C-SIP Handbook

Climate Stewardship Incentive Program FY2025

for Family Forest Owners, Municipalities, and Natural Resource Professionals

A cost-sharing component of the Working Forest Initiative
with support from the
Massachusetts Forest Stewardship Program

The Working Forest Initiative (WFI) is a program of
Department of Conservation and Recreation
Administered by the Massachusetts Woodlands Institute

INTRODUCTION

What is the Climate Stewardship Incentive Program?

The Climate Stewardship Incentive Program (C-SIP) is a branch of the Healey Administration's Forests as Climate Solutions Initiative providing financial encouragement to private forest landowners and municipalities to carry out stewardship practices focused on soil protection, carbon retention, and increasing forest adaptive capacity when pursuing forest management activities. This is the cost-sharing component of the Forest Stewardship Program. In Massachusetts, the Forest Stewardship Program provides technical and financial assistance to forest landowners in several ways: through cost-share, small reimbursement grants to municipalities, and educational outreach and technical assistance to landowners and professionals.

Who is this Handbook For?

This C-SIP Handbook is for the public and private natural resource professionals and Massachusetts Licensed Foresters who deliver the program to thousands of private forest landowners across Massachusetts. The handbook describes the C-SIP Practices that are eligible for financial assistance. Policy guidelines, technical specifications cost share rates, and additional references are detailed for each. Designed in a flexible format, the handbook can be appended as new information develops or as revisions need to be made.

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SECTION 1 - GENERAL C-SIP PROGRAM INFORMATION

Welcome to Climate Stewardship Incentive Program (C-SIP)! The goal of this cost-share opportunity is to assist family forest landowners, municipalities, and natural resource professionals with the costs of addressing impacts on forests, forest carbon, and the rural economy from climate change.

C-SIP cost-share funding is for qualifying applicants. Funds are to provide cost-share reimbursement payments to applicants who implement approved C-SIP practice(s).

1.1 PROGRAM OBJECTIVE

The objective of the Climate Stewardship Incentive Program (C-SIP) is to center climate concerns for resilience and carbon storage while encouraging long-term stewardship and management of non-industrial private and municipal forestlands for sound economic, environmental, and social benefits.

Successful projects must address climate concerns for resilience, sequestration, and carbon storage while encouraging long-term stewardship and management of non-industrial private, and municipal forestlands. C-SIP Practices 1 through 4 must be guided by a Massachusetts Licensed Forester. A Massachusetts Licensed Timber Harvester must implement C-SIP Practice 5.

1.2 CONTACT INFORMATION

For general information on completing this application and for clarification of application requirements, eligibility, and procedures, contact:
Sara Wisner, Program Analyst - Service Forestry Program,
DCR.Forestry@mass.gov
(857) 408-4154

For questions regarding C-SIP practices or to schedule a preliminary site visit please contact your local DCR Service Forester
at mass.gov/dcr/service-forestry

1.3 FUNDING

Funding is dependent upon fiscal allocation for C-SIP Cost-Share Practices and may vary from year to year. Funding for this cost-share opportunity is provided by the "Forests as Climate Solutions Initiative" through the Executive Office of Energy and Environmental Affairs (EOEEA) and is administered as a part of the DCR's Working Forest Initiative (WFI). This is a reimbursement cost-share program. All costs are the responsibility of the applicant. Reimbursement will occur after practice completion, practice standards have been met, submission of necessary financial documentation, and DCR Service Forester approval of the reimbursement form.

a. Maximum Cost-Share Reimbursement

1) The maximum cost-share reimbursement is capped at $30,000 per applicant per fiscal year.
    i. Funding is contingent upon the Forest Cutting Plan File Number for C-SIP Practices 1, 4, 5 or a DCR Forest Stewardship Climate Plan Case

Number and Forest Cutting Plan File Number for C-SIP Practice 2, 3

ii. Multiple practices can take place in the same location under one application.

2) As this program operates on a reimbursement cost-share basis, applicants are advised to assess their capacity for out-of-pocket expenses while awaiting reimbursement before applying.

b. Project time frame

All projects must have well-defined objectives, tasks, and deliverables outlined in performance measures, ensuring completion and invoicing by **May 31** to align with the state Fiscal Year which ends on **June 30**. No time extensions beyond the fiscal year's end will be granted, making it imperative for applicants to apply only if they anticipate completing their projects within the specified timeline. If an applicant cannot complete an approved C-SIP practice within the fiscal year, they may request a partial payment for work completed or an applicant can reapply the next fiscal year. Funding will be contingent upon continued program funding.

Any project maintenance and monitoring required after project completion will be undertaken by the applicant or landowner at their expense unless otherwise stated.

For practices approved by DCR that may extend beyond five months, applicants can submit progress reports and seek partial cost-share reimbursement for completed work, subject to prior approval from the DCR Stewardship Program Coordinator.

Project activities must align with the C-SIP application approval date and the specified completion deadline. Expenditures incurred before the C-SIP application approval date and after the completion deadline are ineligible for reimbursement.

SECTION 2 – ELIGIBILITY REQUIREMENTS FOR C-SIP PRACTICES

2.1 ELIGIBLE APPLICANTS

The following entities are considered eligible applicants for the C-SIP cost-share Program:

a. Applicants are defined as any individual, municipality, partnership, for-profit entity, Non-Governmental Organization (NGO), or not-for-profit (NFP) entity that owns in-fee forest land. NFP is qualified for tax-exempt status under Section 501(c)(3) of the Federal Internal Revenue Code.
b. Applicants with an approved Forest Stewardship Climate Plan for C-SIP 2 and C-SIP 3.
c. Applicants with an approved or submitted Forest Cutting Plan with long-term objectives C-SIP 1, C-SIP 4, and C-SIP-5.
d. Applicants intending to submit a Forest Cutting Plan designated as "Long-Term" within 20 days of C-SIP Application submission to DCR.
e. Massachusetts Licensed Timber Harvester with an approved or submitted Forest Cutting Plan that designated objective is "Long-Term" for C-SIP 5.
f. Massachusetts Licensed Timber Harvester intending to submit a Forest Cutting Plan designated as "Long-Term" within 20 days of C-SIP Application submission to DCR for C-SIP 5.

2.2 GENERAL POLICIES AND REQUIREMENTS FOR C-SIP PRACTICES

1. C-SIP practices, for which the landowner seeks cost-share funding and necessitates a Forest Stewardship Climate Plan, must be explicitly outlined within the approved plan. Amendments to the Forest Stewardship Climate Plan for C-SIP Practices are permissible with prior approval from the DCR Service Forester.

2. Requirement of a DCR C-SIP Work Plan and C-SIP Forest Cutting Plan Stand Map

   a. C-SIP Work Plan and C-SIP Forest Cutting Plan Stand Map is required for C-SIP Practice 1, 4, and 5. These practices do not require a Forest Stewardship Climate Plan. Applicants for C-SIP Practice 1, 4, and 5 must include with the C-SIP Cost-Share Application:
      - C-SIP Work Plan and
      - C-SIP Forest Cutting Plan Stand Map

   b. C-SIP Work Plan and C-SIP Forest Cutting Plan Stand Map are not required for C-SIP Practice 2 and 3. The Forest Stewardship Climate Plan is required to identify these practices in the approved plan to be eligible for C-SIP cost-share.

      Refer to **Appendix B** for a sample C-SIP Work Plan and C-SIP Forest Cutting Plan Stand Map.

3. Landowners must agree to maintain all approved and implemented C-SIP cost-share practices.

   a. In the case of C-SIP practices requiring a Forest Stewardship Climate Plan

(C-SIP 2 and 3), non-compliance with the plan and failure to sustain the practice for the duration of the approved Forest Stewardship Climate Plan or a minimum of ten (10) years after practice completion (whichever is longer) will result in the landowner being obligated to reimburse the C-SIP cost-share for those acres. The repayment will be prorated, considering the duration the practice has been upheld and the number of acres involved.

b. For C-SIP 1, 4, and 5, practices that require an approved Forest Cutting Plan, the practices must be maintained for the duration of the harvest or the issuance of a “Final Report”.

4. Licensed Timber Harvesters must agree to maintain all C-SIP 5 practice components for the duration of the harvest or the issuance of a “Final Report”.

5. To be eligible for cost-share payments, applicants must complete each practice within the same state fiscal year as the practice approval. If practices will not be completed in the same fiscal year, the applicant must forfeit the funds, however, the applicant may re-apply for funding the following fiscal year.

6. C-SIP applications will not be approved unless cost-share funds are available.

7. No C-SIP cost-share funds will be disbursed for the following:

   a. Costs incurred before an application for C-SIP cost-share assistance is approved.
   b. Costs incurred where cost-share has been applied for and/or received by USDA NRCS, or other state or federal cost-share/grant programs.
   c. Costs incurred for practices that have already been partially and/or fully implemented.
   d. Costs incurred for repairs or normal maintenance of C-SIP practices, except for those specifically allowed by certain C-SIP practices.
   e. Repetition of the same practices on the same acre(s) by the same applicant within a 10-year period (calculated from C-SIP application approval date), which has been implemented under C-SIP; or any other federal, state, or local government programs, or private sector programs, except where practices need to be repeated due to:

      i. Failure of a prior C-SIP practice without fault of the applicant
      ii. Invasive plant treatments that require repeated treatment/application to ensure long-term control.

8. All chemicals used in performing C-SIP 4 must be federal, state, and locally registered and applied according to authorized registered uses, directions on the label, and other federal or state policies and requirements. Whenever a chemical is applied by a hired technician, that technician must hold a current Massachusetts Pesticide Applicator license.

9. It is the applicant's responsibility to obtain and abide by all necessary land use

permits from local, state, or federal regulatory agencies before undertaking C-SIP activities.

10. Any aggrieved applicant may appeal a DCR Service Forester's decision in writing to the Stewardship Program Coordinator or their designee within thirty (30) days of disapproval. The Stewardship Program Coordinator shall make recommendations to the State Forester within ninety (90) days of each appeal, who in turn, will make a final determination on the appeal within thirty (30) days of the coordinator’s recommendation.

C-SIP 1: Harvest Layout

PURPOSE

The purpose of this practice is to provide for the proper design and layout of skid roads and the extent of wetland resource areas in the field to help harvest equipment to avoid areas sensitive to wetter conditions, allow for proper location for water control structures, and soil protection measures, to reduce the overall number of skid trails and protect soil carbon through the reduction of soil compaction, mixing and erosion.

A key aspect of effective harvest planning involves the thoughtful design and layout of skid roads in the field by avoiding sensitive areas prone to wet conditions, incorporating water diversion measures, and implementing soil protection measures in advance of harvest activity. Proper harvest layout may also reduce the number of skid trails resulting in less soil disturbance, operational efficiency, and profitability.

The changing climate is leading to more unpredictable harvesting conditions through increasing frequency and intensity of precipitation events and shorter periods of frozen ground conditions. Historically predictable periods of dry summer ground conditions or deep winter freezes are not occurring with regularity placing further need and emphasis on harvest planning to reduce unintended impacts from logging equipment. In addition, carbon stored in forest soils accounts for up to 61% of forest carbon (87 tons/acre). Another landcover in Massachusetts that stores large amounts of soil organic carbon (SOC) is wetland soils—which on average stores 321 tons/acre of SOC.

Wetlands, which account for the most soil carbon per landcover unit area, are the most sensitive to soil compaction, mixing, and erosion that can lead to the loss of soil organic carbon. Proper identification of the extent of wetland resource boundaries in the field before harvesting, can help avoid unintended impacts on these sensitive areas, protect soil organic carbon, as well as ensure timely cutting plan approval.

GENERAL POLICIES

The C-SIP 1 Harvest Layout practice applies to all proposed or approved harvesting activities covered by a long-term designated Forest Cutting Plan.

Application for C-SIP 1 must not be submitted after harvesting activities have commenced.

Applicants must include a C-SIP Work Plan and C-SIP Forest Cutting Plan Stand Map along with the C-SIP Cost-Share Application. Refer to **Appendix B** for a sample C-SIP Work Plan and C-SIP Forest Cutting Plan Stand Map.

To be eligible for C-SIP 1, the application must be submitted either before or at the time of the Forest Cutting Plan Submission or prior to harvesting activities.

Applications for C-SIP 1 will not be accepted after harvesting activities have already begun.

Conserving our forests is a critical part of natural climate solutions. This practice is only to be used where harvesting activities are being considered for a long-term designated Forest Cutting Plan and the applicant's long-term, 10+ year, intent is to maintain the land use as forest. In situations where an applicant's intent is called into question, due to but not limited to, a documented track record of property development, subdivision plans (including preliminary), proposed or signed lease agreements for solar, exploration for development such as perk tests, then the applicant's C-SIP cost-share application may be denied or the applicant may be asked to make a written statement of intent to maintain the forest land for the duration of the Forest Cutting Plan. The landowner may appeal the decision to the Forest Stewardship Program Coordinator.

COST-SHARING POLICIES

C-SIP Cost-sharing is authorized for field work associated with a long-term designated Forest Cutting Plan and performed by a Massachusetts Licensed Forester to:

C-SIP 1.1: Clearly flag or mark (with paint) the following: truck roads, principal skid roads; extent of landing locations; water control structures (i.e., water bars or other water diversion structures); and soil protection measures (i.e., mat, or road armoring).

C-SIP 1.2: Clearly flag or mark the extent of wetland resource areas and filter strips—including filter strips around Certified Vernal Pools and/or potential vernal pools.

Cost-sharing is not authorized for:

1. Any activity that is under M.G.L Chapter 131, town bylaws, or other state or federal laws, or activities as part of land use transition to a non-forest use.

C-SIP 1: COST-SHARE RATES

C-SIP 1 Harvest Layout Cost-Share Rates		
C-SIP 1 Practice	Cost-Share Rate	Forest Cutting Plan Acres
C-SIP 1.1 Harvest Layout Design Clearly flag or mark (with paint) the following: skid roads; extent of landing locations; water control structures (i.e., water bars or other water diversion structures); locations for timber mats; soil protection measures	Up to 4 hours (at $120/hour) Max $480	1 to 50 acres

C-SIP 1.1 Harvest Layout Design Clearly flag or mark (with paint) the following: skid roads; extent of landing locations; water control structures (i.e., water bars or other water diversion structures); locations for timber mats; soil protection measures	Up to 8 hours (at $120/hour) Max $960	51 to 100 acres
C-SIP 1.1 Harvest Layout Design Clearly flag or mark (with paint) the following: skid roads; extent of landing locations; water control structures (i.e., water bars or other water diversion structures); locations for timber mats; soil protection measures	Up to 12 hours (at $120/hour) Max $1,440	Over 101 acres
C-SIP 1.2 Clearly marking/Flagging the extent of Wetland Resource Areas which include but are not limited to Filter Strip Boundaries, Certified Vernal Pool and Potential Vernal Pools.	Up to $0.15/linear foot	All wetland resource areas and filter strips located within the designated harvest area as outlined in the Forest Cutting Plan.

TECHNICAL SPECIFICATIONS

Practice Component C-SIP 1.1: Harvest Layout Design

Definition Purpose: Design and layout for skid trails and roads, the extent of landings, location of water control structures, and soil stabilization measures to protect forest soils before harvesting activities.

Condition Where Component Applies: Forest land with an approved "long-term" designated Forest Cutting Plan. Applicants must include a DCR C-SIP Work Plan and C-SIP Forest Cutting Plan Stand Map along with the C-SIP Cost-Share Application. Refer to **Appendix B** or a sample C-SIP Work Plan and C-SIP Forest Cutting Plan Stand Map.

Considerations:

1. Skid trails and roads must be clearly flagged or marked with paint. Consideration of the time between layout and harvest should guide the chosen method for skid road and trail layout.
2. Skid trails must be strategically laid out, considering topography, resource area(s), and the type of harvest machinery used to minimize skid road and trail impacts on forest soil.
3. Utilize NRCS soil maps or USDA Web Soil Survey, along with knowledge

of local soil conditions, to lay out skid trails and roads, avoiding and minimizing areas susceptible to wet conditions, steep slopes, water fluctuations, or otherwise unsuitable for heavy equipment.
4. Locations for water control structures like water bars or reinforced water bars must be clearly flagged or marked.
5. Areas requiring stabilization through mats, slash, or similar means during the harvest must be clearly flagged or marked with paint.
6. If wetland resource areas are located within fifty (50) feet of a landing—the landing extent must be clearly flagged or marked with paint.

*In your C-SIP Map / Work Plan please indicate if you used any particular color flagging or paint, and what that color corresponds to.

Practice Component C-SIP 1.2: Identification and marking of the extent of wetland resource areas and filter strip boundaries.

Definition Purpose: Wetland resource area protection through clear identification of the extent of resource area boundaries.

Condition Where Component Applies: Forest land with an approved "long-term" designated Forest Cutting Plan. Applicants must include a DCR C-SIP Work Plan and C-SIP Forest Cutting Plan Stand Map along with the C-SIP Cost-Share Application. Refer to **Appendix B** for a sample C-SIP Work Plan and C-SIP Forest Cutting Plan Stand Map.

Considerations:
1. The extent of wetland resource areas and filter strips (including Certified and Potential Vernal Pools) must be clearly flagged or marked with paint. Consideration for the time between layout and harvest should be given to determine the method chosen.
2. Utilize NRCS soil maps or USDA Web Soil Survey, MassMapper, MA DEP Wetland GIS data, along with knowledge of local soil conditions, to identify the extent of wetland resource areas and filter strip boundaries.
3. Clearly marking/flagging the extent of Wetland Resource Areas which include but are not limited to Filter Strip Boundaries, Certified Vernal Pool Filter Strip boundaries, and Potential Vernal Pool Filter Strip boundaries located within the designated harvest area as outlined in the Forest Cutting Plan or C-SIP Forest Cutting Plan Stand Map.

ADDITIONAL REFERENCES

DeArmond, D., Ferraz, J. B., & Higuchi, N. (2021). Natural recovery of skid trails: a review. *Canadian Journal of Forest Research*, *51*(7), 948-961.

Picchio, R., Mederski, P. S., & Tavankar, F. (2020). How and how much, do harvesting activities affect forest soil, regeneration and stands? *Current forestry reports*, *6*(2), 115-128.

Drezdahl-Zaltzberg, K., Gutwein, S., Lawlor, G., Horton-Krok, L., Lindsay, R., Newman,

Johnson I., Toensmeier, E., Roszell, C., Dagoberto, M. (2023). The Massachusetts healthy soils action plan. https://www.mass.gov/doc/healthy-soils-action-plan-2023/download

C-SIP 2: Legacy Tree Retention

PURPOSE

Biologically old and very large trees are uncommon in the New England landscape. These trees are important for a variety of ecological reasons and for carbon storage. The purpose of this practice is to designate a variety of long-lived tree species (those with an average life span greater than 200 years) as individuals or groups to be retained in perpetuity, thereby increasing stand complexity and carbon retention during management activities. Groups of legacy trees may be used to designate patch reserves for increased carbon storage and stand complexity.

The strategic retention of these legacy trees during management activities, particularly when situated near existing downed wood, snags, and other site features, provides additional ecological advantages. Such areas act as refugia, offering sanctuary to plant and animal species with slower colonization rates in new environments. The time element of this practice is the most important. The legacy trees designated by this practice have the potential to be retained on the landscape over many human generations, therefore markings and meticulously documenting these retention trees is paramount.

GENERAL POLICIES

This practice is open to all applicants who have an approved Forest Stewardship Climate Plan. The inclusion of the 'Legacy Tree Retention' (C-SIP 2) practice in the management practices section of the applicant's plan is a prerequisite.

If the Legacy Tree practice is not described in the management practices section, then the applicant’s Forest Stewardship Climate Plan may be amended before or in conjunction with the application for C-SIP practice funding.

Legacy Tree – a tree, usually mature or old-growth, that is retained on a site after harvesting or natural disturbance to provide a biological legacy (Dictionary of Forestry). Legacy tree cutting method, through the Shelterwood with Reserves method, may allow landowners to:

- Leave the older age class to maintain some protection for the new community of an extended period
- Realize additional growth on the overwood trees and maintain them to extra-large diameters for specialty purposes or products
- Enhance scenic values
- Maintain habitat for some plants and animals
- Address special ecological or social needs, consistent with the management objectives

This older age class may have as few as 20 trees per acre (50/ha) but generally

of large diameters, the spacing of which would be approximately 47ft between each Legacy Tree.
Because the legacy trees remain exposed and must stay alive for an extended rotation, foresters select them carefully using the criteria listed below. In most cases, they will leave the legacy trees at a uniform spacing to ensure high levels of insolation across the lower vegetation strata, except where some ecologic value might accrue from leaving small clusters of reserve trees (e.g., groups of cavity trees or snags). In some cases, they might leave scattered decadent trees to become snags over time or ones with broken tops that might serve as nesting sites for large birds. Yet even those legacy trees must have the potential for a reasonably long life. It is essential to protect legacy trees during management activities. Crews must use care to avoid damaging them during logging and limit their work to seasons when the trails (well drained or frozen) will support the harvesting machinery without rutting the soil and cutting the roots.

If a landowner chooses not to use the Shelterwood with Reserves method to retain Legacy Trees, the landowner may instead choose a group-shelterwood method. For this, the seed cutting creates well-dispersed openings, each with a diameter not exceeding the height of adjacent trees with a chosen Legacy Tree retained at the center. This improves environmental conditions at the ground but not as much as clearcutting. Once seedlings become established in the openings and under edges of the adjacent uncut parts of the stand, foresters remove a band or ring of additional trees around each initial patch. This further illuminate's regeneration in the initial openings and releases adjacent areas having new advance regeneration. At each entry, they might also cut some new patches to create additional pockets of advance seedlings. Eventually, the openings become large enough to coalesce, leaving no mature tress within the stand.

It is essential to protect legacy trees during management activities.

a. All new primary skid trails and roads must be located one hundred (100) feet from the identified Legacy Trees and fifty feet (50) from Legacy Tree Patches.
b. Legacy Tree crowns and boles must be protected during harvesting.

The strategic retention of these legacy trees, particularly when situated near existing downed wood, snags, and other site features, provides additional ecological advantages.

This practice will be most effective if the land has a conservation restriction, deed restriction, or any other encumbrance that will ensure the land remains in a forest condition for the foreseeable future.

Although the practice can be applied to any forest land with an approved Forest Stewardship Climate Plan, those forest areas with existing very large or very old trees, and are less prone to disturbance, or areas with relatively high site productivity capable of producing large trees will have a greater ecological and carbon storage benefit.

COST-SHARING POLICIES

C-SIP 2 is authorized for a Massachusetts Licensed Forester's time to:

i. Mark and locate legacy trees and patch reserves.

Cost-sharing is not authorized for:

i. Marking of trees for removal for commercial or non-commercial purposes.
ii. Massachusetts Licensed Forester's time associated with fieldwork and/or preparation time of an applicant's Forest Cutting Plan.

COST-SHARE RATES

C-SIP 2 Legacy Tree Retention Cost-Share Rates		
C-SIP 2 Practice	Cost-Share Rate	Legacy Tree Retention Objective
Individual Legacy Tree Retention (marking)	Cost-share rate $30/tree Max Reimbursement $300/ac (10 trees/ac @ 66-foot spacing)	Individual Tree
Patch Legacy Tree Retention (marking)	Cost-share rate $.25/linear foot	Legacy Tree Patch

TECHNICAL SPECIFICATIONS

Practice Component C-SIP 2: Legacy Tree Retention

Definition Purpose: To increase stand complexity and carbon retention, and to serve as a refugia for species with slow dispersal rates.

Condition Where Component Applies: All ownerships with an existing Forest Stewardship Climate Plan.

Considerations:

1. Legacy trees should be:
    a. Capable of surviving another 50 years or more. Insect/ Disease vulnerability low.
    b. Long-lived tree species, capable of living 200 years or more.
    c. Wind firm.
    d. Dominant or co-dominant crown position.
    e. A variety of tree species.
    f. Generally larger than 15" DBH.
    g. Any living tree over 39" DBH.
    h. Evidence of surviving previous natural disturbances.
2. Single legacy trees will be scribed with an "L" on two sides

and their position mapped or locations spatially captured (GPS, KML, GPX, shapefile) and documented in the Forest Stewardship Climate Plan.

3. Legacy trees serving as anchors for patch reserves will be scribed with an “L” on two sides and their position mapped or locations spatially captured (GPS, KML, GPX, shapefile) and added to the amended Forest Stewardship Climate Plan.
4. The perimeter of a Legacy Tree reserve patch will be painted and mapped, or locations spatially captured (GPS, KML, GPX, shapefile) and documented in the Forest Stewardship Climate Plan.
5. No Primary Skid Trails/Roads or harvesting equipment located within fifty (50) feet of an identified Legacy Tree and one hundred (100) feet of a Legacy Patch.
6. No skid trails/roads can be located or harvesting equipment operated within a Legacy Patch.

Technical Criteria for identifying a Legacy Tree:

- Is expected to live at least fifty to eighty years longer
- Has a single main stem with no strong forking
- Is in a dominant or upper codominant position
- Has no more than 10 degrees of lean from the vertical
- Has no more than 15 percent deduction for sweep, crook, and decay
- Has no dead or dying major branches in the upper crown
- Has no signs of developing epicormic branches on the lower bole
- Is a species not prone to dieback and decline following a heavy release
- Even if the silviculture method itself isn't a standard (like shelterwood with reserves or seed tree), the focus should be on the tree's condition, not just timber quality.

ADDITIONAL REFERENCES

D'Amato, Anthony & Catanzaro, Paul. (2009). A forest manager’s guide to restoring late-successional forest structure.

https://masswoods.org/sites/default/files/pdf-docppt/forest_mgr_guide_ls_structure_web.pdf

https://bigtree.cnre.vt.edu/lifespan.html

Nyland, R. D. (2016). Silviculture: Concepts and Applications (3rd ed.). Long Grove, IL: Waveland Press pp327-333.

Helms, J. A. (1998). The dictionary of forestry. Bethesda, MD: Society of American Foresters.

C-SIP 3: Tree Marking for Increasing Future Adapted Species and Structural Diversity

PURPOSE

As climate change induces shifts in the region's temperature and moisture patterns, our native tree species face increased stress, potentially leading to declines in vigor and regeneration failure. To ensure the continued provision of diverse ecosystem services crucial to society, proactive measures can be implemented to promote tree species anticipated to thrive in the changing climate.

A significant portion of Massachusetts forests are comprised of even-aged, biologically young stands. Introducing structural diversity into these forests becomes pivotal, mitigating the long-term impacts of insect infestations, diseases, or storm events. This is achieved by establishing the next age class on-site, ready to fill gaps and sustain essential functions such as carbon sequestration and clean water. Furthermore, enhancing wildlife habitat through structural diversity offers a broader range of shelter and food sources for insects and native wildlife.

The objective of this practice is to mark trees before harvesting activities to enhance the health, vigor, and regeneration potential of identified climate-adapted tree species[1] outlined in an approved Forest Stewardship Climate Plan. The marking process also aims to enhance structural diversity within the harvested stand, releasing pockets of understory and midstory trees and creating space for the regeneration of a new cohort of trees.

GENERAL POLICIES

This practice may be applied to all applicants with an existing, approved Forest Stewardship Climate Plan when the management practices section of the plan specifically identifies that management intervention(s) will improve or enhance future adapted species and structural diversity under C-SIP 3.

This practice will be most effective if the land has a conservation restriction, deed restriction, or any other encumbrance that will ensure the land remains in a forest condition for the foreseeable future.

COST-SHARING POLICIES

C-SIP 3 is authorized for a Massachusetts Licensed Forester’s time to mark a stand to promote future adapted tree species and increase structural diversity.

C-SIP 3: COST-SHARE RATES

C-SIP 3 Tree Marking for Increasing Future Adapted Species and Structural Diversity Cost-Share Rates		
C-SIP 3 Practice	Cost-Share Rate	Purpose
Increasing Future Adapted Species and Structural Diversity (tree marking)	Up to 1 hour/acre (at $120/hour) Max $120 per acre cut tree marking Max $60 per acre leave tree marking	To increase health, vigor, and regeneration of future adapted tree species while protecting existing and encouraging new snags and coarse woody debris for structural diversity

TECHNICAL SPECIFICATIONS

Practice Component: Increasing Future Adapted Species and Structural Diversity

Definition Purpose: To increase health, vigor, and regeneration of future adapted tree species while protecting existing, and encouraging new, snags and coarse woody debris for structural diversity.

Condition Where Component Applies: Forest land with an impending or recently submitted Forest Cutting Plan that follows the recommendations in an existing, approved Forest Stewardship Climate Plan.

Considerations:

1. Trees must be marked by placing a visible paint mark on both sides of the bole of the tree at approximately breast height and below stump height. The tree shall be marked so as to leave the stump mark visible following harvest if applicable.
2. A goal of the harvest should be to increase complexity and heterogeneity across the stand to improve adaptability.
3. The number and arrangement of future adapted trees will depend upon the current site or stand composition and characteristics.
4. Retained future adapted species, as identified in your Forest Stewardship Climate Plan, should be:
    a. Long-lived, capable of living 200 years or more.
    b. Wind firm
    c. Distributed across all crown positions.
    d. Representative of a variety of future adapted species suitable to the site.
    e. Representative of a variety of seed sources and reproductive methods

f. Any future adapted species over 15" DBH to serve as a seed source.

5. Existing snags and coarse woody debris should be retained and protected from disturbance unless snags create a safety hazard for the applicant, forest workers, or the public.
6. New snags can be recruited by retaining short-lived species that are near maturity such as quaking aspen or paper birch. Individual trees of low timber quality or undesirable species can be girdled or otherwise killed to create snags.

Examples of Climate-Adapted Silvicultural Practices

1. Resistance
    a. Single-tree selection[2]
        i. Appropriate if sufficient basal area of future adapted species is already present in the stand.
        ii. Reduce the basal area of the stand to 70-80 sq. ft.
        iii. Retain and release future adapted species and trees with good crown form.
2. Resilience
    a. Single-tree/group selection[2]
        i. 20% of stand area in 0.1 - 0.25 ac. group openings.
        ii. 20% of stand area in patch reserves.
        iii. Reduce the basal area of the remaining matrix forest to 70-80 sq. ft.
        iv. Retain and release future adapted species and trees with good crown form.
    b. Expanding gap Shelterwood
        i. Harvest 20% of the canopy in gaps of 0.25 - 1 acre in size.
        ii. Subsequent entries can occur between 10 – 20 years and remove another 20% of the canopy in new gaps adjacent to previous gaps.
        iii. No thinning of the remaining matrix forest.
3. Transition
    a. Irregular Shelterwood[2]
        i. 20% of stand area in 0.25 - 1 ac. group openings with retention of future adapted species within the openings.
        ii. 10 - 20% of stand area in patch reserves.
        iii. Reduce the basal area of the remaining matrix forest to 70-80 sq. ft.
        iv. Retain and release future adapted species and trees with good crown form.

ADDITIONAL REFERENCES:

Janowiak, M., Baroli, M., Ontl, T., Rapp, J., Ritterson, J., Fish, J., Downey, M., Rassman, J., and Wright-Hunter, A. *Managing Forests for Climate Change in Massachusetts*. https://forestadaptation.org/sites/default/files/Managing%20Forests%20for%20Climate%20Change_Forester-Guide.pdf

Wikle, J. L., and A. W. D'Amato. 2023. Stand spatial structure outcomes of forest adaptation treatments in northern hardwood forests in North America. Canadian Journal of Forest Research 53:721-734. https://www.researchgate.net/publication/370620287_Stand_spatial_structure_outcomes_of_forest_adaptation_treatments_in_northern_hardwood_forests_in_North_America

C-SIP 4: Invasive Plant Species Control

PURPOSE

Invasive plant species are projected to thrive and spread under changing climate conditions impairing forest health, inhibiting natural plant communities, and negatively impacting wildlife habitat. Mitigating the impact of invasive plants is crucial for enhancing the resilience of forests, enabling them to recover more effectively from both natural and human-induced disturbances.

This practice is designed to address invasive plant populations in forestlands by implementing treatments that reduce their prevalence on the applicant's property. The overarching goal is to bolster the health, vigor, reproductive capacity, and diversity of desirable native plant populations.

Various methods, such as mechanical techniques (cutting, mowing, pulling) and/or chemical applications (foliar, basal bark, or cut stump), may be employed based on the invasive plant species and the severity of the infestation. By executing this practice, the aim is to not only control invasive plants but also to foster a more resilient and ecologically robust forest ecosystem.

Invasive plants can be difficult to effectively control. This practice may be most effective with novel infestations allowing for rapid response and control.

The method(s) for control must be outlined in the applicant's Forest Stewardship Plan, Chapter 61/61A/61B Plan, or if applicable C-SIP Work Plan and C-SIP Forest Cutting Plan Stand Map.

General Policies

This practice may be applied to eligible forest land with an approved "long-term" designated Forest Cutting Plan. Eligible applicants with a Forest Stewardship and/or Chapter 61/61A/61B Plan must have in the management practices section of the plan techniques specific to controlling "Invasive Plant Species." Applicants without a Forest Stewardship Plan and/or Chapter 61/61A/61B Plan must include a DCR C-SIP Work Plan and C-SIP Forest Cutting Plan Stand Map for Invasives along with the C-SIP Cost-Share Application. Refer to **Appendix B** for a sample C-SIP Work Plan and C-SIP Forest Cutting Plan Stand Map for Invasives.

Cost-Sharing Policies

Cost-sharing is authorized for:

1. Practice methods involving chemical treatments
    a. Massachusetts Licensed Pesticide applicator's time to treat invasive plants using a combination of mechanical and/or chemical methods to reduce invasive plant populations on the subject property.
    b. A landowner's time to treat invasive plants using mechanical and/or chemical methods to reduce invasive plant populations on

the subject property.

2. Practice methods involving Light Mechanical treatment for light or new infestations only

a. Landowner, or contractor's time to mechanically reduce invasive plant populations on the subject property.

C-SIP 4: COST-SHARE RATES

C-SIP 4 Invasive Plant Species Control Cost-Share Rates		
C-SIP 4 Practice	Cost-Share Rate	Category
Invasive Plant Species Control HEAVY	$1,193/acre	HEAVY Greater than 67% of the treatment area is occupied by target species
Invasive Plant Species Control MODERATE	$543/acre	MODERATE 26% to 66% of the treatment area is occupied by target species.
Invasive Plant Species Control LIGHT	$309/acre	LIGHT 10% to 25% of the of the treatment area is occupied by target species.
Invasive Plant Species Control LIGHT MECHANICAL	$474/acre	LIGHT MECHANICAL 10% - 25% of the treatment area is occupied by target species but conditions are appropriate for removal with a chainsaw, brush saw, and/or another mechanical method (e.g., mower/chipper).

TECHNICAL SPECIFICATIONS

Practice Component: Invasive Plant Species Control

Definition Purpose: To decrease invasive plant populations on a property to promote native plant communities and tree regeneration. Restore or release desired vegetative cover to protect soils, control erosion, reduce sediment, improve water quality, enhance hydrology, and maintain or modify wildlife habitat.

Condition Where Component Applies: Forestland with an approved "long-term" designated Forest Cutting Plan. Applicants with a Forest Stewardship and/or Chapter 61/61A/61B Plan must include specific techniques for controlling 'Invasive Plant Species' in the management practices section of the plan. For applicants without a Forest Stewardship Plan and/or Chapter 61/61A/61B Plan, completion of a C-SIP Work Plan and C-SIP Forest

Cutting Plan Stand Map for Invasives is required as part of the application. Refer to **Appendix B** for a sample C-SIP Work Plan and C-SIP Forest Cutting Plan Stand Map for Invasives.

Considerations:

1. Heavy control is applicable where access is very poor due to distance or heavy slash, a high number of invasive stems/acre, or invasive cover is greater than 67% (ocular estimation) or greater.
2. Moderate control is applicable where access is moderately poor, a moderate to moderately high number of invasive stems/acres, or invasive cover is 26% to 66% (ocular estimation).
3. Light control is applicable where access is good, and the coverage of invasive plants is patchy or dispersed at 10% to 25% (ocular method). This category would be used for light infestations or follow-up treatment after using the Heavy OR Moderate control.
4. Light Mechanical control is applicable where access is fair to good, and the coverage of invasive plants is patchy or dispersed at 10% to 25% (ocular estimation). OR the treatment area is occupied by target species at 1% to 25% (ocular estimation) but conditions are appropriate for removal with a chainsaw, brush saw, weed wrench, and/or another mechanical method (e.g., mower/chipper).

*A 100ft buffer may be included in the treatment area. Areas such as the harvest area, landing zones, and access roads. Please indicate if you are including a buffer zone in you C-SIP Work Plan and C-SIP Map.

Evaluation:

The DCR Service Forester will make final decisions on all C-SIP 4 practices. A visual check of the invasive removal site must be completed, with an 80% success rate. An applicant may reapply to do follow up invasive removal measures to obtain the 80% success rate.

C-SIP 5: Climate-Smart Best Management Practices for Forest Operations

PURPOSE

Forestry Best Management Practices (BMPs) dedicated to erosion control are proven techniques used to mitigate the impacts of timber harvests on water quality, site productivity, and soil health. The efficacy of BMPs is most pronounced when planned before, and implemented during, harvesting activities. Long-term effectiveness depends on monitoring, vigilant inspection, and adequate maintenance throughout the entirety of the timber harvest and at harvest closeout.

The changes in our climate, characterized by rising temperatures and altered seasonal precipitation patterns, have introduced greater unpredictability to soil conditions in Massachusetts. A notable increase in heavy precipitation events, coupled with milder winters leading to abbreviated frozen ground conditions, has heightened the challenge of maintaining stable ground conditions during timber harvests. Extreme weather events coupled with large equipment in a forest can increase the chance of erosion, flooding, and sedimentation in nearby water resources.

In addition, carbon stored in forest soils accounts for up to 61% of forest carbon, with forested wetlands contributing a substantial share. Soil compaction, mixing, and erosion during logging operations can result in the loss of soil carbon. It is therefore extremely important to apply BMPs appropriately in areas of high resource concern or areas with disturbed soils.

GENERAL POLICIES

This practice is relevant to all Forest Cutting Plans designated as 'Long-Term'.

Climate-Smart forestry Best Management Practices (BMPs) must be applied and sustained both during and after the harvest to be eligible for C-SIP cost-share reimbursement approval. (*Note: Maintenance of all Forestry BMPs as required by 302 CMR 16.00 Forest Cutting Practices are mandatory throughout the entire harvest process).

Removal or disturbance of erosion control and/or soil stabilization measures shall not be removed until the site and soil condition are stabilized or fully vegetated (if applicable) or otherwise authorized by the DCR Service Forester.

The use of straw is required for erosion control because straw bales do not contain seed heads and therefore will not transport the seeds from invasive plants from one site to another.

No more than two (2) C-SIP 5 applications may be submitted per “long-term” designated Forest Cutting Plan File Number per Fiscal Year.

Protecting soil health and water quality is a critical part of natural climate

solutions. These Climate-Smart Forestry BMPs are only to be used where an approved Forest Cutting Plan with Long-Term designation has been issued.

Proper placement, spacing, and orientation will be assessed by Service Forestry staff using **Table 3 from the Massachusetts BMP Manual for spacing and technical specifications and **Illustration 4**. The DCR Service Forester will maintain final decisions on the "Log Reinforced Water Bars" regarding the layout, quantity, placement, spacing, and orientation of these water control structures.

COST-SHARING POLICIES

The applicant must submit a C-SIP application and be approved before incurring any costs associated with C-SIP 5. Costs incurred before being approved are not eligible for reimbursement.

The DCR Service Forester will review the application for eligibility and assign a cost-share reimbursement value based on the submitted application and field review.

Applicants approved for the Climate-Smart BMP Kit may receive reimbursement after the submission and processing of the completed reimbursement form, required documentation, and receipts, in advance of the "Final Report" and at the discretion of the DCR Service Forester. All other C-SIP cost-share practice payments will be issued once the "long-term" designated Forest Cutting Plan is issued a "Final Report" by the DCR Service Forester.

Cost-share reimbursement for C-SIP 5 is exclusively authorized for the execution of Climate-Smart Forestry Best Management Practices (BMPs) by Massachusetts Licensed Timber Harvesters operating within the framework of a long-term designated Forest Cutting Plan.

C-SIP Work Plan and C-SIP Forest Cutting Plan Stand Map for Climate-Smart BMPs are required as part of the application. Refer to **Appendix B** for a sample C-SIP Work Plan and C-SIP Forest Cutting Plan Stand Map for Climate-Smart BMPs. ALL Climate-Smart BMPs identified on the "C-SIP Forest Cutting Plan Stand Map" must also be clearly identified on the ground with flagging or marked with paint. An exception to this is the Climate-Smart BMP Kit. Examples of areas and/or locations for C-SIP 5:

- Areas of critical resource concern where Climate-Smart BMPs will be implemented (i.e., approaches to stream crossings and wetland crossings).
- Primary and Secondary Skid Trails/Roads where slopes exceed 10%
- Areas/locations where soils are expected to be highly compacted and heavily disturbed (i.e., landings).

C-SIP 5: COST-SHARE RATES

C-SIP 5 Climate-Smart Best Management Practices for Forest Operations Cost-Share Rates		
C-SIP 5 Practice	Cost-Share Rate	Category
C-SIP 5.1 Log-reinforced water bars (on slopes > than 10%)	$250/log-reinforced water bar	Properly constructed and maintained throughout the entirety harvest
C-SIP 5.1 Log-reinforced water bars (on slopes > than 10%)	$75/log-reinforced water bar	Properly constructed for harvest closeout
C-SIP 5.2 Implementation/Installation of biodegradable soil stabilization product(s)	Staked Straw bales $20/bale Staked Wattle $150/wattle	Soil stabilization product(s) during harvesting activities
C-SIP 5.2 Implementation/Installation of biodegradable soil stabilization product(s)	Staked Straw bales $20/bale Biodegradable Fiber Blanket $150/roll Staked Wattle $150/wattle	Soil stabilization product(s) at harvest closeout
C-SIP 5.3 Seeding disturbed soils	Up to $30.00/lb. Seeding rates 20lbs/acre or 2,200 sq ft/pound. Rates should increase if applied just before/during the dormant season. BMP Manual for Seeding *Please refer to Appendix C in how to calculate the amount of seed you will need*	Seeding to stabilize soils on disturbed areas and steep slopes ≥10% on primary skid roads and stream crossing approaches.
C-SIP 5.4 Climate-Smart BMP Kit	Climate-Smart BMP Kit Includes: Straw bale and stakes at $20/bale Wattle and stakes at $150/wattle (max. reimbursement for a kit is $600)	Soil stabilization measures will be on site before harvesting activities begin for emergency and unanticipated weather events.

TECHNICAL SPECIFICATIONS

Practice Component C-SIP 5.1: Log-reinforced water bars (on slopes ≥10%).

Definition Purpose: Log reinforced water bars constructed during, and/or after a harvest will outlast traditional earthen water bars and prevent water runoff from extreme weather events. Implementation of properly constructed and maintained water diversions for skid trails and roads to stabilize soil throughout the harvest.

Condition Where Component Applies: Access roads, primary skid roads, and secondary skid roads on forest land with an approved "long-term" designated Forest Cutting Plan.

Applicants must include a DCR C-SIP Work Plan and a Forest Cutting Plan C-SIP Stand Map along with the C-SIP Cost-Share Application. Refer to **Appendix B** for a sample C-SIP Work Plan and C-SIP Forest Cutting Plan Stand Map.

Considerations:

1. Logs used for reinforced water bars should be a minimum of 8" DBH and at least 2'-4' longer than the skid road to allow outflow.
2. Reinforced water bars during active harvest will prevent water runoff during extreme weather events. Creation and use of water bars during and after the completion of the harvest will pay $250/water bar at appropriate pre-determined and DCR Service Forester-approved locations. To receive cost-share payment, use **Table 3** from the Massachusetts BMP Manual for spacing and technical specifications and **Illustrations 4**.
3. Reinforced water bars are created once the harvest is completed and before leaving the job. Creation of reinforced water bars at "close out" will pay $75/reinforced water bar at appropriate pre-determined locations. To receive cost-share payment, use **Table 3** from the Massachusetts BMP Manual for spacing and technical specifications and **Illustrations 4**.
4. Log-reinforced water bars located on skid trails and roads (on slopes ≥10%) must be indicated on the C-SIP Work Plan and C-SIP Forest Cutting Plan Stand Map for Climate-Smart BMPs and flagged or marked with paint. Consideration of the time between layout and harvest should guide the chosen method for skid road and trail layout.
5. Log-reinforced water bars must be strategically constructed, considering topography, resource area(s), and the type of harvest machinery used.
6. Utilize NRCS soil maps or USDA Web Soil Survey, along with knowledge of local soil conditions, to install log-reinforced water bars on skid trails and roads.
7. The DCR Service Forester will make final decisions on the "Log-Reinforced Water Bars" regarding the layout, quantity, placement, spacing, and orientation of these water control structures.

TABLE 3: Water Bar Spacing Chart (from MA BMP Manual 2nd Edition, 2013)

ROAD GRADE (%)	SPACING (ft.)
0-2	250-500
3-5	165-250
6-10	140-165
11-15	125-140
16-20	100-125
21+	<100

4. Water Bar Technical Specifications

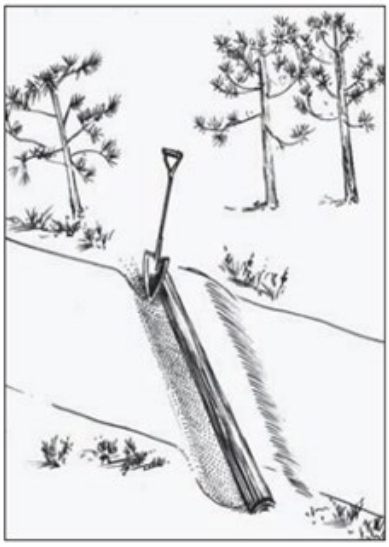


Illustration 4.
Water bar installation
Proper installation of water bar.

- Make angle to the center line of the road roughly 30 degrees (i.e., not perpendicular).
- Make height of berm depth of ditch.
- Allow outflow for water from the ditch to be open and extend beyond the edge of the skid trail; use shovel.
- Make water bars deep to ensure that they last a long time and serve as a possible deterrent or ORV traffic.
- Mulch or seed berm to reduce scouring or erosion and make it last longer.

Illustrations from: Massachusetts Forestry: Best Management Practices Manual

Example of log reinforced water bar on the active harvest. Photo credit: Colin Mettey

Installation process of a log reinforced water bar on the active harvest. C-SIP 5 Demo day, Town of Athol. Photo credit: Sara Wisner

Finished Installation of a log reinforced water bar on the active harvest. C-SIP 5 Demo day, Town of Athol. Photo credit: Michael Downey

TECHNICAL SPECIFICATIONS

Practice Component C-SIP 5.2: Implementation of biodegradable soil stabilization product(s).

Definition Purpose: The proper use and placement of soil stabilization products, such as Straw Bales, Wattles, and Seeded Blankets will be used as temporary means to intercept extreme runoff/trap sediment in areas with disturbed soils and high resource concerns (i.e., along stream crossings, filter strips, areas of high-water flow, etc.) throughout the harvest.

Condition Where Component Applies: Landings, stream crossing approaches, filter strips, access roads, primary skid roads, secondary skid roads, etc. on forest land with an approved “long-term” designated Forest Cutting Plan. Applicants must include a DCR C-SIP Work Plan and a Forest Cutting Plan C-SIP Stand Map along with the C-SIP Cost-Share Application. Refer to **Appendix B** for a sample C-SIP Work Plan and Forest Cutting Plan C-SIP Stand Map.

Considerations:

1. Proper placement of straw bales used DURING a harvest when the harvest is inactive (nights, weekends, weather delays) or in areas of high resource concern and soil disturbance.

2. Proper placement of wattles used DURING a harvest in areas of high-water flow and/or when the harvest is inactive (nights, weekends, weather delays) or in areas of high resource concern (steep banks along streams, steep skid roads).

3. Proper placement of straw bales USED AT HARVEST CLOSEOUT in areas of high resource concern and soil disturbance.

4. Proper placement of fiber blanket rolls USED AT HARVEST CLOSEOUT on short, steep slopes or approaches to stream crossings to reduce the overland flow of water and prevent sloughing of soil on steeper slopes.

5. Proper installation and maintenance of soil stabilization product(s) during harvest: Straw bales; Wattles with biodegradable netting ≤1/4" or ≥2"; Wattles must be indicated on the C-SIP Work Plan and Forest Cutting Plan C-SIP Stand Map for Climate-Smart BMPs and flagged or marked with paint.

6. Soil stabilization product(s) installed during the harvest must be strategically located, taking into account topography, resource area(s), and the area of soil disturbance.

7. Utilize NRCS soil maps or USDA Web Soil Survey, along with knowledge of local soil conditions, to install soil stabilization product(s).

8. Proper installation and maintenance of soil stabilization product(s) at harvest closeout: Straw bales; Fiber Blankets made from natural biodegradable materials; Wattles filled with natural materials (wood fiber, straw, coir) with biodegradable netting ≤1/4" or ≥2"; Wattles must be indicated on the C-SIP Work Plan and Forest Cutting Plan C-SIP Stand Map for Climate-Smart BMPs and flagged or marked with paint.

Straw Bales: Straw bales should be used downslope of disturbed areas, such as landings or on a skid trail upslope from a stream crossing, to keep water carrying sediment from entering the stream while the job is inactive (e.g., overnight, on weekends, or known extreme weather events). Bales become ineffective when saturated with sediment. * See illustration for proper installation of straw bales.

Installation:

- Excavate a trench 4 inches deep and the width of the bale;
- Position the bales in a single row or stagger them, making sure there are no gaps between the bales where water could flow through;
- Place the bales in the trench and stake with at least two stakes per bale; and
- Backfill with soil on the uphill side to keep water from flowing underneath the bale;
- Do not install bales in the streambed.

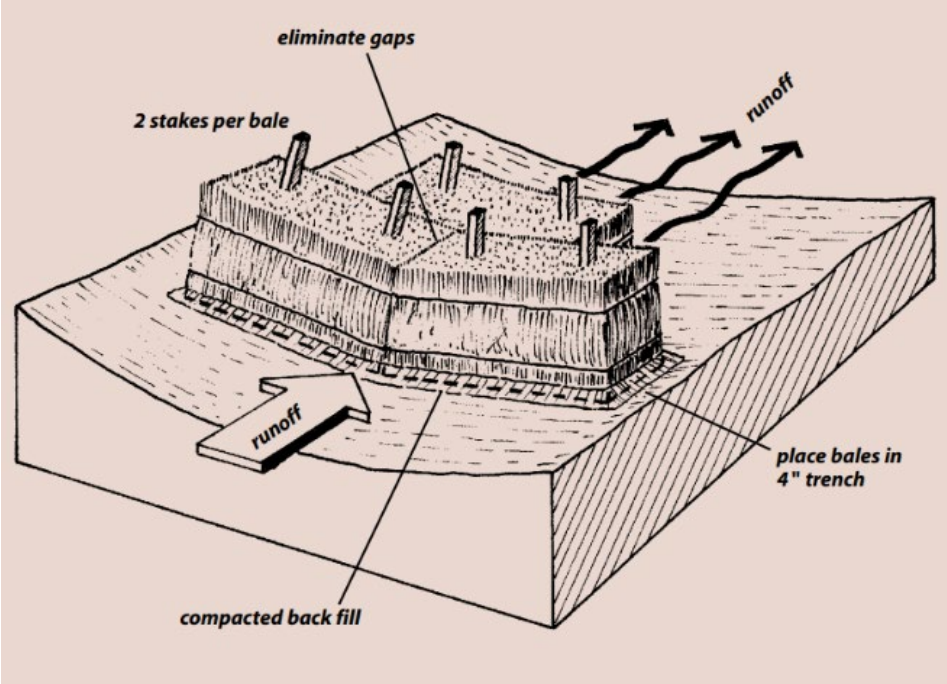


Illustration from Best Management Practices for Forestry: Protecting New Hampshire's Water Quality

- **Blankets:** Fiber blankets are made of biodegradable materials such as straw, coconut fiber, or shredded wood, these blankets can be on short, steep slopes or approaches to stream crossings to reduce the overland flow of water and prevent sloughing of soil on steeper slopes. Avoid netting or other mesh material with a nominal opening between ¼" and 2" to avoid entrapment of fish and wildlife. On slopes greater than 25%, blankets must be anchored with stakes. Blankets work best in ditch and swale sections (where there is concentrated runoff) when the slopes are gentle. Some products include a matrix of seeds to speed re-stabilization; and ensure that seeds are native to appropriate regions of the state.

Seed Blanket Installation:

- Begin at the top of the slope and unroll the downgrade.
- Ensure uniform contact with the soil surface.
- Allow the mat to lay loosely on the soil; do not stretch.
- Bury the upslope end in an anchor slot no less than 6" deep.

Wattles: Erosion control wattles contain biodegradable materials such as straw or wood fiber, stuffed into netting or tube structures typically 8 to 20" in diameter. Such tubes can be used as alternatives to silt fencing or straw bales to temporarily slow the flow of water-carrying sediment from entering the stream while the job is inactive (e.g., overnight, on weekends, or during known extreme weather events). Avoid netting and coarse material with nominal openings between ¼" and 2" that can trap and kill fish and wildlife.

Wattle Installation:

- Install well-staked along slope contours, with ends wrapped uphill.
- Drive stakes through the rear half of the tubes at a 45-degree angle.
- Extend termination points uphill to minimize flow bypassing.
- Overlap adjoining tubes 6” and stake joints securely.
- On long slopes, establish multiple lines of protection.

Finished Installation of a straw wattle on an active harvest. C-SIP 5 Demo day, Town of Athol. Photo credit: Sara Wisner

TECHNICAL SPECIFICATIONS

Practice Component C-SIP 5.3: Seeding Disturbed Soils and slopes ≥10%

Definition Purpose: Seeding can stabilize soil and minimize soil erosion in disturbed areas and on steep slopes. Seeding establishes perennial vegetative cover, which helps control soil erosion in disturbed areas. It reduces erosion and sediment loss by protecting bare soil surfaces from displacement by raindrop impacts, reducing stormwater flow rates and volumes, and providing permanent stabilization. This practice is economical, adaptable to different site conditions, and allows selection of a variety of plant materials.

Seeding is well-suited to areas where permanent, long-lived vegetative cover is the most practical or most effective method of stabilizing the soil. These include

roughly graded areas that will not be disturbed for at least a year. Seeding's advantages over other means of establishing plants include lower initial costs and labor needs. Properly implemented permanent seeding can significantly reduce soil loss, often by up to 99 percent.

Condition Where Component Applies: Landings, stream crossing approaches, access roads, primary skid roads on forest land with an approved "long-term" designated Forest Cutting Plan. Applicants must include a DCR C-SIP Work Plan and a Forest Cutting Plan C-SIP Stand Map along with the C-SIP Cost-Share Application. Refer to **Appendix B** for a sample C-SIP Work Plan and Forest Cutting Plan C-SIP Stand Map.

Considerations:

1. Selecting suitable plant species depends on climate, soil, and topography. Consult regional, state, and local resources for recommendations on native, low-maintenance, shade-tolerant (if applicable), and low-water plant species. The Massachusetts BMP Manual provides a list of recommended native grasses and rushes (pg. 21)
2. Apply seeds uniformly using methods like manual scattering, seed spreaders, or hydroseeding. Recommended seeding periods are from April 15 to June 15 and August 1 to September 15. Protect seeds with mulch to retain moisture, regulate soil temperatures, and prevent erosion during seedling establishment. Seeding rates should align with the time of year, seed species mix, Pure Live Seed (PLS), and other factors. Apply 20-50 pounds of a native Perennial Conservation Seed Mix per acre. See page 21 of the Massachusetts BMP Manual for a list of recommended species.
3. Factors constraining the effectiveness of seeding encompass challenges such as heightened erosion during the establishment phase, the necessity to reseed areas that do not successfully germinate, constrained planting seasons and fluctuations in soil temperature and moisture content during germination and early growth. It is essential to recognize that seeding alone does not confer immediate soil stabilization. Hence, implementing supplementary temporary erosion and sediment control measures is advisable to prevent erosion from disturbed areas.
4. **The DCR Service Forester will make final decisions on all C-SIP 5 practices.**

ADDITIONAL REFERENCES:

Five Counties Salmonid Conservation Program (5C) (2012). 5C Roads Workshop Presentation, Understanding Erosion with the Revised Universal Soil Loss Equation. https://www.5counties.org/docs/roadedu/2012_5c_roads/rusle.pdf

Smolen, M. D., Miller, D. W., Wyatt, L. C., Lichthardt, J., & Lanier, A. L. (2013). Erosion and sediment control planning and design manual. North Carolina Sedimentation Control Commission; North Carolina Department of Environment

and Natural Resources; North Carolina Agricultural Extension Service. https://www.deq.nc.gov/energy-mineral-and-land-resources/land-quality/erosion-and-sediment-control-planning-and-design-manual/design-manual-updates-may-2013/design-manual-revision-packet-may-2013/download

1. Permanent Seeding (EPA.gov)—most of the above is info from this EPA document.
2. EROSION (mass.gov)

Recommended native grasses and rushes from the MA Forestry BMP Manual:

- Little bluestem (*Schizachyrium scoparium)*
- Switch grass (*Panicum virgatum)*
- Virginia wild rye (*Elymus virginicus)*
- Big bluestem (*Andropogon gerardii)*
- Indian grass (*Sorghastrum nutans)*
- Deer tongue (*Panicum clandestinum)*
- Patridge pea (*Chamaecrista fasciculata)*
- Soft rush (*Juncus effusus)*
- Path rush (*Juncus tenuis)*
- Rough bentgrass/Ticklegrass (*Agrostis scabra)*

Suggestions for seed source:

USFS National Nursery and Seed Directory Reforestation, Nurseries and Genetics Resources (rngr.net)

TECHNICAL SPECIFICATIONS

Practice Component C-SIP 5.4: Climate-Smart Forestry BMP Kit

Definition Purpose: Climate-Smart Forestry BMP Kit consisting of straw bales and stakes and/or wattles and stakes to be strategically positioned on-site before the commencement of harvesting activities. This kit is designed to effectively address unforeseen weather events and emergencies during the harvest operation.

Condition Where Component Applies: Landings, stream crossing approaches, filter strips, access roads, primary skid roads, secondary skid roads, etc. on forest land with an approved “long-term” designated Forest Cutting Plan. Applicants

must include a DCR C-SIP Work Plan and C-SIP Forest Cutting Plan Stand Map along with the C-SIP Cost-Share Application. Refer to **Appendix B** for a sample C-SIP Work Plan and C-SIP Forest Cutting Plan Stand Map.

Considerations:

1. The Climate Smart BMP Kit maximum reimbursement is $600.
2. C-SIP Cost-Share Application for the Climate-Smart BMP Kit contents MUST be approved before kit contents are purchased.
3. Climate-Smart Kit contents must be located on-site and covered from the elements until use.
4. The DCR Service Forester will make final decisions on all C-SIP 5 practices.

ADDITIONAL REFERENCES:

Massachusetts Forestry: Best Management Practices Manual. 2nd Edition, 2013. Massachusetts Forestry: Best Management Practices Manual

Best Management Practices for Forestry: Protecting New Hampshire's Water Quality. University of New Hampshire, Cooperative Extension, 2005. (Best Management Practices for Forestry: Protecting New Hampshire's Water Quality (unh.edu)

SECTION 4 – APPLICATION PROCESS

Applicants are encouraged to contact their tax professional regarding any potential implications for income, property, or any other possible taxes associated with the acceptance of this cost-share, completion of work, and cost-share reimbursement payments.

Timetable of Key Events:

Event	Date
Application Period Begins	February 5, 2024
C-SIP Application Deadline	C-SIP Cost-Share applications will be accepted until the funds are exhausted or May 31, 5:00 P.M. EST each year (whichever comes first)
Cost-Share Award(s) Announced	Rolling

Applications must be submitted via email to dcr.forestry@mass.gov
or paper applications can be mailed to:
MA Forest Stewardship Program
355 West Boylston Street
Clinton, MA 01510

Below is a summary of the steps that must be completed to meet application requirements. PLEASE NOTE: The information included here is not intended to be exhaustive, and Applicants should contact the C-SIP Cost-Share designated contact:
Sara Wisner, Program Analyst - Service Forestry Program,
DCR.Forestry@mass.gov
(857) 408-4154

4.1 Application

On the DCR Climate Forestry Website, download a copy of the C-SIP Application Form. Or download via link in Appendix A.

4.2 IRS Form W-9

An IRS Form W-9 is required for all C-SIP applications. The IRS Form W-9 must be completed by the applicant.
Form W-9 (Rev. March 2024) (irs.gov)

4.3 Complete C-SIP Application and Submission

Complete the required fields and upload the required documents and email or mail. Applicants are required to submit a map of the project area(s) as part of the application. This constitutes your completed application. Optional Documents are not required unless specified.

a. Cost-Share Application Requirements and Conditions
Please be sure to include with your application, information on the following requirements, if applicable to your project.

Applications must meet the following minimum requirements to be eligible:

i. Identify the practice/s types to be completed.
ii. Provide the specific management practices as identified in your existing Forest Stewardship Plan and Summarize the proposed work to be completed. If the application includes C-SIP 5 Forestry Best Management Practices (BMPs) then provide a narrative of BMPs to be implemented in C-SIP Work Plan and C-SIP Forest Cutting Plan Stand Map.
iii. Complete the C-SIP Workplan including a description of the project location and C-SIP Forest Cutting Plan Stand Map practice map (if applicable).
iv. Provide a budget estimate/s for work to be completed.
v. Confirm the Fiscal Year completion time frame (May 31, 20XX)
vi. Use the services of a MA Licensed Forester (C-SIP 1, 2, 3), MA Licensed Pesticide Applicator (only for C-SIP 4 Invasives Plant Species Control), MA Licensed Timber Harvester (only for C-SIP 5 Climate-Smart BMPs)
vii. Agree to a DCR Service Forester field evaluation of the project site.

4.4 Confirmation of your application received.

The Applicant will receive an email notification that your application has been received.
If your application meets program and eligibility requirements you will be contacted by the DCR Service Forestry Program, who will schedule a site visit to the applicant's property if necessary.

SECTION 5 – C-SIP COST-SHARE APPLICATION EVALUATION

All applications will be reviewed and evaluated by the DCR Service Forestry Program utilizing the criteria and specifications contained in this document. Applicants are strongly encouraged to read thoroughly this document in the process of developing an application.

Applications will be reviewed for applicant and project eligibility on a pass/fail basis. Applications that fail one or more of the following eligibility criteria will be rejected. Upon completion of the eligibility review, including a DCR Service Forester field visit, the application will be given a pass or a fail determination.
C-SIP Cost-share Application Evaluation:

1. Applications will be evaluated in the order they are received based on the email received date and time or date stamp on mailed applications, until C-SIP funds are exhausted, or **MAY 1 of the given fiscal year, 5:00 P.M. EST**, whichever comes first.
2. Application and Project Eligibility Determination Pass/Fail criteria. Yes=Pass; No=Fail
3. Applicants who receive a positive determination will be notified of their cost-share approval within 20 business days of DCR receiving the application.
4. Applicants who receive a negative determination will be notified by the DCR Service Forester within 20 business days of DCR receiving the application.

Eligibility Questions
Applications will be evaluated using the pass/fail-based questions below.

1. **Proof of Ownership:** Are you the owner of the property? Do you hereby certify that I (we) have the legal authority to carry out C-SIP practices under a "Long-term" designated Forest Cutting Plan.

2. **Project Size**-Is the applicant applying for practices that total one (1) acre or more?

3. **Climate Stewardship Incentive Practices:** Please identify all eligible practices the project will implement for the FY 2024 C-SIP Cost Share:

   C-SIP 1: Harvest Layout
   1.1 Skid Trail and Road Design
   1.2 Identification and Marking of Wetland Resource and Filter Strip Boundaries

   C-SIP 2: Legacy Tree Retention
   2.1 Designation of Legacy Trees
   2.2 Designation of Patch Reserves

   C-SIP 3: Tree Marking for Increasing Future Adapted Species and Structural Diversity

   C-SIP 4: Invasive Plant Species Control

   C-SIP 5: Climate-Smart BMP for Forest Operators
   5.1 Log-Reinforced water bars
   5.2 Implementation of biodegradable soil stabilization product(s)

5.3 Seeding Disturbed Soils
5.4 Climate-Smart BMP Kit

4. **Identification and mitigation of rare, threatened, or endangered species.**
   Prior to submitting a C-SIP cost-share application—the Applicant may want to review the project area for the presence of any rare, threatened, or endangered species through the NHESP. MassMapper is a resource landowners and foresters can use to identify the presence of any rare, threatened, or endangered species on the property. The DCR Service Forester reviews all submitted Forest Cutting Plans for the presence of rare, threatened, or endangered species through the NHESP.

5. **Other Funding:** Projects already receiving cost-share funds or grants from another Massachusetts or Federal assistance programs such as Natural Resources Conservation Services' Environmental Quality Incentives Program (EQIP) for the same activities as those being proposed in this application are not eligible to apply for funding under C-SIP.

   Is the project already supported by funds from another Massachusetts or Federal assistance program for the same activities as those being proposed?

6. **C-SIP Forest Cutting Plan Stand Map (aka Project Location Map):** Applicants are required to furnish a map that precisely delineates the project site. This map should convey crucial information about the project location and the overall condition of the site. Specifically, applicants need to clarify whether the project is entirely situated on their land or within the boundaries of the Forest Cutting Plan. It is essential to identify the project area where all proposed practices will be implemented. To ensure clarity and facilitate the review process, the map should be clearly labeled and/or referenced. It should include necessary elements such as the applicant's name, location, property acres, and practice acres, all clearly outlined on the map. This will aid application reviewers in easily identifying the project site(s) as described in the response to this question.

7. **C-SIP 4: Invasive Plant Species Control:** Please provide the MA Licensed Pesticide applicator's name and number if known at the time of C-SIP Application (if applicable). If not known at the time of application this information must be supplied before work begins.

8. **Time Frame:** All approved C-SIP practices must be completed by MAY 31, within the same fiscal year that the application was approved.

9. **Field Evaluation:** A DCR Service Forester will visit the project location as part of the application evaluation. Confirm the DCR Service Forester is allowed access to project area(s)

10. **C-SIP Work Plan:** For those practices, C-SIP 1, C-SIP 4, and C-SIP 5 that do not require a Management Plan or Forest Stewardship Climate Plan, a C-SIP Work Plan will be required as part of the application. Applicants must provide a robust description of project goals. A timetable for objectives, tasks, and performance measures must be provided, including who is responsible for each task. Informal cost/budget estimates must be included in the C-SIP Work Plan Project Cost/Budget. Project descriptions in the C-SIP Work Plan shall concisely summarize the work proposed and the project goals. Describe the main tasks and objectives of the project and a general description of the location.

11. **C-SIP Forest Cutting Plan Stand Map:** For those practices, C-SIP 1, C-SIP 4, and C-SIP 5 that do not require a Forest Stewardship Climate Plan, a C-SIP Forest Cutting Plan Stand Map

will be required as part of their application. See **Appendix B** for a Sample C-SIP Forest Cutting Plan Stand Maps (for C-SIP 1,4, 5).

12. **Long-Term Maintenance Plan for C-SIP 2 Legacy Tree Retention:** The Applicant's Forest Stewardship Climate Plan must describe in detail how this project will be supported and monitored over the plan period including a monitoring schedule associated with upkeep.

SECTION 6 – APPLICANT REIMBURSEMENT PROCESS

APPLICANT REIMBURSEMENT PROCESS FOR C-SIP 1-4

1. Notify your local DCR Service Forester that you are submitting the C-SIP Reimbursement Form(s)
   and receipts to the appropriate DCR Service Forestry Program Office.
2. The DCR Service Forester will schedule a site visit to review the completed C-SIP Practice.
3. The DCR Service Forester will complete and sign the C-SIP Reimbursement Form.
4. The DCR Service Forestry Program will complete a financial review of your request for reimbursement.
5. The DCR Service Forestry Program will submit the signed Reimbursement Form and financial documents (receipts, invoices, etc.) to Massachusetts Woodlands Institute authorizing reimbursement payment to be made to the applicant.
6. Massachusetts Woodlands Institute will issue payment to the applicant within 21 business days of receiving the DCR Service Forester signed reimbursement form and receipts/paid invoices.
7. Massachusetts Woodlands Institute will issue a 1099-MISC to the applicant for tax reporting purposes.

APPLICANT REIMBURSEMENT PROCESS FOR C-SIP 5

1. Notify your local DCR Service Forester that you are submitting the C-SIP Reimbursement Form(s) and receipts to the appropriate DCR Service Forestry Program Office and request to schedule a Forest Cutting Plan “Final Report” site visit.
2. The DCR Service Forester will schedule a site visit to review the completed C-SIP Practice.
3. The DCR Service Forester will complete and sign the C-SIP Reimbursement Form.
4. The DCR Service Forestry Program will complete a financial review of your request for reimbursement and all relevant receipts and paid invoices for all soil stabilization products and seeds used throughout the harvest.
5. The DCR Service Forestry Program will submit the signed Reimbursement Form and financial documents (receipts, invoices, etc.) to Massachusetts Woodlands Institute authorizing reimbursement payment to be made to the applicant.
6. Applicants approved for the Climate-Smart BMP Kit may receive reimbursement after the submission and processing of the completed reimbursement form, required documentation, and receipts, in advance of the “Final Report” and at the discretion of the DCR Service Forester. All other C-SIP cost-share practice payments will be issued once the “long-term” designated Forest Cutting Plan is issued a “Final Report” by the DCR Service Forester.
7. Massachusetts Woodlands Institute will issue payment to the applicant within 21 days of receiving the DCR Service Forester signed reimbursement form and receipts/paid invoices.
8. Massachusetts Woodlands Institute will issue a 1099-MISC to the applicant for tax reporting purposes.

SECTION 7 - ROLE & RESPONSIBILITIES OF DCR SERVICE FORESTRY PROGRAM FOR C-SIP

DCR Service Foresters are responsible for the administration of the program within a district, and for monitoring the program to ensure compliance with practice installation and C-SIP program requirements.

The DCR Service Forester will evaluate C-SIP applications for eligibility, assign approved cost-share amounts, and approve the issuance of cost-share payments.

The DCR Service Forester or individuals appointed by the Director of the Service Forestry Program shall have access to the applicant's or landowner's property (where the C-SIP practice(s) is being implemented) to conduct inspections of C-SIP practices during the maintenance period. Regular compliance checks for all C-SIP practices will be conducted.

DCR reserves the right to:

- Award a portion of an approved applicant's cost-share reimbursement based on the work completed.
- Award ONLY a portion of an approved applicant's full cost-share reimbursement due to ineligible project-related costs.
- Monitor the progress and maintenance of all cost-share projects.
- Withdraw approved cost-share funding if the applicant fails to make significant and timely progress on the project or fails to receive the necessary permissions and permits for the project.
- Deny or withdraw approval of any application that fails to conform to the eligibility requirements of the relevant C-SIP practice(s).
- Deny cost-share reimbursement for projects that are determined not to comply with C-SIP practice standards and eligibility.
- Deny cost-share reimbursement for projects that are determined not to be consistent with the Forest Stewardship Climate Plan, C-SIP Work Plan, M.G.L. Chapter 61/61A/61B, and M.G.L. Chapter 132 regulations, if applicable.
- Seek clarification from an applicant and/or the landowner to effectively evaluate a project proposal.

Appendix A—C-SIP APPLICATION

Please follow the link to download and fill out an application:

C-SIP 1-4 Fiscal Year 2025 Application

C-SIP 5 Fiscal Year 2025 Application

Applications must be submitted via email to dcr.forestry@mass.gov or paper applications can be mailed to:
MA Forest Stewardship Program
355 West Boylston Street
Clinton, MA 01510

Appendix B—SAMPLE C-SIP WORK PLANS AND FOREST CUTTING PLAN STAND MAPS

For those practices, C-SIP 1, C-SIP 4, and C-SIP 5 that do not require a Forest Stewardship Climate Plan, a C-SIP Work Plan, and a C-SIP Forest Cutting Plan Stand Map will be required.

SAMPLE C-SIP- 1 WORK PLAN

PRACTICE: HARVEST LAYOUT
FOREST CUTTING PLAN ACRES: 50
Landowner Name: ARNOLD LAYNE
MA Licensed Forester: SYD BARRETT
Cost-Share Application Submission Date: February 5, 2024
Cost-Share Project Deadline: May 31, 2024

Provide a high-level overview of the project, including the overall goal and desired outcomes.

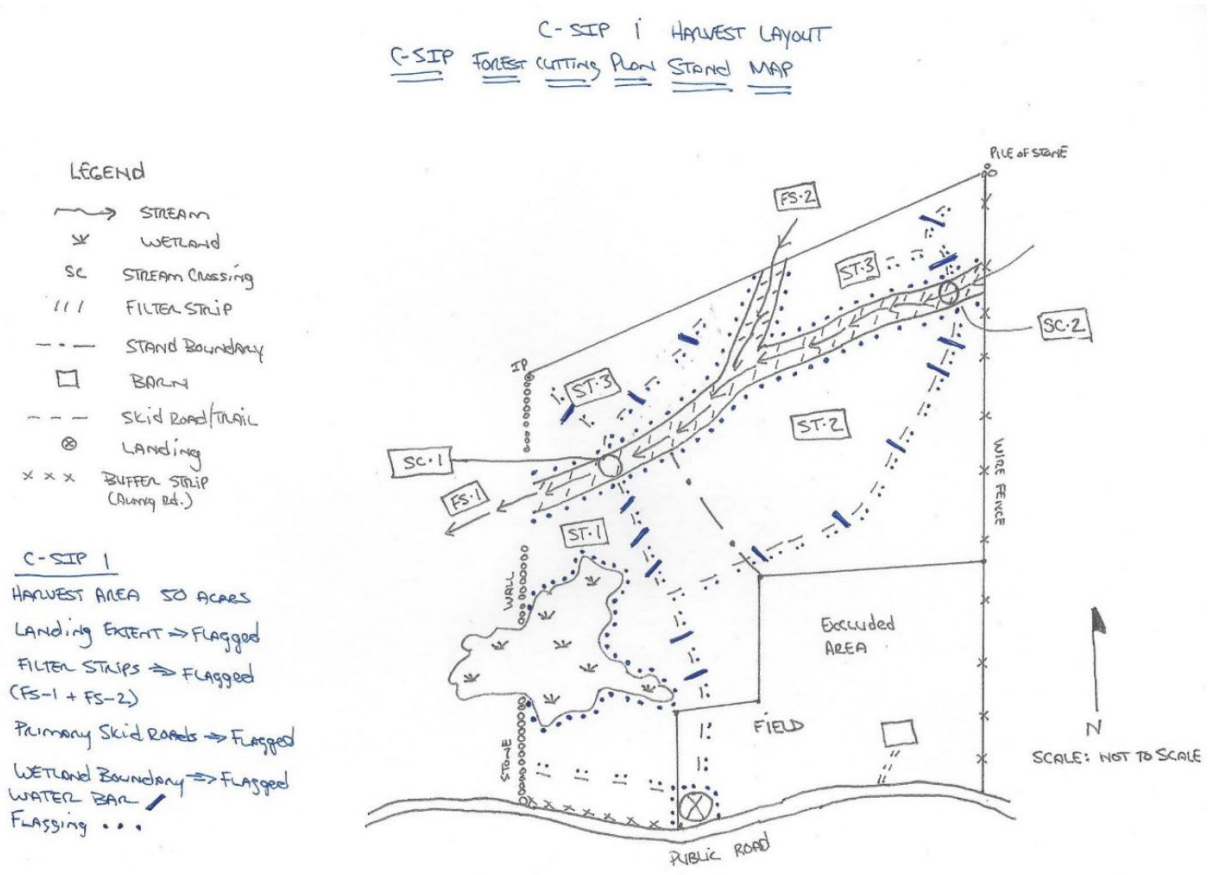
This project consists of C-SIP 1 Harvest Layout.
The Harvest Layout is for a cut-to-length operation and the silviculture being applied to this property is a seed tree harvest. The landowner's goal is to regenerate the forest due to poor stocking, tree form, and tree vigor.

The following will be clearly flagged in the field utilizing C-SIP 1 cost-share: landing location and extent, location of primary/secondary skid trails, water bar locations, and filter strips.

The Harvest Layout is expected to take four (4) hours on the 50-acre project. Additionally, 2,500 feet of Wetland Boundary will be flagged.

BUDGET			
Practice	Unit	Cost-Share	Total
C-SIP1 Harvest Layout	50 acres (4 hours)	$480	$480
C-SIP1 Wetland Boundary	2,500 ft.	$375 (0.15/foot)	$375
----------	----------	----------	$855

SAMPLE C-SIP FOREST CUTTING PLAN STAND MAP for C-SIP 1



SAMPLE C-SIP 4 WORK PLAN

PRACTICE: INVASIVE PLANT SPECIES CONTROL
FOREST CUTTING PLAN ACRES: 50
INVASIVE TREATMENT AREA: 15 acres
Landowner Name: CAPTAIN BEEFHEART
MA Licensed Pesticide Applicator: DON VAN VLIET
Cost-Share Application Submission Date: February 5, 2024
Cost-Share Project Deadline: May 31, 2024

OVERVIEW and DESIRED OUTCOMES
(Applicant please provide a high-level overview of the project, including the overall goal and desired outcomes)
Invasive plants are present on the property and mostly found at higher to moderate density levels at the top of the hill in Stands 1 and 2 and at a lower (light) density along the riparian area woods road at the north/northeast area of the property in Stand 3.

The present non-native species include Asiatic bittersweet, autumn olive, Japanese barberry, and winged euonymus. Well-adapted to changing conditions, these invasives are likely to expand their populations, especially in areas where disturbance occurs following a harvest. Controlling the existing invasives and monitoring for future infestations will be an important part of the management of the property.

C-SIP 4 SUMMARY TABLE

C-SIP 4 Invasive Plant Species					
Objective	Stand #	Forest Type	C-SIP 4 Category	Extent (Acres)	Timing
Forest Resilience	1	HH	Heavy	5	April 2024
Forest Resilience	2	WH	Moderate	5	April 2024
Biodiversity	3	WH	Light Mechanical	5	April 2024

BUDGET TABLE:

BUDGET			
Practice	Unit	Cost-Share	Total
C-SIP 4 Invasive Plant Species Control	5 acres @ $1,193/ac.	$5,965	$5,965

HEAVY			
C-SIP 4 Invasive Plant Species Control MODERATE	5 acres @ $543/ac.	$2,715	$2,715
C-SIP 4 Invasive Plant Species Control LIGHT MECHANICAL	5 acres @ $471/ac.	$2,355	$2,355
----------	----------	----------	$11,035

C-SIP INVASIVE PLANT SPECIES CONTROL NARRATIVE:

Project Specifications:
The project will employ Integrated Vegetation Management (IVM) to address areas affected by invasive plant species. While the invasive plant communities are currently not extensive, a combination of chemical and manual methods (Stand 1 & 2) and manual methods (Stand 3) will be strategically employed to effectively control invasive plant species.

Target Species and Stocking Densities:
Stand 1 (5 acres Heavy) is a high-density area of invasive species dominated by Asiatic bittersweet, Autumn olive, Japanese barberry, and Burning bush that is in the northeast portion of the stand.

Stand 2 (5 acres Moderate) is a pocket of Oriental bittersweet that is concentrated in the western portion of Stand 2. Luckily, this is a controllable population.

Stand 3 (5 acres Light Mechanical) contains very sparse populations of Japanese barberry.

Mechanics of Practice:
Stand 1 (5 acres Heavy): Asiatic bittersweet (*Celastrus orbiculatus*), Autumn olive (*Elaeagnus umbellata*), Japanese barberry (*Berberis thunbergii*), and Burning bush (*Euonymus alatus*): This area is highly impacted by these invasive species. Cut stems can be treated with concentrated herbicides such as glyphosate or triclopyr. In addition, a foliar application of herbicide may be used.

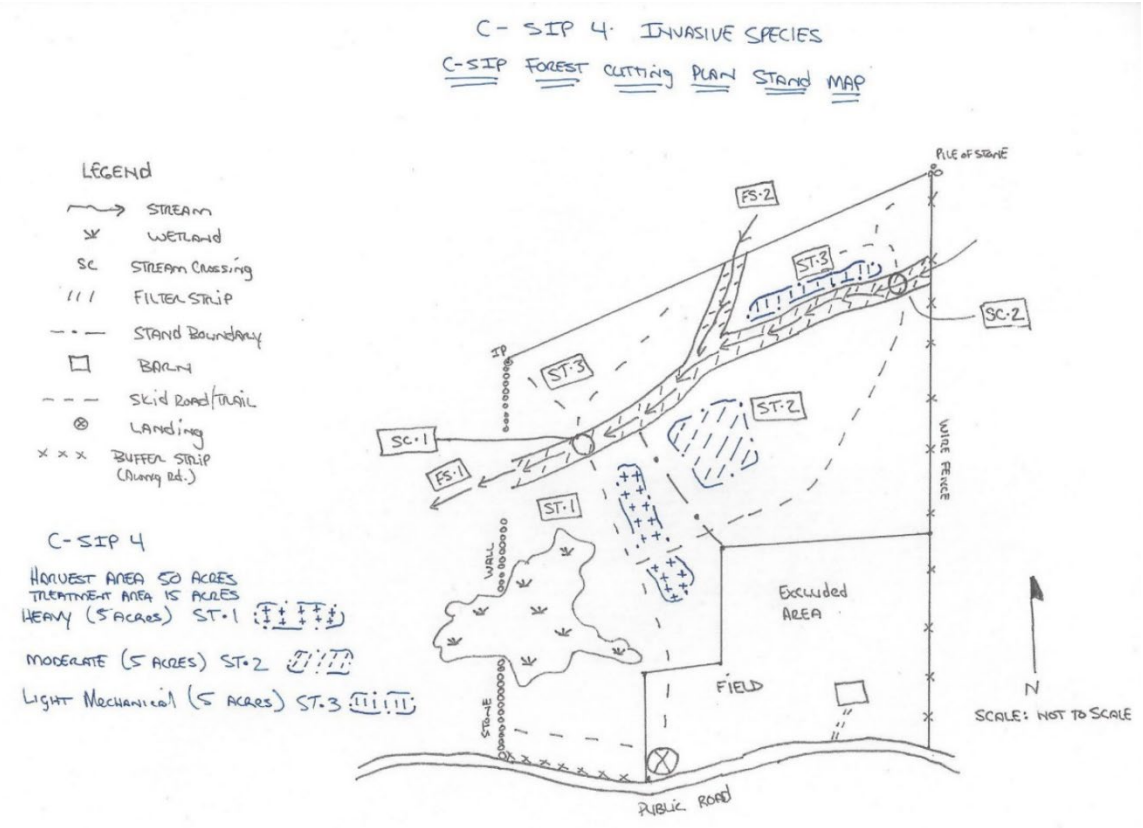
Stand 2 (5 acres Moderate): Asiatic bittersweet (*Celastrus orbiculatus*): Bittersweet will be controlled by cutting the vines and immediately treating the stump with herbicide. Herbicides that could be used include triclopyr or glyphosate. Large patches of bittersweet may be treated with a foliar application of herbicide.

Stand 3 (5 acres Light Mechanical): Japanese barberry (*Berberis thunbergii*): Hand pulling or grubbing is often the quickest and easiest way to halt invaders when first spotted. However, roots that break off during extraction will sometimes re-sprout. Removal of Japanese barberry plants by pulling or digging is recommended in early spring. This shrub

leaves out early, making it easy to identify. Small plants can be pulled easily by hand. Manual removal will be accomplished using digging tools. Examples of brand names for manual removal include the Weed Wrench™ Honeysuckle Popper™, Root Talon™, and Extractigator™ or Mattocks.

Climate Vulnerability and Carbon:
Forest regeneration stands as a cornerstone for ecological sustainability. However, when invasive plants encroach on growing spaces, the available seed bed area diminishes. Strategic control of invasive plant populations not only safeguards native plants but also nurtures the growth of tree seedlings.
Proactive measures for controlling invasive plant species not only preserve ecological balance but also contribute to carbon sequestration, enhanced growth, and future-proofing the forest ecosystem.

SAMPLE C-SIP FOREST CUTTING PLAN STAND MAP for C-SIP 4 INVASIVE PLANT SPECIES



Additional References:

Guide for a Forest Management/Stewardship Plan Addendum for Forest Carbon and Climate Resiliency, 2022. [Guide for a Forest Management/Stewardship Plan Addendum (2022)]

SAMPLE C-SIP 5 WORK PLAN

PRACTICE: Climate-Smart Best Management Practices for Forest Operations **(MA Timber Harvester prepared)**
FOREST CUTTING PLAN ACRES: 50
Landowner Name: JASON PIERCE
MA Licensed Timber Harvester: PETER KEMBER
Cost-Share Application Submission Date: February 5, 2024
Cost-Share Project Deadline: May 31, 2024

OVERVIEW and DESIRED OUTCOMES
(Applicant please provide a high-level overview of the project, including the overall goal and desired outcomes)
This project consists of C-SIP 5 Climate-Smart Best Management Practices for Forest Operations.
The Harvest is a cut-to-length operation and the silviculture being applied to this property is a seed tree harvest. The landowner's goal is to regenerate the forest due to poor stocking, tree form, and tree vigor.

Climate-Smart Best Management Practices for Forest Operations will utilize one (1) Climate-Smart BMP Kit (kit includes Straw bale and stakes and Wattle and stakes); a total of ten (10) straw wattles at the approaches to Stream Crossing 1 (SC-1), Stream Crossing 2 (SC-2), and landing area.
At job closeout—15 log-reinforced water bars will be installed, and 30 pounds of New England Logging Road seed mix will be distributed across approximately 22,000 square feet of disturbed soil area(s). One (1) erosion control blanket (roll) will be utilized at the steep approach to SC-2.

BUDGET TABLE:

BUDGET			
Practice	Unit	Cost-Share	Total
C-SIP 5.4 Climate-Smart BMP Kit (kit includes Straw bale and stakes and Wattle and stakes)	1	$600	$600
C-SIP 5.2 Biodegradable soil stabilization	10 Straw Wattles	$1,500 ($150/wattle)	$1,500
C-SIP 5.3 Seeding disturbed soils At closeout	10 lb. of seed Soil disturbance = 22,000 sq. ft.* (*2,200 sq. ft./lb. seeding rate)	$300 @ $30/lb.	$300

C-SIP 5.2 Biodegradable soil stabilization	1 Erosion Control Blanket (roll)	$150/roll	$150
C-SIP 5.1 Log-reinforced water bars At closeout	15 Log-reinforced water bars	$1,125 ($75/bar)	$1,125
----------	----------	----------	$3,675

C-SIP BMP NARRATIVE:
During Forest Cutting Plan harvesting activities, a combination of erosion, sediment control, and forestry BMPs will be implemented to stabilize and prevent advanced erosion. Refer to the **C-SIP FOREST CUTTING PLAN STAND MAP** for location details. Also, the area of disturbed soils shall be kept to a minimum and, the C-SIP Climate-Smart BMP Kit will be available before any soil disturbance and harvesting activities.

Where applicable, Straw Wattles will be installed downslope of disturbed areas, to prevent sediment-laden stormwater from entering local waterways, adjacent properties, and roadways. Log-reinforced water bars will be constructed at closeout to control stormwater runoff across skid trails and roads. The log reinforced water bars will be spaced in accordance with Table 3 of the Massachusetts Forestry BMP Manual (2nd edition, 2013). Log-reinforced water bars will be constructed to convey surface flow to a stable area without causing water to pool behind the water bar.

As necessary, straw wattles or log-reinforced water bars will be installed at locations indicated on the C-SIP Forest Cutting Plan Stand Map. All log-reinforced water bars on skid trails and roads are permanent except for those specified as temporary on the C-SIP Forest Cutting Plan Stand Map.

Seed will be utilized at closeout for the landing area and on the approaches to all stream crossings (approximately 22,000 square feet of disturbed area). An Erosion Control Blanket will be used on the steep approach to SC-2 at closeout.

The following Erosion, Sediment Control, and Forestry BMPs are based on those found in the C-SIP and MA Forestry BMP Manuals and will be utilized as part of the proposed forestry project:

- Straw Wattle: Straw Wattle is a sediment barrier consisting of a mesh sock and coarse compost. CFS will be placed to control runoff and collect sedimentation.

- Reinforced Water bars: Water bars will be constructed at an angle (roughly 30%* not perpendicular) across the skid trail and/or road to direct runoff away from the skid trail and/or road onto a well-vegetated area.

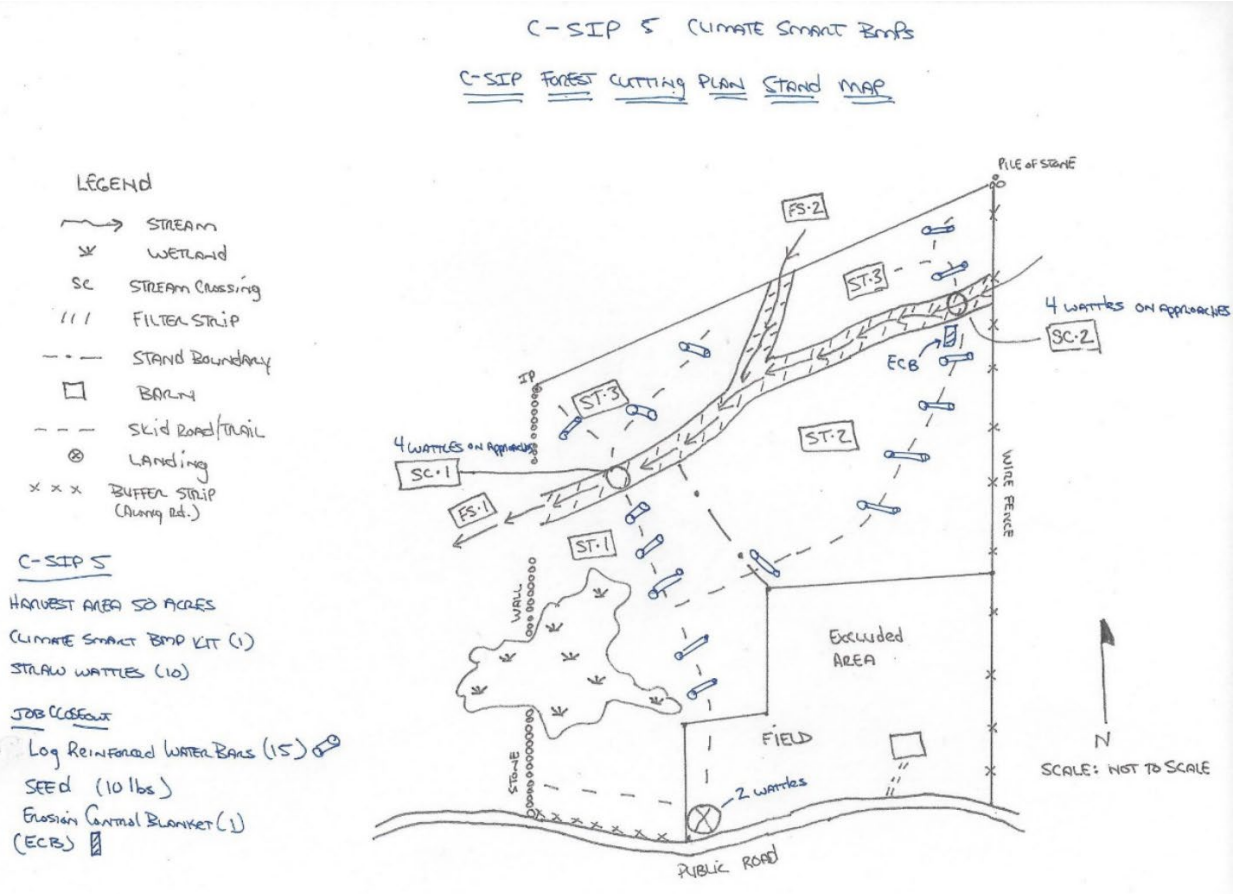
- Erosion Control Blanket: Erosion Control Blanket (ECB) is a soil covering made from straw, coir, excelsior, or other biodegradable material used to minimize the potential for erosion of an exposed soil until a suitable vegetative cover can be established.

- Straw Bales: Straw Bales are sediment barriers constructed from straw attached to support stakes. Straw Bales will be placed to control runoff from small, disturbed areas when it is in the form of sheet flow.

- Seed: Seeding can stabilize soil and minimize soil erosion in disturbed areas and on steep slopes. Seeding establishes perennial vegetative cover, which helps control soil erosion in disturbed areas. Seed will be utilized at closeout for the landing area and on the approaches to all stream crossings.

Additional References:
Erosion and Sediment Control Plan Narrative. Atlantic Sunrise Project. August 2017. [CPLS-Lebanon County E&S Narrative.pdf (state.pa.us)]

SAMPLE C-SIP FOREST CUTTING PLAN STAND MAP for C-SIP 5



Appendix C—CALULATING THE AMOUNT OF SEED REQUIRED

Step-by-Step Process

1. **Determine Planting Time** Decide the optimal date and time of year for your planting.
2. **Identify the Conservation Practice** Choose a conservation practice that aligns with your goals. Select plant species that are best suited for this practice and will meet your objectives, such as erosion control or wildlife.
3. **Calculate the Planting Area** Determine the total area (in acres or square feet) where you'll be planting.
4. **Choose the Planting Method** Decide whether you'll use broadcast seeding or another method. If you opt for broadcast seeding, you might need a higher seeding rate for better coverage.
5. **Select Plant Species** Choose species that support your conservation objectives. Prioritize native species and consider those that are compatible with each other and well-suited to the site.
6. **Calculate Seed Requirements** To determine how much seed to purchase, use the following formula:
    - **Seeding Area Calculation**:
        - If using acres: Area = length of the planting site in feet x width of the planting site in feet. Divide this value by 43,560 to arrive at your acreage.
          Example: Skid trail is 5,000 feet long by 20 feet wide = 100,000 square feet
          100,000 square feet ÷ 43,560 = 2.30 acres
        - If using square feet: Area = length in feet x width in feet.
          Example: Skid Trail is 1,000 feet long by 20 feet wide = 20,000 square feet
    - **Seed Requirement Calculation**:
        - For acres: Multiply the area by the recommended seeding rate (20 lbs/acre).
        - For square feet: Divide the area by the seeding rate (2,220 sq ft/lb).

Example Calculations

1. **Using Acres**: If you have 10 acres of skid road to seed, the calculation would be:
    - 10 acres x 20 lbs/acre = 200 lbs of seed.
2. **Using Square Feet**: If you have 21,780 square feet of skid road to seed, the calculation would be:
    - 21,780 sq ft ÷ 2,220 sq ft/lb = 9.8 lbs of seed (round up to 10 lbs).

Additional Information

- The recommended planting rate from the C-SIP Manual is 20 lbs/acre or 2,220 sq ft/lb.
- Increase seeding rates if planting just before or during the dormant season.
- Remember, an acre is equivalent to 43,560 square feet.