity in identifying qualifying land almost prohibited him from enrolling in the FFCP at all. Through connections with local foresters, however, he was convinced to reapply and was eventually accepted to the

program after some advocacy from a forester he knew well. We had been unaware of AFF's selectivity in choosing qualifying landowners until this point. Secondly, Tim felt comfortable with the FFCP's extensive contract length as he seemingly has an intergenerational land management plan in place. As his daughter and granddaughters live only two-hundred yards from his own house, he can trust that should he become unable to manage his land while still enrolled in the FFCP, someone will pick up where he left off. Finally, Tim's background in natural resources and conservation made him knowledgeable in forestry and carbon markets, which is knowledge many landowners seemingly don't possess. Tim's passion for nature was evident in our discussion, and in many ways showcased how he exemplifies the "perfect" landowner for AFF's FFCP.

II. Landowner interviews

Throughout our interview process, we identified seven key themes as to why landowners became lost in the initial stages of the FFCP. In this section of our report, we analyze and discuss each of these seven common themes, and provide quotations from landowners to support our conclusions.

1. Low Payback Rates

The first trend we saw in our landowner interviews was that the low monetary return promised by the FFCP's contract were not enough to outweigh the sacrifices landowners make in "locking up" their land. Interviewees had concerns about future value of contract and often mentioned that they can get more money from timber harvests or tax credit programs. For example, a New York landowner, talked about getting low payment rates as his land promised little additionality since he "was not planning on cutting the land as it is used for recreation, not forestry." Another landowner from Pennsylvania stated, "It's not worth the headache of trying to figure out how to jump through all their little hoops. I have plenty on my plate already. I could find another way to get \$500." Additionally, a landowner from Kentucky remarked, "I was not interested in the program because it simply does not pay enough for me to tie up my property for that long." This sentiment was echoed later on when stating, "Although I'm very supportive of the program, I just can't participate with my acreage for this small amount of money." A different Pennsylvania landowner mentioned, "The income given was pitiful, that's a great word to describe it— not bad, not terrible, but pitiful, because it was beyond terrible." He further elaborated by saying, "I could get more money cutting a few trees and selling them for firewood than I could make on the program." Finally, a landowner that is a self-described "nature lover" from Northwest Pennsylvania mentioned how while a twenty-year contract felt like "a lot" at his age, he ultimately turned away from the program because he felt "lowballed" by AFF. Specifically, he noted how AFF originally provided him a range of what he might be compensated, and following a land assessment he was offered a number at the very low end, with little explanation.

2. Extensive Contract Length

The second trend we found in our landowner interview phase was that the contract length was a big deterrent for many. Landowners stated that there was too much unknown 20 years in the future that made it difficult to make this kind of finite decision. This had a lot to do with wanting the next generation of their lands' owners to have agency over its use and uncertainty about the unpredictable, fluctuating value of the carbon markets. For example, a New York landowner felt strongly about the fact that AFF and other carbon credit program organizations did not account for the uncertainty of future disaster when creating contracts. In his survey response, this interviewee selected that the "compensation was too low" and the "contract was too long" to make enrolling feel worthwhile. However, when further prompted about his aversion to the contract length, he suggested that it was less about the number of years that the land is tied up and more about his ability to draw on his land as an asset in times of need or disaster. He stated, "20 years is way too long. I could have cancer next year, and I need to sell or my kids could be sick and need to or I need there could be reasons that it's too many. It's too much of a restriction." Another landowner from Michigan expressed concerns with making a decision that may affect his children's autonomy once he passed on the land parcel: "The contract was worded in such a way that if you didn't opt-out you were opting-in. This could put a burden on my estate planning where one of my children is just stuck with it." He also mentioned thinking about the discount rate of future money and what that could mean when signing a long term agreement. He stated, "signing a contract upfront now, may end up being more of a hindrance later." These quotations align with this landowners survey responses of the "contract being too long" and "payment being too low."

3. Misaligned Use Goals

The next trend we noticed in conversing with interviewees was related to the landowners having different goals for their land that were not conducive to maximizing carbon sequestration. For example, several respondents mentioned wanting the agency to sustainably cut their forests. An alternate landowner from Pennsylvania highlighted the importance of maintaining autonomy over forest management, stating, "We decided against the Carbon Program so that we would have complete flexibility with forest management and usage decisions in the future." Another landowner from the Upper Peninsula of Michigan, highlighted that "There are times when you need to do timber harvests for good silvicultural practices." Therefore, he was not willing to sacrifice his ability to maximize the ecological health of his forestland. Additionally, a landowner in Massachusetts, seemed to be excited about the prospect of enrolling, however, was hoping to cut his land right before doing so. In the survey he responded that it is "not a good time" to sign the contract. He said, "It seemed like another tool that we could use to encourage us to do good things, but we needed another 6 months to cut our land right before enrolling." This brings about questions of if this landowner would truly be improving sequestration through his enrollment. Finally, the manager of a land sanctuary in Vermont, found that the goals their collective had for the land did not fit with the goals of the Family Forest Program to reduce

timber harvest. She stated, “our land doesn’t really fit the program’s purpose. Humans pretty much stay out of there and the wildlife has a safe, private place where no hunting is allowed. None of us are at all interested in harvesting any timber from our woods.” This is another example of a landowner whose land enrollment will not confirm additional carbon sequestration, showing that the intent to cut timber without the contract is essential to making these carbon credits ecologically beneficial.

4. Fear of Punishment

Additionally, the fear of penalties in the FFCP contracts seemed to be a trending reason why the landowners we interviewed did not end up enrolling with the program. A common sentiment seemed to be that there is no buffer or insurance clause if there is a disaster, and the contract outlines a net loss on behalf of the landowner if the contract is breached. A landowner in Vermont said, “I’ve had trespassers cut down 29 trees. The contract has some level of ambiguity when it comes to other people. I can’t control the actions of others. Would I have to pay for someone else’s actions?” Another landowner in Pennsylvania, stated “even though I’m not planning to cut any trees, the thing that kind of had me a little bit worried was their penalty process.” This conclusion aligns with this respondent’s survey response that the termination fee was too high. When further questioned about this pain point, this interviewee stressed her fear surrounding uncontrollable circumstances having the potential to unintentionally decrease the carbon sequestration of her property and the contract forcing her to owe AFF any money she had earned, plus additional fees. A landowner from Southwestern West Virginia elaborated that they may have joined “if the escape clauses weren’t as penalizing...I felt that if I needed to get out from underneath it, the payback was too hefty.”

5. More Attractive Competing Options

Many landowners also mentioned their enrollment with competing programs or finding alternative avenues to get revenue from their land. Some respondents either got a better payment offer from a different carbon credit program, wanted to enroll in a program with shorter time horizons (ie. NCX) or they alternatively sought out tax credit programs or land easements. When asked about their consideration of the FFCP one landowner from Tennessee stated, “I’m already working with NRCS (Natural Resources Conservation Service).” This shows that many of the small landowners that were pursued by the AFF are already committed to environmental stewardship through other programs. Additionally, a Massachusetts landowner mentioned wanting to recertify his land under the Chapter 61 tax program. He said, “I wanted to learn more about how the Chapter 61 program from the state would interface with the Forest Credits Program.” Another New York landowner mentioned how he found success with enrolling in a 488 tax program where he got 80% off property taxes on his forest land. This seemed to be enough for this interviewee as he stated he “didn’t want to mess with that deal” when considering other potential revenue streams.

6. Inflexibility of Contract

Multiple landowners expressed dissatisfaction, believing AFF's contracts to be fundamentally one-sided. A Northeastern Pennsylvania landowner elaborated on what he described as an "incredibly one-sided" contract, saying "they (AFF) can get out at any time, you (the landowner) can't". A landowner from the Upper Peninsula of Michigan reiterated such concerns, stating that the contract was "horribly one-sided...you were locked into a program for a substantial amount of time and they could cancel it at any time." This fear of contract termination from AFF, when they faced penalties for mismanagement or withdrawal made landowners believe they were at a long-term contractual disadvantage, and thus decided to not sign contracts. Further concerns regarding external involvement on one's land were expressed. One landowner stated that they "would not like to be limited in my land management from an external factor" and would "need to speak to an independent forester about what the restrictions (20%, 30%) would mean if we were harvesting on a sustainable basis." Lastly, one landowner questioned the need for NDAs in AFF's contract, describing them as "sketchy" and unsure of their purpose in a conservation program. AFF may consider communicating why they need the ability to exit contracts and the utility of their NDAs to improve landowner retention.

7. Distrust of Carbon Markets

Carbon markets remain a novel concept to many forest landowners, especially given their generally older age. Some are not fully convinced that their land management actions will have a beneficial effect on carbon sequestration, specifically that they may not create "additionality." A Vermont landowner summed up this concern humorously, saying "I'm already doing everything the AFF wanted. It's like paying a Christian to go to church. It doesn't feel right to accept money for something I'm already doing." On the other hand, a New York landowner expressed distrust about where the credits generated on their land are being sold, stating "We don't know about what these guys (presumably AFF) are doing with the money and credits made." The aforementioned landowner expressed their belief that the credit buyers have "good intentions, but no idea about the business." Lastly, a Michigan landowner expressed his confusion, saying he "is not aware of any (carbon) markets." General information on where AFF sells its carbon credits, and who are potential buyers may enhance transparency and thus improve landowner relationships. While providing landowners information on who is purchasing the credits directly attributed to their land is likely infeasible and costly, overarching educational materials could potentially distinguish AFF from other companies and organizations in the forest carbon space.

Discussion

The survey and interview processes conducted with AFF's lost landowners provided many valuable insights into their experiences and decisions regarding the Family Forest Carbon Program. To structure our findings, we have organized this discussion section into subsections corresponding to our three primary research questions.

1. Concerns Affecting Enrollment

The general survey results indicated that while many landowners recognized the environmental benefits of the program, there were notable concerns that influenced their decision to not enroll their land. These concerns included:

- Complexity of contract language - Landowners found the contract language difficult to understand, making it a significant barrier for some.
- Restrictions on land management and timber harvesting - The perceived limitations on how they could manage and harvest their land deterred participation in the program.
- Inadequate compensation - Many felt that the financial incentives were not sufficient to justify the restrictions imposed by the program.

Comparing these survey results with the responses from the interviews reveal a consistent pattern. Both data sets highlight the importance of clear communication and personalized support. Specifically, landowners expressed a need for simpler contract language and more flexible terms that could be adapted to their individual circumstances. These findings suggest that improving these aspects could significantly enhance landowner satisfaction and increase enrollment rates.

2. Key Points from Interviews

Despite the small sample size, several key points emerged from the interviews:

- Need for Clear Communication - Many landowners felt that clearer, more frequent communication from AFF representatives could have positively impacted their decision to enroll.
- Contract Length and Complexity - The complexity and length of contracts were common barriers. Landowners indicated that had the contracts been shorter, simpler, and more straightforward, the program would have been much more appealing.
- Personalized Support - Improvements around tailored support and more personalized interactions would make the program more appealing. Several landowners expressed that they appreciated when representatives took the time to understand their unique needs and circumstances.

These insights highlight the importance of tailored support and straightforward communication in enhancing the program's appeal.

3. Strategies for Improvement

Implementation of the following strategies could help AFF to better align their contracts with landowner needs while still maintaining their mission:

- Enhanced Communication Strategy - Establish more consistent and transparent communication channels, including regular updates, clear explanations of why contract terms are necessary, and having dedicated support staff to address landowner questions and concerns.

- Simplified Contract Language - Revise contracts to include more simplified language. Making these contracts more accessible does not necessarily mean simplifying the language, but could also be done by including a glossary of terms and a summary of key points to ensure clarity without having to fully understand the jargon.

Conclusion

I. Main Takeaways

The process of long-form, information-gathering interviews allowed us to better understand the underlying reasons why landowners choose not to enroll in AFF's Family Forest Carbon program. As we look to accelerate to a more sustainable, low-carbon economy it is important to understand the role that carbon markets can play. Consistency across contracts is important for both AFF and landowners. Still, the FFCCP and other similar programs aimed at small landowners will benefit from increased attentiveness to concerns over the complexity of contract language, restrictions on land management and harvesting, inadequate compensation, and contract length & penalties. We have distilled our analysis into six key takeaways.

1. Contract length may always pose a barrier to some landowners, but remains necessary for additionality.
 - a. Given the age of many forest landowners and the importance of land ownership as a means of securing financial stability for future generations, some landowners will always be weary of multi-decade contracts. This should not impact carbon-credit program design, as longer contracts provide the greatest degree of assured additionality.
2. The interplay between state land management programs and carbon markets must be considered for landowner retention and concerns regarding additionality.
 - a. Many conservation easements and other tax incentives were created long before the existence of carbon markets. Thus, current land management structures are not attuned to the integration of carbon markets. Organizations providing carbon credits to small landowners should aim for seamless integration with existing property tax reductions and other land management subsidies, with attentiveness to leakage concerns. This will require a significant amount of research and adaptability given differences in U.S. state policy. With such expertise, organizations may be able to guide landowners through program and tax structure compatibility to increase retention rates for "lost landowners."
3. Improved transparency and communication regarding compensation determinations can increase landowner retention.
 - a. Some landowners expressed confusion or frustration regarding the financial determinations regarding their forests. Providing more precise information on how valuations correspond to tree species, age, local climate dynamics, etc. may improve landowner relationships.

4. Financial penalties for leaving carbon credit programs may be a “non-starter” for many landowners.
 - a. The threat of incurring a financial penalty for legal (though not contractually allowed) actions on their own land was a point of contention for many landowners. Less punitive language regarding penalties, or exploring contractual alternatives may increase retention rates but could bring about additionality concerns.
5. AFF may consider including exemptions/clauses for solar development and other renewable energy production on land plots.
 - a. A surprising finding from our interview is that some landowners are considering developing solar or other renewable energy production on their land instead of participating in a carbon credit program. AFF may consider changing contract language or structure to allow or promote pro-environment development such as renewable energy.
6. AFF’s web-based landowner marketing appears to be working well.
 - a. Potentially affected by our limited sample size, AFF’s digital marketing appears to be adequately reaching the landowner population of interest. Many of the landowners we spoke with had not considered or heard of other programs aiming to include smaller private landowners in carbon markets. Such landowners most frequently referenced learning about the program via digital marketing or trade/interest area magazines.

The findings of our project remained limited in their applicability outside the Eastern and Midwestern U.S. This is particularly salient given our country’s unique landowning structure and private land ethics. Lastly, we expect such findings may change carbon markets and expand their reach and effectiveness. Presently, carbon markets are a novel concept for many, and significant informational barriers exist. Additionally, private forest landowners in the U.S. tend to be older and may have limited exposure to information about carbon credit programs. Continued attention to the attitudes of forest landowners in the U.S. will be necessary to optimize program participation.

II. Study Limitations

This study also has several limitations that should be acknowledged. The first is the potential presence of self-selection bias in the interview sample. The voluntary nature of participation in this research phase may have introduced the possibility that more individuals with strong opinions or poignant experiences they wanted to discuss were motivated to respond to our outreach. Similarly survivorship bias was also likely at play because respondents were self-selecting and may not accurately represent the general population of those who chose to discontinue their involvement with AFF. Additionally, because of the short timeframe this research was produced in, the sample size of the lost landowners we were able to interview was

relatively small. This introduces the possibility that the sample is not the most accurate representation of all the lost landowners in questions and limits the generalizability of our findings. Finally, as this research was produced by a group of student researchers, there is the possibility that inconsistent data collection protocols may have influenced the uniformity of the interview results. For example, each interviewer had different outreach and recording methods that may have introduced inconsistencies in data collection and analysis methods. Although an interview protocol was generally followed during each landowner and key informant interview, each group member has a different conversational style and familiarity with the format, potentially introducing variation in the key quotes and takeaways expressed in this report.

III. Applications Beyond AFF

Present uncertainty about the future of carbon markets may be disrupting current programs. AFF and other credit providers cannot accurately predict the state of the carbon market multiple decades into the future. As a result, they must rely on price estimates when determining compensation and put forth strict contracts that penalize landowners for opting out. Financial penalties are a “non-starter” for some, and greater compensation would surely attract more landowners. As carbon markets mature, consistency in payments and reduced penalties (as a result of more wide-ranging, developed markets) will increase landowner retention. Next, private forest landowners have unique value systems and conservation ethics that may differ from the general population. We have found such values and ethics to be largely influenced by U.S. cultural ideals of property ownership, individualism, and libertarianism. Due to this, and disparities in informational access, landowner populations may believe that their “personalized” (including harvesting patterns, agriculture, recreation, etc.) land management practices are more environmentally productive than what is recommended by an outside program. This can increase program skepticism and remains a hard barrier to overcome. AFF should keep such concerns in mind if it seeks to expand the FFCP beyond the current geographic focus.

IV. Future Research Directions

To build on the insights from this study, future research should consider several key areas. Continuing interviews with a larger sample size will provide more robust data and enhance the reliability of the findings. Expanding the study to include other organizations working with landowners, like Finite Carbon and Family Forest Works, could offer comparative insights and broader applicability. Additionally, implementing longitudinal studies to track landowner satisfaction and outcomes over time will help identify long-term trends and the lasting impact of AFF’s contracts. These steps will provide a deeper more comprehensive understanding of the factors influencing landowner decisions and help refine strategies to better meet their needs. Some questions that AFF could continue to explore are listed below:

1. Does dual enrollment in conservation-oriented property tax deductions alongside carbon programs raise concerns regarding additionality?
 - a. If landowners are already taking conservation-minded actions due to tax deductions and easement programs, enrolling in a carbon credit program may not create a large amount of additionality. Programs should consider whether “doubling up” on financial incentives for forest landowners is the most effective carbon sequestration strategy. A large amount of this will depend on state-to-state differences in tax programs.

2. How do cultural land-ownership values across the Eastern U.S. impact willingness to enroll in carbon programs? What differences may we see on an international scale?
 - a. While this is likely not under the scope of the *American Forest Foundation*, we are curious to examine potentially different incentives and barriers to entry for forest landowners in the Western U.S. and internationally. We believe this will be a blossoming area of study as carbon markets continue to develop.

3. Could AFF and other carbon credit programs serve as a bridge to non-sequestration-focused forest conservation initiatives?
 - a. As informed by our interview with Dr. Morgan Peach, it may be of ecological benefit (although likely not financial) for AFF to continue correspondence with forest landowners, even if they decide not to enroll in programs like FCCP. Helping guide them towards community conservation resources, sustainable timber practices, and other productive land management strategies may help build more long-term relationships with a diverse cohort of forest landowners. This could have long-term ecological benefits while increasing trust between AFF and communities of landowners.

Group Reflection

We find it important to note that this report is the result of rigorous and intensive group work that required extensive collaboration and communication between our group members. By establishing group norms at the beginning of this project, it helped guide this collaborative and communicative task. For instance, our group established expectations for communication timelines, progress-indicator completion, and leadership roles we were responsible for. Drawing upon the Matthews article about the importance of being a good follower, we acknowledged that each member of the group has different skill sets, areas of interest, and academic backgrounds. Our team’s ability to step back at different stages of this process and be led, fulfill defined objectives, and create deliverables under the guidance of someone with a greater understanding of the task at hand allowed us to effectively meet goals. On the contrary, our team worked well at acknowledging when to step forward and take the lead as well.

We would also like to acknowledge that throughout this project, our group engaged in healthy debate and dissent. As discussed in class with John Turner, debate, clash, and disagreement are healthy parts of our academic setting. Setting a group norm that allowed us to express open disagreement in a constructive, productive, and respectful manner increased the quality of our work as it allowed us to incorporate different perspectives into our work. Dissent challenged our inherent assumptions and biases, leading to more well-rounded decisions and solutions throughout the course of our project. In other words, because our group valued and encouraged healthy disagreement, we were better equipped to address complex challenges, adapt to change effectively, and leverage the collective intelligence and creativity of our members.

Finally, relating to our class discussion on research methods, our conversation about counterfactuals helped shape our understanding of “additionality”. Our project revolved heavily around “what if” statements in the context of landowner behavior without enrollment in a carbon credit or other conservation program. Proving additionality requires carbon verifiers to prove a counterfactual regarding what a landowner would have done had they not been incentivized to conserve their land. This was a fundamental argument in our groups’ debate assignment, and having covered this theory in class, the concept was much easier to grasp.

Appendix

I. Dartmouth Key Informant Interview Protocol

1. What has been your experience thinking about carbon credits through an academic or personal lens?
 - a. Verification? - upfront costs paid?
2. What ethical or practical arguments have you heard about in discussions of the carbon markets we should make sure to research/include in our analysis?
3. Are there any other options small landowners may have to get incentives to protect their land? Government programs? Tax incentives (current use)?
4. What do you think are some of the major barriers to small landowner engagement?
5. What are some of the benefits and challenges you see with trying to implement quality carbon projects with private small landowners
6. Have you been involved in any stakeholder engagement or focus group or interview based research in the past? If so, any recommendations/suggestions for outreach?
 - a. Best interview techniques?
7. What do you think is the best way to leverage the carbon market for small landowners?

II. Landowner Interview Protocol

1. Greetings and Introduction:

- Thank the individual for agreeing to provide feedback.
- Introduce yourself
- Introduce AFF - family forest program
 1. **Summary:** Family Forest Carbon Program enables family forest owners to access climate finance from carbon markets—empowering them to help address climate change while earning income from their land.
 2. Up until now, family forest owners had almost entirely been excluded from carbon markets due to complexity and high upfront costs. And because they own the largest portion of forestland in the United States, leaving them out was essentially shorting the potential of our forests to address climate change, withholding economic opportunities from rural Americans and limiting the carbon credit supply for companies.
 3. The Family Forest Carbon Program was designed to simultaneously meet the needs of family forest owners, policymakers and companies as we all work together to sequester and store carbon.

2. Explanation of the Interview:

- Explain that you're seeking feedback to improve the Family Forest Carbon Program.
 - Emphasize the value of their honest opinions and how it will help refine your program.
3. Can you tell me about your land – where are you located, and what are your primary goals or reasons for owning your land?
- How do you plan to manage your land in the future? Intergenerational considerations?

Section 1: Understanding the Decision

3. Reasons for Not Purchasing:

- What were some of your initial motivations for looking into enrolling your land in a carbon credits program?
- Ask open-ended questions:
 - "Could you please share the reasons behind choosing not to enroll in the Family Forest Carbon Program?"
 1. Ask follow up questions to get at root issues
 - "Were there specific aspects of the Family Forest Carbon Program that didn't meet your expectations or needs?"
 - If they mention payment and/or contract length:
 1. Payment rates and contract length are two of the most common reasons we hear for people choosing not to sign up. Can you share a little bit about how do you think about these two things?

2. Please walk me through your thought process when you decided either that the contract was too long, the payment rate was too low, or some combination of them both.
4. Comparison with Competitors:
 - Inquire about any comparison with competitor products:
 - "Did you consider other programs similar to ours?"
 - "What advantages did those alternatives have over our program?"
 - Did you end up enrolling your land in any alternative incentive programs?

Section 2: Exploring Alternatives

5. Alternate Features or Options:
 - "If our program had a higher payment rate for the same 20-year agreement, would that have influenced your decision?"
 - If yes:
 1. "Could you share how these changes might impact your decision?"
 2. "The per-acre, per-year payment rate we offered you was \$X. How much would the per-acre, per-year payment rate need to increase to influence you to enroll in the Family Forest Carbon Program?"
 3. "If we were able to increase the payment to [whatever they answered for #2], but the payments were back loaded such that you received smaller payments in early years, larger payments in later years, and a total overall larger payment, would that have influenced your decision?"
 - "If our program was structured as a 10-year, auto-renewing agreement, where you had a lower per-acre, per-year payment rate, but you could opt out without penalty at every 10-year mark, would that have influenced your decision?"
 - If yes:
 1. "Could you share how these changes might impact your decision?"
 2. "The per-acre, per-year payment rate we offered you was \$X for 20 years. For this scenario, you would get paid , \$x/2 per-acre, per-year for the first ten years, then \$x per-acre, per-year for the last five years. Would you be likely to enroll in something like this?"
 1. Probe for more details/thought process.
 - "If we offered a payment model that depended on the amount of carbon credits we sell and the price we sell them at, rather than a guaranteed rate of payment, would that have influenced your decision?"
 1. "Could you share how these changes might impact your decision?"
 2. If they don't mention it, probe on willingness to accept downside AND upside.

Section 3: Gathering Additional Insights

7. Feedback on Overall Experience:

- Inquire about their overall experience with your brand:
 - "How was your experience interacting with the Family Forest Carbon Program?"
 - "Did any specific aspect of your experience influence your decision?"
 - Did you feel supported with enough involvement from AFF when making your decision?
 - Was any part of the process difficult to understand or navigate? Did this play a role in your enrollment decision?
8. Future Consideration:
- Ask about potential future interest:
 - "What would be the most important thing we could do to encourage you to reconsider the Family Forest Carbon Program in the future?"

Conclusion:

9. Appreciation and Closure:
- Express gratitude for their time and valuable insights.
 - Reiterate the importance of their feedback in enhancing the Family Forest Carbon Program.
 - Offer the opportunity for further communication if they have additional thoughts or suggestions.

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