Cover Letter

LINNEAN SOLUTIONS
11 Stearns Street
Cambridge, MA 02138

Tom Anderson
Massachusetts Executive Office of Energy and Environmental Affairs
100 Cambridge Street, 9th Floor.
Boston MA, 02114

Dear Mr. Anderson and members of the selection team,

Thank you for the opportunity to respond to the Challenge Grants Implementing the Commonwealth's Healthy Soils Action Plan (HSAP). The Challenge Grants Request for Proposals calls for projects that put the HSAP into motion, and ultimately strengthen state-wide efforts to protect and restore the Commonwealth's critical ecosystems. We would be thrilled to contribute to the success of the HSAP's recommendations by implementing the proposed Healthy Soils Voc-Tech Curriculum, an initiative that will support learning and action related to sustainable land management practices and soil health improvement.

Our team is led by Linnean Solutions, a mission driven, regenerative consulting firm that focuses on creating systems change for more resilient communities. We are joined by No Loose Braids, a Nipmuc-led organization reviving Eastern Woodlands traditions and cultural practices; and by Minuteman High School, an award-winning public regional career technical education high school. Together, we bring a shared passion for expanding the capacity of communities across the Commonwealth to better steward the Earth, and a proven track record of working with diverse populations to implement land-based and community-centered resilience initiatives.

The proposed Healthy Soils Voc-Tech Curriculum builds on recent collaborations that brought diverse knowledge sets and cultural practices into alignment to improve environmental and social health and resilience. The Healthy Soils Voc-Tech Curriculum addresses several key recommendations outlined in the HSAP related to expanding the educational and technical programming needed for a wide range of actors to adopt soil-smart practices and combat climate change. We will develop a curriculum for students in vocational education institutions that will prepare youth to enter the workforce with specialized knowledge and skills related to soil health and land management, and encourage them to adopt innovative and soil-smart land management practices in their own careers.

We are committed to working with the Commonwealth of Massachusetts and land management practitioners to find innovative ways to protect the state's soil. Please do not hesitate to contact us for additional information.

Sincerely,

Jim Newman, Principal
Linnean Solutions

1 Project Description

Overview

The Massachusetts Healthy Soils Action Plan (HSAP) describes the state of soil ecosystems in Massachusetts, and highlights the critical role of soil health in both sustaining the Commonwealth's healthy ecosystems and working towards its climate goals. Preserving, restoring, and regenerating soil health across the Commonwealth will require a shift in land management culture and practice at many different scales. Effectively engaging with many different actors who play a role in the creation and maintenance of turf and ornamental landscapes will be an important part of ensuring successful implementation of recommendations in the HSAP. This proposal focuses on several key recommendations outlined in the HSAP: expanding educational and material support for land managers to employ soil-smart practices; supporting local initiatives and educational programs that increase awareness about the importance of soil health; and empowering communities to use soil-smart practices to combat climate change.

Jim Newman from Linnean (right) and Rebecca Longvall from the Town of Bolton (left) assess land management practices and the impact on soil health across a stark gradient as part of the Apple Country Natural Climate Solutions project.

This project seeks to create a vocational-technical (voc-tech) curriculum for high schoolers that combines learnings and recommendations from the HSAP with Indigenous stewardship practices and cultural knowledge (referred to throughout the proposal as The Healthy Soils Voc-Tech Curriculum). Working with youth and Indigenous stewards to develop a voc-tech curriculum is a particularly effective way to implement the HSAP recommendations for the following reasons:

1) Youth have a critical role to play in stewarding the cultural and practical shifts that drive climate action, both now and in the future.

From the on-going youth-led global climate strikes inspired by Greta Thurnberg, to High School Environmental Clubs across the State, youth have been central to raising awareness about the environmental impacts of human activities, and influencing shifts in policy and practice that will mitigate climate change. Engaging youth around the work of the HSAP brings their critical perspective to the table with the potential to create a new generation of professionals who implement and advocate for soil-smart practices, ultimately shifting land management culture and practice among their peers, families, communities, and the field at large.

> **"Among Indigenous Peoples of the Eastern Woodlands, approaches to forest management may vary widely, but are strongly connected to cultural, economic, and spiritual practices and beliefs, and often are based on a more reciprocal and respectful relationship with a recognition of the living beingness of places, trees, and the web of life."**
>
> *Care of Trees: Guides to Living Forest Resilience; Nashua River Resilient Lands Management MVP Project*

2) Land management practices must incorporate Indigenous stewardship practices and cultural knowledge to truly regenerate the health of our ecosystems and combat the effects of climate change. Developing respectful, mutually beneficial collaborations with local Tribal members, in a way that both folds traditional ecological knowledge (TEK) into soil-smart practices, and also enables Indigenous stewards to practice caring for their ancestral lands, is a key part of preserving, restoring, and regenerating soil health across the Commonwealth. The Healthy Soils Voc-Tech Curriculum presents a significant opportunity to collaborate with Nipmuc Cultural Stewards, with whom Linnean has existing relationships, on developing and facilitating this curriculum.

3) Voc-tech programs are designed to provide hands-on, practical learning experiences for students in a way that increases student engagement and motivation, supports in-depth comprehension and technical skill development, and prepares students for employment in a specific trade or profession. The curriculum will combine content on soil health and climate resilience with hands-on activities (eg, soil testing, site visits, and other opportunities for technical skill development) to make the science of soil health, and land management practices that support soil health, more accessible to high schoolers who are preparing to enter careers in relevant fields. By nature of working with students in voc-tech education who are training to enter directly relevant fields, this project will not only prepare youth to enter the workforce with specialized skills in soil health and land management, but also encourage them to adopt innovative and soil-smart land management practices in their own careers.

This project is the product of many collaborative efforts to improve the stewardship of our planet and expand the reach of the HSAP ideas, starting with Linnean's work on the Healthy Soils Action Plan (HSAP), and growing into multiple partnerships with the Regenerative Design Group (RDG), BSC Group (BSC), local Tribal Stewards, and others. From 2019 - 2021, Linnean Solutions collaborated with RDG and BSC, as well as with Nipmuc and Mashpee Wampanoag Tribal Stewards, to work with the towns of Bolton, Devens, and Harvard, on the Apple Country Natural Climate Solutions (Apple Country) project. The project highlighted a key area for further collaboration: Eastern Woodland Tribes have a set of scientific knowledge and cultural practices that advance the overall goals of the

HSAP, and the HSAP recommendations align with existing Tribal endeavors to rebuild the health of the Eastern Woodlands ecosystems.

The same team subsequently pursued the Nashua River Communities Resilient Land Management MVP project (Nashua River) with the towns of Clinton and Bolton to turn the knowledge and set of relationships developed during Apple Country into specific guidance for land stewards. The Nashua River Project also brought our first collaboration with Dr. Sarah Cammer to develop a short unit on sustainable land management practices with Minuteman High School students.

We believe there is much more untapped potential to bring the work and recommendations of the HSAP to students across the Commonwealth, starting with Minuteman High School. As a team, we are committed to continuing our collaborations towards better stewardship of our planet. The Healthy Soils Voc-Tech Curriculum will allow us to build on our experiences and continue our work in meaningful ways. For more on the project team, see the "Organizational Capacity" section.

Minuteman High School students conducting field studies as part of the Nashua River Communities Resilient Land Management Project

Healthy Soils Action Plan Goals and Objectives

The Healthy Soils Voc-Tech Curriculum will directly address the following specific recommendations from the Healthy Soils Action Plan:

- **A6 -** Eliminate technical and knowledge barriers to the adoption of practices which increase soil health (78).
- **A6.c -** Conduct multimedia awareness campaigns on soil health and its connection to community resilience, economic viability, and climate change [...] Support the development of training for soil health practitioners and soil health providers (78).
- **R4 -** Increase soil health education and outreach for professionals that play a role in the creation and maintenance of turf and ornamental landscapes (95).

Additionally, The Healthy Soils Voc-Tech Curriculum meets the objectives of the grant in the following ways:

Sustainable Land Management: ***To encourage innovative approaches to sustainable land management that minimize environmental degradation, enhance biodiversity and/or restore degraded soil health.*** By nature of working with students in voc-tech education who are training to enter directly relevant fields, this project will encourage adoption of innovative and soil-smart land management practices.

Community Engagement: ***To foster community involvement and education in sustainable land practices and soil health improvement.*** This project will bring together the latest science, research on best management practices, local traditional ecological knowledge (TEK), and practical, hands-on learning activities, to enhance student learning about the importance of soil health, and existing innovative and sustainable approaches to land management.

Methodology

The project team will oversee the implementation of the entirety of the project. The project team is composed of consultants from Linnean Solutions, students and one teacher at Minuteman High School, and Tribal Stewards from No Loose Braids. The project will unfold in three phases:

PHASE 1. Curriculum Design – The curriculum will be designed by the Curriculum Design and Facilitation (CDF) Team in the spring and summer of 2024 at Minuteman High School. The team will be composed of members of the project team, and include additional Minuteman staff and students. Each member of the CDF Team will bring specific skills and knowledge sets to support development of a well-rounded curriculum. Consultants from the Linnean Solutions team bring theoretical and technical expertise in climate-smart land use planning and sustainable land management practices. Tribal Stewards from No Loose Braids will ensure that the curriculum integrates wisdom from local traditional ecological knowledge. Dr. Cammer and several other Minuteman faculty are well versed in creating hands-on curriculum for their environmental science students. Students from Minuteman will provide vital insight to inform the development of the curriculum based on their expertise in student experience. Throughout the spring and summer of 2024, the team will collaborate to develop a curriculum that will engage students in hands-on experiences and reflections that will enable them to put their classroom learning into professional practice. Key elements of the course include:

- The science of soil health and its importance in sustaining healthy ecosystems and climate resilience
- Land management practices that support soil health and innovative solutions for improving soil health and adapting land management practices
- Indigenous stewardship practices and traditional ecological knowledge, and their impact on soils, ecosystems and climate

Investigating soil cores as part of the Apple Country Natural Climate Solutions project.

Additionally, the course will include experiential learning through field research and hands-on training in the following areas:

- Soil testing
- Land management practices that protect and enhance soil health and resilience to climate change, including Indigenous Stewardship practices
- Mapping/analysis with ArcGIS Pro
- Curriculum design and evaluation

PHASE 2. Curriculum Implementation – The CDF Team will implement the curriculum in the fall of 2024. The CDF team will establish an ongoing monitoring process to evaluate student experience and learning throughout the

During the 2022-2023 school year, the Minuteman Environmental Class of 2025 collaborated with the Nashua River Project team to develop a set of climate solutions for increasing resilience at Forbush Field. The project was focused particularly on natural resource conservation and nature-based solutions. They used their technical expertise in ArcGIS and I-tree, as well as conducting interviews with residents, to produce their recommendations. See one of the StoryMaps produced by a pair of students here: https://shorturl.at/kGS34

semester, and make iterative revisions to the curriculum accordingly. The monitoring process will include short, open-ended reflections for the students, administered on a weekly basis by their instructor, Dr. Sarah Cammer. These reflections could be administered orally or in written format during the last five minutes of class, or could be added to take-home assignments. Additionally, Dr. Cammer will conduct one short focus group with students, teachers, and Indigenous Stewards, half-way through the course to collect more in-depth feedback.

PHASE 3: Evaluation and Documentation – The Linnean team will develop and administer pre- and post-program surveys to understand the curriculum's impact on the students. It is important that these evaluations be collected by an entity outside of Minuteman High School, so that students feel comfortable providing honest responses. This will provide data for discussion on the project's successes, areas for improvement, and recommendations for implementing this curriculum in a wider range of settings. In addition to the curriculum itself, the team will prepare a resource (referred to in this proposal as "A Resource for Implementing the Healthy Soils Voc-Tech Curriculum") to enable other educational and vocational training programs across the Commonwealth to adapt, scale, and implement the curriculum.

Following completion of the project, the project team intends to identify future opportunities to affect long-term, transformative impact on voc-tech students at Minuteman through working directly with Minuteman High School administrators and educators to ensure continued adoption of the curriculum. The project team also intends to identify future opportunities to affect long-term, transformative impact on voc-tech students and institutions, and the soil health and land management fields at large, through sharing the resource and supporting implementation of the curriculum, pursuing partnerships with other institutions, and considering

different avenues for reporting this information through podcasts, social media campaigns, or peer reviewed journals. The learnings established through this program, and relationships established during the activities of this project, will inform the focus of future curriculum development and identification of opportunities for additional funding.

Expected Outcomes and Deliverables

We expect to implement the curriculum with one cohort of up to twenty students through this project. The students will likely represent a mix of grade levels, and will engage with the curriculum in multiple ways – all will attend the course, some may be a part of the CDF team.

The primary deliverables from this project will be related to the development and implementation of a voc-tech training program on soil health and sustainable land-management practices.

1. The Healthy Soil Voc-Tech Curriculum: The development of the curriculum will yield a set of educational materials, classroom lesson plans, field research activities, and skill-building trainings that distill current research on soil health, sustainable land management practices, and TEK; and prepare youth for careers in soil health and sustainable land management.

2. Implementation: This project will result in the implementation of a voc-tech curriculum on soil health, sustainable land management practices, and TEK. The implementation of the curriculum will support the following outcomes for participating students:

- **Learning Outcomes:** students will gain knowledge in soil health, sustainable land management practices, TEK, and other related topics.
- **Cognitive impacts:** students will be exposed to new perspectives and beliefs about the role of soil health and TEK in their communities and the field at large.
- **Behavioral impacts:** students will develop skills that prepare them for jobs in land management, soil science, and ArcGIS Pro.

3. A Resource for Implementing the Healthy Soils Voc-Tech Curriculum: The resource will be a document that includes the curriculum itself, lessons learned, and recommendations for implementation. The resource can be used by educational and voc-tech programs across the Commonwealth to implement the curriculum beyond Minuteman High School.

Grant reporting: The project team will submit progress reports summarizing activities at the end of each project phase (Curriculum Design; Curriculum Implementation; Evaluation and Documentation) to OEEA. Progress reports will include materials such as meeting notes and draft lesson plans. Final materials will be submitted to OEEA, and shared publicly, as part of the Resource for Implementing the Healthy Soils Voc-Tech Curriculum.

Andre Strongbearheart Gaines looking at forest wetland species migration as part of the Nashua River Communities Resilient Lands Management Project.

2 Budget

	Linnean Solutions					
	Jim Newman, Pricipal		Sarah Saydun, Climate Planner		Olivia Vilá, Climate Planner	
	$175		$150		$160	
Task 0: Project Management						
0.1 Project Team Meetings	0	$0	24	$3,600	0	$0
0.2 Project Management	0	$0	28	$4,200	9.5	$1,520
Task 1: Establish Curriculum Design and Facilitation Team						
1.1 Establish Curriculum Design and Facilitation (CDF) Team	0	$0	2	$300	0	$0
1.2 Hold kickoff meeting to introduce team members, clarify roles, and set expectations	2	$350	4	$600	2	$320
Task 2: Design Curriculum						
2.1 Conduct an assessment with the CDF team to understand the interests, learning styles, and needs of Minuteman students	0	$0	0	$0	0	$0
2.2 Compile research on soil health, sustainable land management practices, and relevant professional development training	2	$350	4	$600	4	$640
2.3 Develop lesson plans, lectures, fieldwork plans, and assignments that align with research, Indigenous TEK, and student needs	1	$175	8	$1,200	8	0
2.4 Finalize designed curriculum, based on feedback from students and CDF	0	$0	2	$300	2	$320
2.5 Coordinate with Minuteman High School to prepare to deliver curriculum	0	$0	0	$0	0	$0
2.6 CDF team meetings	1.5	$263	7.5	$1,125	1.5	$240
Task 3: Implement Curriculum						
3.1 Deliver curriculum at Minuteman High School	15	$2,625	20	$3,000	0	$0
3.2 Implement monitoring process	0	$0	1	$150	2	$320
3.4 Make adjustments to improve the curriculum based on feedback from monitoring process	0	$0	3	$450	0	$0
3.6 CDF team meetings	3	$525	3	$450	3	$480
Task 4: Evaluate and Document						
4.1 Administer pre-evaluation	0	$0	2	$300	6	$960
4.2 Administer post-evaluation	0	$0	1	$150	3	$480
4.3 Analyze data from monitoring and evaluation processes, assess program's impact	0	$0	4.5	$675	15	$2,400
4.4 Conduct reflection with CDF Team	2	$350	6.5	$975	5.5	$880
4.5 Document successes, challenges, and lessons learned during the curriculum implementation	0	$0	15	$2,250	30	$4,800
4.6 Produce "A Resource for Implementing the HSAP Voc-Tech Curriculum"	2	$350	19	$2,850	70	$11,200
Direct Costs (soil tests, honorariums for guest speakers)						
TOTAL	28.5	$4,988	154.5	$23,175	161.5	$24,560

(continued on page 9)

Grant Budget									Match Budget		Total
No Loose Braids				Minuteman High School					Minuteman High School		
Andre Strongbearheart Gaines, Director $150		Daishuan Tallhairreddeer Garate, Youth $25		Sarah Cammer, Teacher (grant paid) $70		Student Interns $25		**Total Grant (without match)**	Sarah Cammer, Teacher (match) $70		**Total Project Cost (with match)**
16	$2,400	16	$400	3	$210	16	$400	$7,010	13	$910	$7,920
6	$900	0	$0	0	$0	0	$0	$6,620	6	$420	$7,040
2	$300	0.5	$13	0	$0	0.5	$13	$625	2	$140	$765
4	$600	4	$100	4	$280	4	$100	$2,350	0	$0	$2,350
0	$0	0	$0	0	$0	5	$125	$125	10	$700	$825
0	$0	0	$0	5.5	$385	5	$125	$2,100	0	$0	$2,100
5	$750	15	$375	30	$2,100	15	$375	$4,975	0	$0	$4,975
0	$0	1	$25	5	$350	1	$25	$1,020	0	$0	$1,020
0	$0	0	$0	5	$350	5	$125	$475	5	$350	$825
4.5	$675	4.5	$113	4.5	$315	4.5	$113	$2,843	0	$0	$2,843
45	$6,750	60	$1,500	0	$0	60	$1,500	$15,375	120	$8,400	$23,775
5	$750	5	$125	0	$0	5	$125	$1,470	10	$700	$2,170
0	$0	3	$75	0	$0	3	$75	$600	12	$840	$1,440
3	$450	3	$75	0	$0	3	$75	$2,055	3	$210	$2,265
0	$0	1	$25	0	$0	2	$50	$1,335	10	$700	$2,035
0	$0	1	$25	0	$0	2	$50	$705	5	$350	$1,055
0	$0	5	$125	0	$0	5	$125	$3,325	10	$700	$4,025
2	$300	2	$50	0	$0	2	$50	$2,605	2	$140	$2,745
5	$750	5	$125	0	$0	5	$125	$8,050	10	$700	$8,750
5	$750	2	$50	0	$0	2	$50	$15,250	10	$700	$15,950
								$1,000			
102.5	$15,375	128	$3,200	57	$3,990	145	$3,625	**$79,913**	228	$15,960	**$94,873**

Match % of overall budget	**17%**

3 Organizational Capacity

Project Team

Linnean Solutions, No Loose Braids, and Minuteman High School bring a shared mission of expanding the capacity of communities across the Commonwealth to protect, restore, and steward the Earth's ecosystems. Collectively, our team has a long history of working together for climate justice in Massachusetts, and decades of experience working with diverse communities to co-create knowledge and shift practice around approaches to sustainable land management. Most recently, we contributed to the Healthy Soils Action Plan, and then worked with multiple municipalities through funding from the Municipal Vulnerability Preparedness (MVP), to bring learnings from the HSAP to their regulatory bodies, residents, landowners, and youth.

Linnean is a mission-driven firm based in Cambridge, MA and Portland, ME that works with communities, state and local governments, agencies, organizations, and project teams to create a just and regenerative future. A large portion of Linnean's work involves developing community-driven and equity-centered climate plans with state and local governments and community groups in the northeast to advance building energy efficiency and resilience, expand renewable energy, grow circular economies, protect critical ecosystems, strengthen food systems, and build community resilience.

No Loose Braids is a Nipmuc-led organization focused on continuing and reviving Eastern Woodlands traditions and cultural practices. No Loose Braids' mission is to braid Eastern Woodland Tribal communities together in continuity and reciprocity through traditional practice, cultural revitalization, experiential learning, knowledge sharing, and art. No Loose Braids facilitates cultural events, provides apprenticeships for Indigenous youth, and consults local land trusts and planning agencies on Indigenous stewardship practices.

No Loose Braids uses ancestral technology and traditions to empower Indigenous communities by promoting sustainable practices, defending their territories, challenging oppressive laws, advocating the protection of sacred sites, and preserving traditional knowledge to revitalize Indigenous culture.

Minuteman Regional Vocational Technical High School (Minuteman High School) focuses on academics and career technical education (CTE), to prepare students for careers in the trades, engineering, health, hospitality, human services, agriculture, and environmental and life sciences. The Environmental Science & Technology career major brings together students interested in the environmental field, environmental scientists and engineers, community and state officials, and other environmental organizations to investigate real world environmental issues.

Students are trained in wastewater and drinking-water technologies and are prepared to take the Massachusetts Class II Municipal Wastewater Treatment Plant Operators and Massachusetts Grade I Drinking- Water Treatment Exams administered by the State of Massachusetts. Eligible seniors may also complete internships with local environmental consulting companies, contractors, or laboratories. Most graduates of this program pursue further education at the college level.

Course content includes: geology; wildlife biology; soil sciences; environmental site assessment; water treatment technology; land-use planning/watershed management; geographic information systems (GIS); sustainability and green technologies.

Highlighted Projects

Nashua River Communities Resilient Land Management Project

Client: Town of Bolton, MA and Town of Clinton, MA

Dates: October 2021 - June 2023

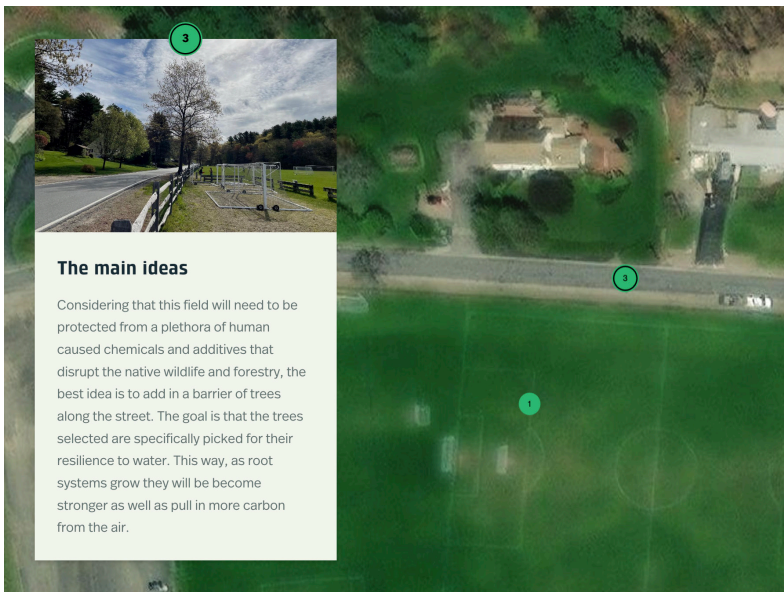
Team: Linnean Solutions (Lead); BSC Group; Regenerative Design Group; No Loose Braids; Minuteman High School; additional project advisors and community liaisons

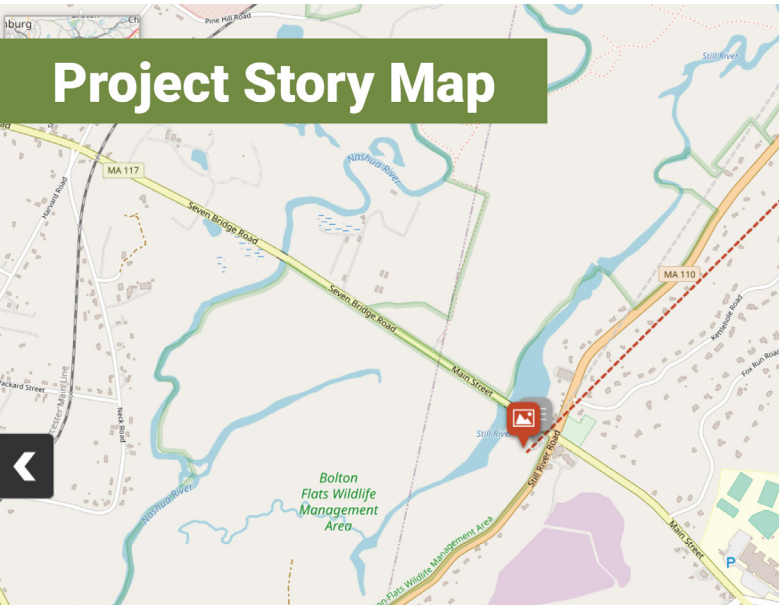
Contact: Rebecca Longvall, Town of Bolton
rlongvall@townofbolton.com
(978) 779-3304

Launched in September 2021, the Nashua River Communities Resilient Lands Management Project (or "Nashua River Project") invited residents and other local stakeholders in the Nashua River watershed communities of Clinton and Bolton, MA, to shape the future of how forests and open spaces are maintained, accessed, used, and transformed. Linnean facilitated the community-based collaboration among a diverse set of stakeholders to create a set of "care guides" for regenerative care of forests, lawns, and open spaces. The highly involved stakeholder groups included town staff, state agency staff, individual land owners, Indigenous Cultural Stewards, multiple members of the Spanish speaking communities in the towns, and youth representatives. Linnean and BSC also led the development of regulatory prioritization tools for implementing climate-smart development and wetland bylaws and strategies that respond to the climate emergency. These tools identified opportunities for local regulations to better support climate resilience through: reducing carbon emissions; increasing carbon sequestration; encouraging sustainable and equitable development; and strengthening ecosystems while engaging whole communities in creating climate solutions.

See the Nashua River Resilient Land Management project website at:
https://climateresilient.wixsite.com/nashuariver

See the StoryMap that Minuteman High School students produced as part of their project to increase resilience at Forbush Field, at the following link:
https://shorturl.at/kGS34





Apple Country Natural Climate Solutions Project

Client: Town of Bolton, MA; Town of Harvard, MA; Devens Regional Enterprise Zone

Dates: November 2020 - June 2021

Team: BSC Group (Lead); Linnean Solutions; Regenerative Design Group; No Loose Braids; Annawon Weeden; Woodwell Institute; additional project advisors and community liaisons

Contact: Rebecca Longvall, Town of Bolton
rlongvall@townofbolton.com
(978) 779-3304

Linnean Solutions collaborated with a team of regenerative landscape designers, ecologists, environmental engineers, the towns of Harvard and Bolton, and the Devens Regional Enterprise Zone to identify opportunities for increasing community and ecosystem resilience through nature-based solutions in Harvard, Bolton, and Devens. Among other goals, the project identified best management practices for supporting the health and capacity of soils, agriculture, forests, wetlands, and floodplains to store carbon and provide resilience benefits, as well as identify opportunities to implement those best management practices at specific sites throughout the three communities. The project's soil assessments and best management practices with respect to soils—including how to expand their capacity to infiltrate stormwater and store carbon—draw on findings from the Massachusetts Healthy Soils Action Plan, which Linnean developed with Regenerative Design Group in 2020.

See the Apple Country Natural Climate Solutions project website at:
https://climateresilient.wixsite.com/applecountry

Massachusetts Healthy Soils Action Plan

Client: Massachusetts Executive Office of Energy and Environmental Affairs

Dates: November 2020 - June 2021

Team: Regenerative Design Group (Lead); Linnean Solutions (Engagement Lead)

Contact: Tom Anderson, EEA
(617) 519-4587
Thomas.Anderson@mass.gov

The Massachusetts Healthy Soils Action Plan was developed through a grant from the Massachusetts

Executive Office of Energy and Environmental Affairs. The purpose of the plan is to guide the Commonwealth in creating policies and programs that protect and enhance soil resources across all land cover types in the state. The plan recognizes that healthy soil has significant carbon drawdown and storage potential and considers the specific co-benefits of carbon storage, climate adaptation, and other ecosystem services while promoting economic viability of forest and agricultural resources. For this ambitious project, Linnean worked with a group of technical and policy experts to assess existing soil conditions throughout the state, and to develop a matrix of opportunities, challenges, and economic benefits to support action toward healthier soil across the Commonwealth. Linnean also facilitated a number of listening sessions and working groups to hear feedback and gather responses to this technical information, so that community insight and knowledge could inform the approaches suggested by the plan. The Healthy Soils Action Plan outlines actions, policies, and management approaches to protect existing high value soils, and promote the regeneration of compromised soils.

See the Healthy Soils Action Plan at:
https://shorturl.at/dDQTY

MVP 2.0

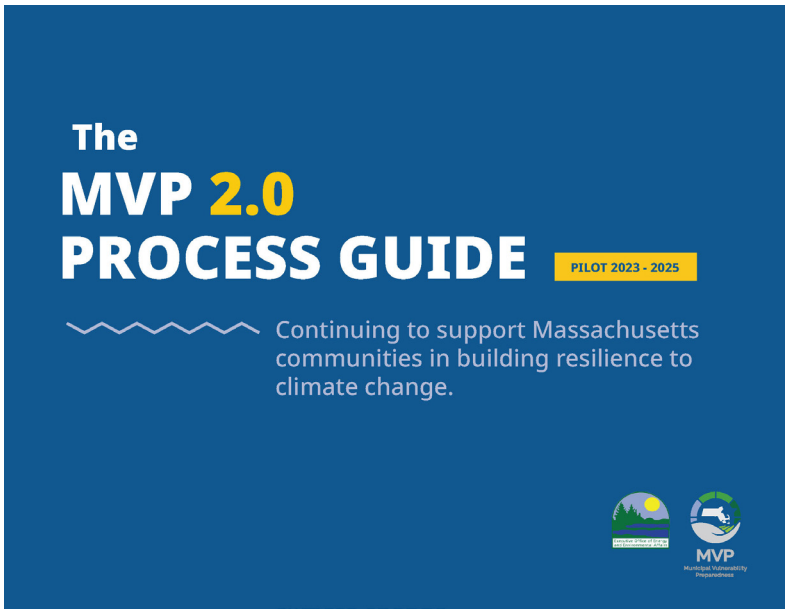
Client: Massachusetts Executive Office of Energy and Environmental Affairs

Dates: January 2022 - June 2024

Team: Linnean Solutins (Lead); StarLuna Consulting; BSC Group

Contact: Kara Runsten, MVP Program Director
kara.runsten@state.ma.us
(617) 312-1594

MVP 2.0: The Municipal Vulnerability Preparedness grant program (MVP) provides support for cities and towns in Massachusetts to build resilience to climate change. Communities who complete the MVP Planning program



(MVP 1.0) become certified as an MVP community and are eligible for future funding to complete resilience projects. Since 2017, nearly every Massachusetts municipality has participated in MVP 1.0. Linnean, in collaboration with StarLuna Consulting and BSC Group, worked with the Massachusetts Executive Office of Energy and Environmental Affairs (EEA) to redesign the State's Municipal Vulnerability Preparedness Planning Grant program from 2021 - 2022. The new program, MVP 2.0, expands on the work municipalities' have done to date, and provides communities throughout the state with new tools, resources, and processes for building community resilience. An Equity Council made up of social and environmental justice advocates throughout the state guided the overall development, and 75 stakeholders participated in a set of asynchronous focus groups (through a Policy Delphi model) to inform the needs, goals, and vision for the program. The resulting program – which includes trainings in community resilience, equity, climate justice, as well as seed funding for community-driven projects – creates a process for communities to revisit their community resilience priorities with a focus on equity and translate those priorities into action through project development and implementation.

See the MVP 2.0 Program details at:
https://www.mass.gov/info-details/mvp-20

About the Team

Sarah Cammer, PhD (she/her)
Environmental Science Teacher | Minuteman High School

Sarah Cammer is an environmental scientist and educator. She has an undergraduate degree in geology, a Master's in geosciences, and a Ph.D in marine science from Willam and Mary. Her scientific work focused on understanding the role of ancient carbon in fueling microbial food webs and how large storm events leach carbon from soils and fuel coastal zone food webs. She has been a K-12 educator for over 10 years. In that role she has developed curriculum in soil science, climate change and hydrology for Lexington Public Schools and ArcPro and OSHA 40 Hazwoper curriculum for Minuteman Technical High School. She also takes an active role in her community and has served on the open space committee, stormwater commission, the board of assessors and is a certified conservation commissioner. She is proud to empower the next generation to face climate changes and other environmental challenges through her work in vocational education and within her community.

Andre Strongbearheart Gaines, Jr. (he / him)
Founder and Director | No Loose Braids

Andre Strongbearheart Gaines, Jr. is a citizen of the Nipmuc people. He serves as a cultural steward for his Tribe, is a father, public speaker, traditional dancer, Indigenous Activist for Indigenous rights, carpenter by trade and educator. Andre's work focuses on bringing traditional knowledge back to Indigenous Peoples, and restoring balance between everyday life and traditional values while navigating the colonial systems we live in. This work is focused on cultural revitalization and preservation by making and building traditional homes (wetus), drums/waterdrums, buckskin, blankets, and burning out dugout canoes(mishoonash). Andre is a board member of Native Land Conservancy and actively works alongside various land trusts to create cultural inventory reports and fights to make the LandBack movement visible.

Jim Newman (he / him)
Founder and Principal | Linnean Solutions

Jim Newman is the founder and Principal at Linnean Solutions, a mission-driven firm that helps local and state governments, institutions, projects, and communities reach resilience and sustainability goals. Jim's thirty years of experience includes climate mitigation and adaptation planning; the development of sustainability and resilience frameworks and certification programs; carbon and life cycle analyses for rethinking building construction and waste; resilience assessments at the building

and urban scales; and participatory planning processes to strengthen communities. Mr. Newman led the engagement activities for the Healthy Soils Action Plan, led engagement and reporting for Apple Country, designed and led the Nashua River project, and led engagement and facilitation for the Ayer/Devens Pocket Forest project.

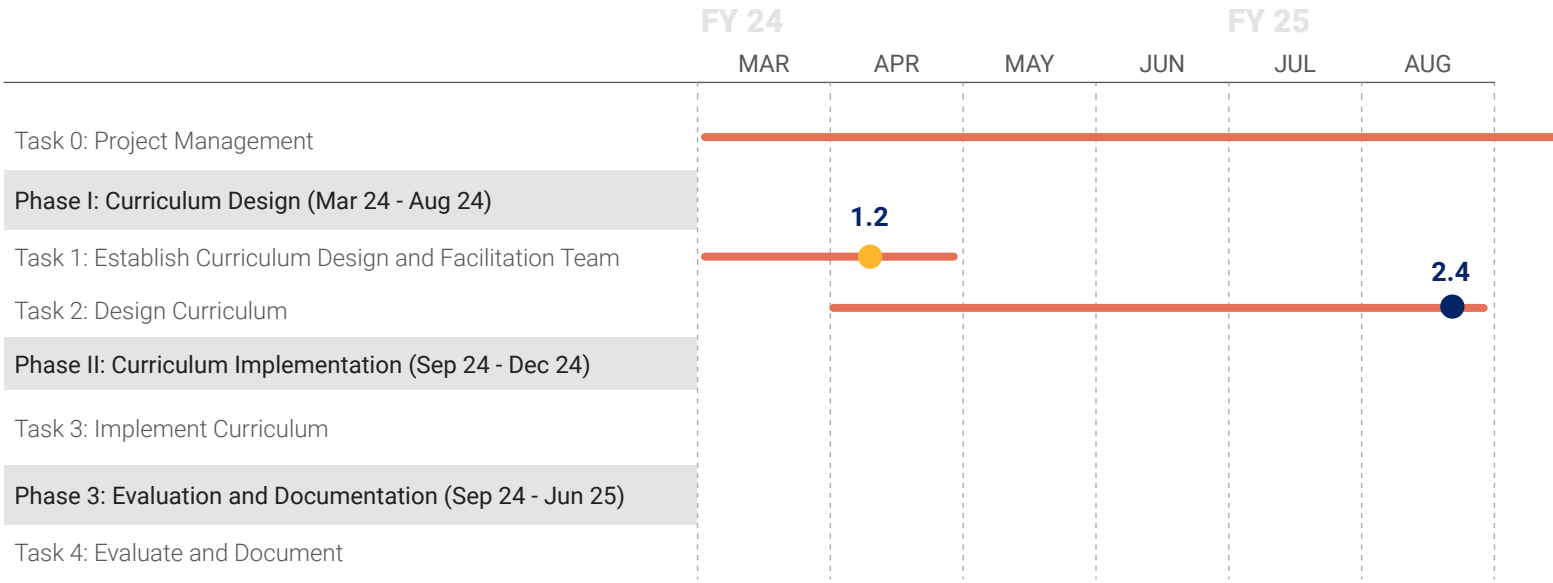
Sarah Saydun (she / her)
Climate Planner | Linnean Solutions

Sarah Saydun is a climate planner and facilitator who has spent over a decade in Boston working with youth and organizing for social justice. Through Sarah's background in positive youth development and popular education, she has extensive experience in designing and facilitating engaging spaces for knowledge co-creation with people of all ages who have a diverse range of experiences and learning styles. As a climate planner at Linnean, she works with local governments and communities to develop collaborative, intersectional, and values-centered approaches to mitigating and adapting to climate change. Previous projects include the Nashua River Communities Resilient Land Management Project. Current projects include coordinating the development of Penobscot Climate Action, the climate planning effort for the Bangor region, as well as working with residents in the El Punto neighborhood of Salem, MA to develop community-driven resilience resources.

Olivia Vilá, PhD (she / her)
Climate Planner | Linnean Solutions

Olivia Vilá is a social scientist specializing in environmental justice aspects of hazard mitigation, climate adaptation, and resilience. Her work, rooted in interdisciplinary, community-based, and participatory methods, aims to enhance resilience, empower individuals, and address policy challenges. With a proven track record of successful collaborations, Olivia focuses on building trust and authentic relationships, co-creation, and overcoming participation barriers, especially among disadvantaged groups, when working with communities.

4 Project Timeline



Task 0 - Project Management

March 2024 - March 2025

Key Components:

0.1 Project Team Meetings

0.2 Project Management

Key deliverables: Regular grant reporting (see Expected Outcomes and Deliverables)

Task 1 - Establish CDF

March 2024 - April 2024

Key Components:

1.1 Establish Curriculum Design and Facilitation (CDF) Team

1.2 Hold kickoff meeting to introduce team members, clarify roles, establish the curriculum monitoring process

Key deliverables: List of CDF Team members, kick-off meeting materials (agenda, notes, next steps), and draft curriculum monitoring process.

Task 2 - Design Curriculum

April 2024 - August 2025

Key Components:

2.1 Conduct an assessment with the CDF team to understand the interests, learning styles, and needs of Minuteman students

2.2 Compile research on soil health, sustainable land management practices, and relevant professional development training

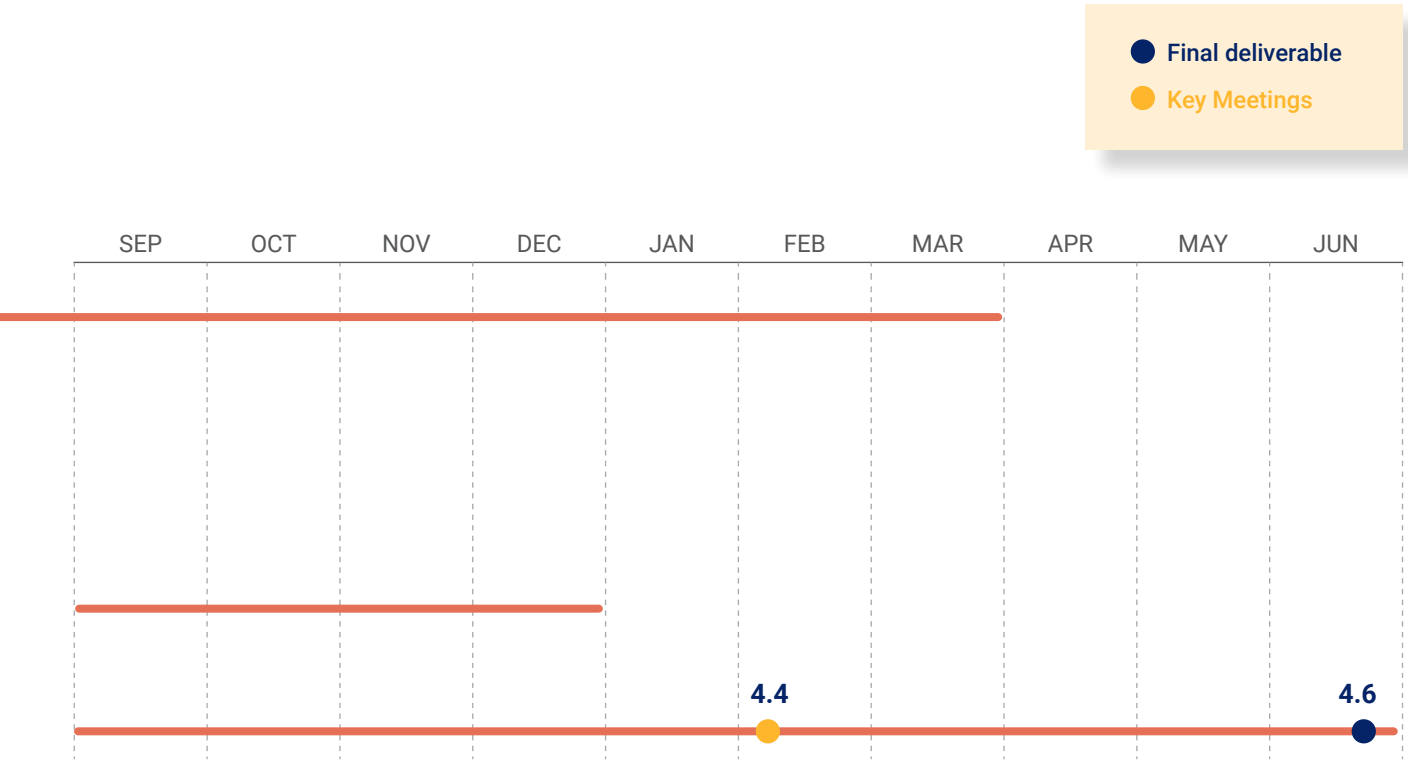
2.3 Develop lesson plans, lectures, fieldwork plans, and assignments that align with research, Indigenous TEK, and student needs

2.4 Finalize designed curriculum based on input from students and CDF

2.5 Coordinate with Minuteman High School to prepare to deliver curriculum

2.6 CDF team meetings

Key deliverables: Meeting notes from CDF team meetings; The Healthy Soils Voc-Tech Curriculum



Task 3 - Implement Curriculum

September 2024 - December 2024

Key Components:

3.1 Deliver curriculum at Minuteman High School

3.2 Implement monitoring process

3.3 Make adjustments to improve the curriculum based on the feedback from monitoring process

3.4 CDF Team meetings

Key deliverables: Meeting notes from CDF team meetings; Implementation of The Healthy Soils Voc-Tech Curriculum

Task 4 - Evaluate and Document

September 2024 - June 2025

Key Components:

4.1 Administer pre-evaluation: Assess student base-line knowledge of, and attitude towards, soil health and TEK (September)

4.2 Administer post-evaluation: assess program's impact on student knowledge of, and attitude towards, soil health and TEK (December)

4.3 Analyze data from monitoring and evaluation processes; assess the program's impact on participating students, considering knowledge gained, skills developed, and overall engagement

4.4 Conduct reflection with CDF Team

4.5 Document successes, challenges, and lessons learned during the curriculum implementation

4.6 Produce "A Resource for Implementing the Healthy Soils Voc-Tech Curriculum": including evaluation of findings, documentation of the curriculum, and recommendations for future implementation

Key deliverables: Meeting notes from CDF team meetings and reflection; Resource for Implementing the Healthy Soils Voc-Tech Curriculum

5 Evaluation and Monitoring

Evaluation Plan

The Healthy Soils Voc-Tech Curriculum will be assessed through an evaluation plan designed to measure student learning, and the cognitive, affective, and behavioral impacts of the curriculum on participating students. The evaluation will be conducted through pre- and post-surveys and focus groups with Minuteman High School Students, and interviews with Minuteman High School educators and Nipmuc cultural stewards. The evaluation process will encompass both quantitative and qualitative methods to provide a nuanced understanding of the project's outcomes. The project team will collaborate with teachers at Minuteman High School to get consent from students and their parents to collect sensitive data.

Key Evaluation Components:

- Student Learning Outcomes: Assess the knowledge gained by high school students in soil health, sustainable land management practices, climate justice, and related topics.
- Cognitive impacts: Explore the program's impact on students' thoughts and beliefs about the role of soil health and Traditional Ecological Knowledge in their communities and in the field at large.
- Affective impacts: Explore the program's impact on students' attitudes about soil health and Traditional Ecological Knowledge.
- Behavioral impacts: Explore the program's impact on students' behavior in and outside the classroom, including use of tools (e.g., ArcGIS Pro, soil testing,land management practices), and self-reported educational and career choices.
- Participant Pre- and Post-Surveys: Conduct pre- and post-surveys to assess the curriculum's impact on student knowledge of, and attitude towards, soil health and TEK.
- Feedback from Educators and Cultural Stewards: In addition to evaluating students, we will interview Minuteman High School educators and Nipmuc cultural stewards to explore their perceived impact of the program on students across cognitive, affective, and behavioral dimensions.

Long-Term Impact: The project team intends to identify future opportunities for assessing long-term transformative impact on voc-tech students related to their academic performance, career choice, and attitudes towards soil health and TEK; as well as to understand the impacts of this curriculum on the adoption of innovative land management practices the at field large.

Monitoring

Feedback will be gathered throughout the implementation of the curriculum to track progress, understand what is working effectively, and identify challenges. This ongoing monitoring process will support iterative revision to the curriculum throughout the course. The system for collecting feedback will include:

- Check-ins with the CDF Team: Schedule regular meetings with the CDF team to assess progress, address concerns, and facilitate collaboration.
- Participant reflections: Integrate regular opportunities for students to reflect on their experience (eg, at the end of each class session, or as part of homework assignments). This will allow the CDF Team to gather feedback on the curriculum and identify opportunities to regularly make improvements.

Minuteman High School students conducting field studies as part of the Nashua River Communities Resilient Land Management Project

Documentation

The monitoring and evaluation processes will play a crucial role not only in assessing the project's effectiveness but also in generating valuable insights and documentation to be shared with a broader audience. The evaluation process will provide understanding of the project's outcomes, successes, and challenges. These insights, along with the curriculum and educational materials developed, will be documented to create a resource that can be shared openly with other educational institutions, training programs, and community organizations, contributing to a broader effort to advance education on soil health and sustainable land management practices.

Progress reports summarizing project activities and key learnings will be submitted to OEAA at the end of each phase of the project (August 2024, December 2024, and June 2025). Progress reports will include supplemental materials such as sample lesson plans, pre- and post-surveys, and notes from project team meetings.

6 Sustainability Plan

This project is the product of many collaborative efforts to improve the stewardship of our planet and expand the reach of the HSAP ideas, starting with Linnean's work on the Healthy Soils Action Plan (HSAP), and growing into multiple state-funded projects with No Loose Braids and Minuteman High School. All three project partners have a proven track record of completing similar projects and are committed to, and excited about, the implementation of this curriculum with Minuteman High School, and beyond.

Following the completion of this project, Dr. Sarah Cammer and other educators at Minuteman High School will continue to implement the curriculum, and adapt as needed. Linnean and No Loose Braids are exploring funding opportunities, such as through the Municipal Vulnerability Preparedness (MVP) program, to provide continued support to Dr. Cammer in that endeavor. It is possible that the team could pair student soil health testing with existing water quality monitoring efforts led by the Bolton Conservation Commission to leverage MVP funding administered by the Town of Bolton.

All three project partners are committed to using the Resource for Implementing the Healthy Soils Voc-Tech Curriculum as a platform to share knowledge with local educational and voc-tech institutions, in a way that encourages wider adoption of the curriculum. Worcester Technical High School, for example, has already been identified as a potential future partner.

Community planting day as part of the Ayer and Devens Main Street Pocket Forest Pilot Project

7 Risk Assessment

Our team has a proven track record of completing projects similar to The Healthy Soils Voc-Tech Curriculum (See section on Organizational Capacity). Collectively, our team brings 20 years of experience working with diverse communities to co-create knowledge and shift practice around approaches to sustainable land management. Individual team members Dr. Cammer, Sarah Saydun, and Andre Gaines, all bring a wealth of knowledge and experience on working with high school youth. We are confident in our ability to deliver a high-quality product on-time and on-budget. The following is a list of risks and mitigation strategies for The Healthy Soils Voc-Tech Curriculum.

Staff disruptions:

In the unlikely event that any member of our team leaves their role, the project team will establish a clear contingency plan for off-boarding and replacing that person. The overall project, and activities that are already planned for in the "project management" task, integrate consistent opportunities for open communication and detailed documentation that would facilitate a smooth transition.

Barriers to long-term integration of curriculum:

The project already has full support from Minuteman High School's Interim Director of Career and Technical Education. Potential barriers to long-term curriculum integration can be reduced through collaborating with Dr. Cammer to strengthen relationships with, and deepen buy-in from, Minuteman High School administrators. Our team plans to share progress reports and other documentation that highlight the benefits of the curriculum with administrators and other instructors. If timing permits, administrators and other instructors will be invited to focus groups and reflections so they have a better understanding of the curriculum and its impacts on students.

Insufficient feedback from students:

Student participation in surveys and focus groups will depend on each student's consent to participate and their parent's consent for the student to participate. In the circumstance where there is insufficient feedback from students, the team would substitute the planned surveys and focus groups for one-on-one interviews with those students who are able to participate. Additionally, a greater emphasis would be placed on the feedback sessions with Minuteman High School educators and Nipmuc cultural stewards, for example, through additional and more in-depth stages of data collection.

COVID resurgence:

All lesson plans will be designed to allow for remote engagement in the event that a COVID resurgence requires a transition to online and asynchronous lesson plans. The team has previous experience adapting project activities for online engagement: Both the HSAP and Apple Country Natural Climate Solutions project were completed during the height of COVID-19 shutdowns.

MINUTEMAN
HIGH SCHOOL REVOLUTIONIZED

Healthy Soils Challenge Grant Program
Tom Anderson
Massachusetts Executive Office of Energy and Environmental Affairs
100 Cambridge Street
9th Floor. Boston, MA 02114

Dear Health Soils Challenge Grant Program:

I am writing on behalf of the Minuteman Chapter 74 Environmental Program, in support of the project being submitted by Linnean Solutions to the Healthy Soils Challenge Grant Program. This project builds on previous work with climate resilience and sustainability centered around soils and prepares our students to be the leaders we need for environmental policy in the years to come.

Any successful implementation of environmental regulations needs to be centered squarely on the informed consent and welcome of the community for its adoption and success to be realized. For this reason, our educator, Dr. Sarah Cammer is a pleased to donate her hours and expertise to bring to life this project, which incorporates student ideas and indigenous practices to bring about healthy soils for the Commonwealth. It gives career and technical (CTE) students valuable hands-on experience working side by side with environmental justice communities and mentors carrying out soil and sustainability investigations and understanding diverse cultural perspectives.

Aside from the immediate benefits to students and the community, we predict this experience will have a long-lasting impact on student efficacy in their future careers, which is the goal of CTE education. For that reason, we wholeheartedly support this grant application and the time our educator is donating for the effort.

Sincerely,

Sarah A. Ard

Sarah Ard
Interim Director of Career and Technical Education