

Climate Forest Stewardship Plan – Bringing it all Together

dcrc
Submitted to the Massachusetts Department of Conservation and Recreation for enrollment in CH61/61A/61B and/or Forest Stewardship Program

Forest Management Plan

CHECK-OFFS

CH61	CH61A	CH61B	STEWARDSHIP	Cost Share
cert <input type="checkbox"/>	cert <input type="checkbox"/>	cert <input type="checkbox"/>	new <input checked="" type="checkbox"/>	EEA <input type="checkbox"/>
recert <input type="checkbox"/>	recert <input type="checkbox"/>	recert <input type="checkbox"/>	renew <input type="checkbox"/>	Other <input type="checkbox"/>
amend <input type="checkbox"/>	amend <input type="checkbox"/>	amend <input type="checkbox"/>	Climate <input checked="" type="checkbox"/>	Birds <input type="checkbox"/>
			Conservation Rest. <input checked="" type="checkbox"/>	
			CR Holder DCR <input checked="" type="checkbox"/>	

Plan Change ☐ to ☐

OWNER, PROPERTY, and PREPARER INFORMATION

Property Owner(s) Sample Family
Mailing Address Main Street 2, Sturbridge, MA 01566
Email Address _____

Property Location Town(s) Brimfield Phone 413-200-0000

Plan Preparer Millie Quercus
Mailing Address Main Street, Brimfield, MA 01010 Road(s) Main Road

Mass Forester License # 1000 Phone 413-300-9999

RECORDS

Assessor's Map No.	Lot/Parcel No.	Deed Book	Deed Page	Total Acres	Ch61/61A/61B Excluded Acres	Ch61/61A/61B Certified Acres	Stewship Excluded Acres	Stewship Acres
10	25	1588	200	74.395			0	74.395

Directions for the preparation of a Forest Management Plan and Forest Stewardship Plan

Additional Elements for Climate or Bird Habitat Plans

This set of instructions will guide foresters in the development of management plans appropriate for enrollment in Chapter 61, 61A, 61B or the Forest Stewardship Program. The combination of instructions for these programs is designed to clarify the respective requirements for each. When incorporating Stewardship into management plans, foresters should keep in mind that the primary emphasis of this program is landowner education. In contrast, the Chapter 61, 61A and 61B programs were designed to fill a regulatory function.

The purpose in any forest management plan is to help landowners better understand current forest conditions and future management needs and opportunities, integrating all the forest resources. This plan will provide a "road map" of management activities to help landowners protect, improve, or restore the health and productivity of forest resources, attain their individual ownership objectives, and provide for long-term sustainable forest management. Provide useful information to anyone with a current or future interest in the property, including heirs and subsequent owners.



Managing Forests for Climate Change in Massachusetts

(DRAFT – Feb. 2022)



CARING FOR YOUR WOODS Managing for Forest Carbon



CARING FOR YOUR WOODS Setting Goals



CARING FOR YOUR WOODS Adapting to Changing Conditions

Alison Wright-Hunter
Service Forester
DCR



Our Objectives for Today

- 1. Review new “Directions for Preparation of a Climate Stewardship Plan” using language from the Sample Climate Stewardship Plan as an example**
- 2. The 5 Adaptation Steps – how work here will support the content in the plan**
- 3. Demonstrate where possible “linkages” can be made in the plan to facilitate landowner knowledge and *action***



A Forest Management Program through a Climate Lens

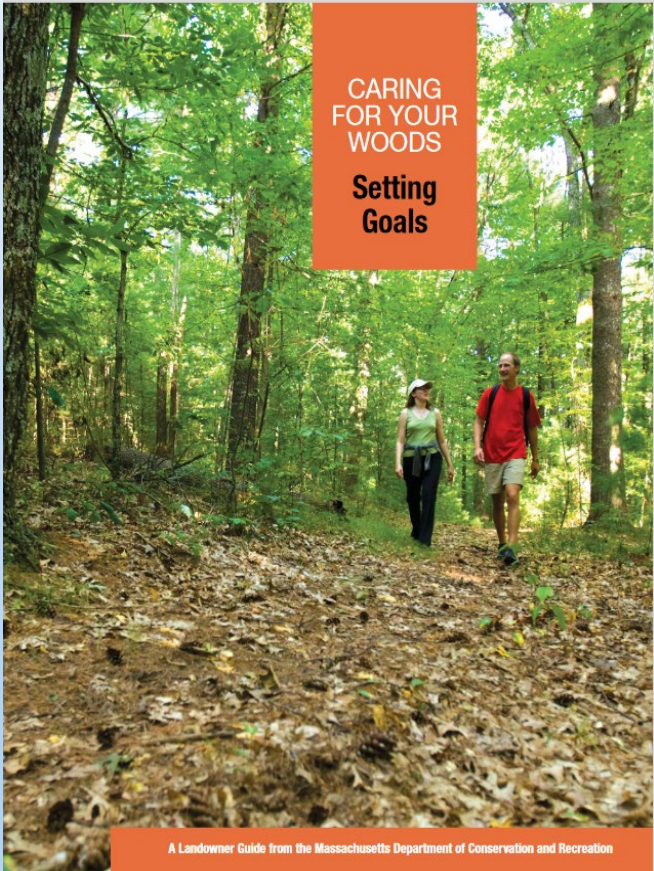
Translate your results from the Adaptation Steps to:



- Inform your landowner so that they understand whether their forest is **vulnerable** and at **risk** due to the potential impacts from climate change
- Link this information to actions they can take to support climate adaptation and/or mitigation through your prescribed Management Practices



New Landowner Goals Form



Landowner Goals

Please check the column that best reflects the importance of the following goals:

Goal	Importance to Me		
	HIGH	LOW	
Improve access for walking/skiing/recreation			
Improve hunting or fishing			
Maintain or enhance privacy			
Preserve or improve scenic beauty			
Protect special features, including those of historical or person significance			
Enhance the quality and/or quantity of forest products*			
Practice agroforestry			
Produce income from timber products, or other products and services			
Produce firewood for personal use			
Enhance habitat for birds			
Enhance aquatic habitat in streams, ponds, and other wetlands			
Enhance habitat for wildlife			
Promote diversity of plant species and habitat types			
Increase forest resiliency			
Minimize damage from forest pests			
Protect water quality			
Sequester and/or store carbon to mitigate climate change			
Suppress or eradicate invasive plants			
Lower property taxes			
Protect land from development			

* This goal must be checked "HIGH" if you are interested in classifying your land under Chapter 61/61A.

In your own words please describe your goals for the property:

The Sample Family Goals

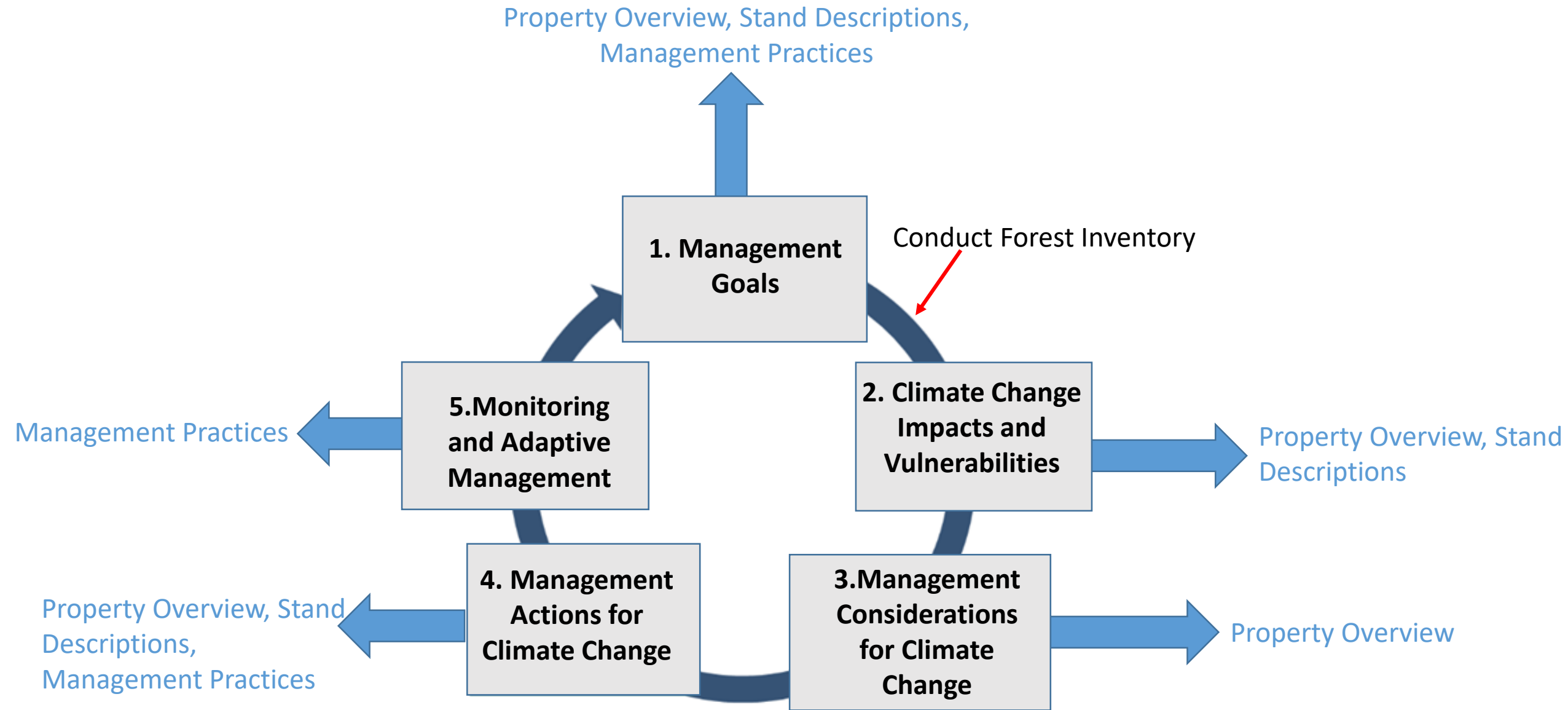
- Preserve their woodlot
- Recreation
- Protect special landscape features
- Enhance Quantity/Quality of Forest Products
- Improve Bird Habitat
- Address climate change
- Increase Carbon Storage
- Protect Water Quality

Landowner Interest Categories

Outdoor Recreationist	Improve access for walking/skiing/recreation Improve hunting or fishing Maintain or enhance privacy Preserve or improve scenic beauty Protect special features, including those of historical or personal significance
Working Woodlands Owner	Enhance the quality and/or quantity of forest products* Practice agroforestry Produce income from timber products, or other products and services Produce firewood for personal use
Wildlife Steward	Enhance habitat for birds Enhance aquatic habitat in streams, ponds, and other wetlands Enhance habitat for wildlife Promote diversity of plant species and habitat types
Nature's Ally	Increase forest resiliency Minimize damage from forest pests Protect water quality Sequester and/or store carbon to mitigate climate change Suppress or eradicate invasive plants

“Climate-informed forest management plans intentionally consider climate change and make **linkages** between potential climate change **impacts** and the associated management **actions**.” *Managing for Climate Change in Massachusetts (2022)*





Stand Descriptions – What's New?

The narrative should discuss:

- stand vulnerability
- identify risks
- Identify adaptation options

Overall emphasis:

*The landowner should be left with a sense of how vulnerable various stand components are to climate change and whether to take **action**.*

Plans focusing on carbon should focus on components that would positively or negatively affect carbon storage or sequestration.



Call to Action

Taking Action in Your Woods

Taking an active role as a steward of your land can help your woods adapt to warmer, drier summer conditions and more frequent disturbances from events such as wind, storms or disease that can damage trees. A woodland of healthy, diverse trees can better withstand stress and support the community of plants and animals that live in your woods.

Managing Forests for Climate Change in Massachusetts

ACTIONS TO PROTECT ECOSYSTEM FUNCTIONS

- Keep forest land in forest use.
- Protect rare or sensitive plant and animal communities.
- Protect water and soils on your land.

ACTIONS TO REDUCE STRESSORS

- Improve ability of your trees to resist insect pests and disease.
- Prevent and control invasive plants.
- Manage damage to young trees from excessive deer browsing.

ACTIONS TO BUILD RESILIENCE

- Promote a diversity of tree species.
- Promote a diversity of tree ages and sizes.

ACTIONS TO PROMOTE CHANGE

- Prepare for big weather events by promoting strong, healthy trees in your woodlot.
- Respond quickly after big disturbance events to help your woods bounce back.
- Proactively manage your forest for future conditions.

MONITORING

- Monitor your woods and the effect of different management tactics.

High Forest Complexity

*“Promoting forests that have a **diversity of tree species**, ample tree **regeneration of future-adapted species**, vigorous **trees of various sizes and ages**, a **variety of tree arrangements**, and an appropriate amount of **deadwood** gives forests a complex structure and helps them **withstand and recover from stressors**”*

Catanzaro, Paul & D'Amato, Anthony, & Huff, Emily. (2016). Increasing Forest Resiliency for an Uncertain Future

Birds



Climate



Forest/Habitat Component	Bird Habitat	Climate Change vulnerability and risk, adaptation options
Canopy/Overstory	Height Cover Distribution	Species Diversity <ul style="list-style-type: none"> species diversity proportion at-risk trees Structural Diversity <ul style="list-style-type: none"> canopy height percent cover and distribution Forest Health <ul style="list-style-type: none"> tree vigor pests/pathogens Carbon <ul style="list-style-type: none"> Wood volume
<u>Midstory</u>	Cover Distribution Type	Species Diversity <ul style="list-style-type: none"> species diversity proportion at-risk trees Structural Diversity <ul style="list-style-type: none"> canopy height percent cover and distribution Forest Health <ul style="list-style-type: none"> tree vigor pests/pathogens
Understory and Regeneration	Cover Distribution Type	Structural Diversity <ul style="list-style-type: none"> percent cover and distribution Stressors <ul style="list-style-type: none"> location and percent cover of invasive vegetation deer browse Regeneration <ul style="list-style-type: none"> Seedling abundance Seedling species diversity Proportion of at-risk trees
Habitat Features	<ul style="list-style-type: none"> Soft Mast Non-native invasive Leaf Litter 	Soft mast
Site Features	Snags	infrastructure

Stand Description Narrative Requirements

Forest/Habitat Component	Bird Habitat	Climate Change vulnerability and risk, adaptation options
Habitat Features	<ul style="list-style-type: none"> Soft Mast Non-native invasive Leaf Litter 	Soft mast
Site Features	Snags	infrastructure
	<ul style="list-style-type: none"> Adequate/not adequate Coarse Woody Material <ul style="list-style-type: none"> Count of pieces Fine Woody Material <ul style="list-style-type: none"> Adequate/not adequate 	<ul style="list-style-type: none"> Erosion and soil disturbance Culverts or other structures Water quality <ul style="list-style-type: none"> Steep slopes Filter strips Risks due to increased precipitation or storm events Operability Snags <ul style="list-style-type: none"> Adequate/not adequate Carbon <ul style="list-style-type: none"> Coarse Woody Material Count of pieces
Climate Vulnerability		1) Identification of key climate risks 2) Overall evaluation of how vulnerable the stands are to climate change and related stressors in the near (<20 years) and long (50+ years) term [and carbon connections]

Stand Description Narratives – What's New?

Canopy

Describe the Diversity of:

- **SPECIES** – proportion of at risk trees?
- **STRUCTURE** – what is the canopy height and what is the percent cover and distribution?

What is the forest health of the forest canopy – tree vigor? – Any pests or pathogens?

Sample Family Climate Stewardship Plan:

“Hemlock and white pine *dominate* with lesser numbers of RM, WO, RO, PP, BB, WA, SM, BC”” Of the three stands on the property, **climate risks** are highest in this stand, which is also the largest stand by size.” (St-1)

“**Canopy closure** is about 80% with dappled light reaching the forest floor and a canopy height near 60’.” (St-2)

“Approximately 70% of the trees in this stand are AGS (acceptable growing stock), with full crowns and good **vigor**.” (St-2)

“The **health** of the hemlocks is impacted by two invasive insects, as hemlock scale is widespread in this stand and hemlock woolly adelgid is found where the scale is not.” (St-1)

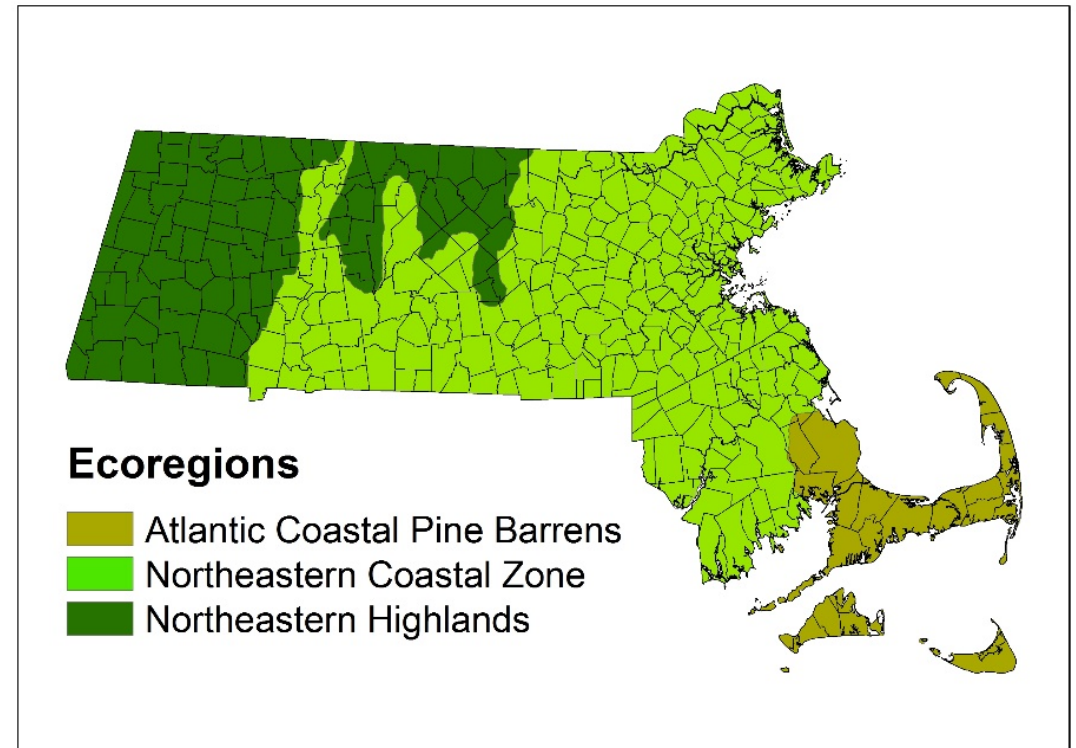
Estimating Forest Carbon Stocks

- Purpose – provide land owners with a general sense of how much carbon their forest stores
- Approach – relate carbon to basal area
- Limitations – not precise enough for carbon offset sales
- Resources –
 - [Forest Carbon: An essential natural solution to climate change](#) – *existing*
 - [Caring for Your Woods: Managing for Forest Carbon](#) - *existing*
 - **Estimating Carbon for Forest Stewardship Plans** – *available now*
 - [EPA Greenhouse Gas Equivalencies Calculator](#) - *existing*
 - **Managing Forests for Carbon Benefits in Massachusetts** - *forthcoming*



Carbon stocks estimated by basal area

- Carbon in trees is a function of wood volume and density
- In Massachusetts forests, volume relates strongly to basal area
- In U.S. Forest Service FIA data, basal area explains 80-90% of variation in estimated carbon stocks in live and dead trees within ecoregions



Northeastern Highlands

Predicted Live Tree Carbon Stock by basal Area

BA (ft ² /ac)	C Prediction (ton/ac)
0.0	0.0
10.0	3.2
20.0	6.5
30.0	9.7
40.0	12.9
50.0	16.2
60.0	19.4
70.0	22.7
80.0	25.9
90.0	29.1
100.0	32.4
110.0	35.6
120.0	38.8
130.0	42.1
140.0	45.3
150.0	48.6
160.0	51.8
170.0	55.0
180.0	58.3

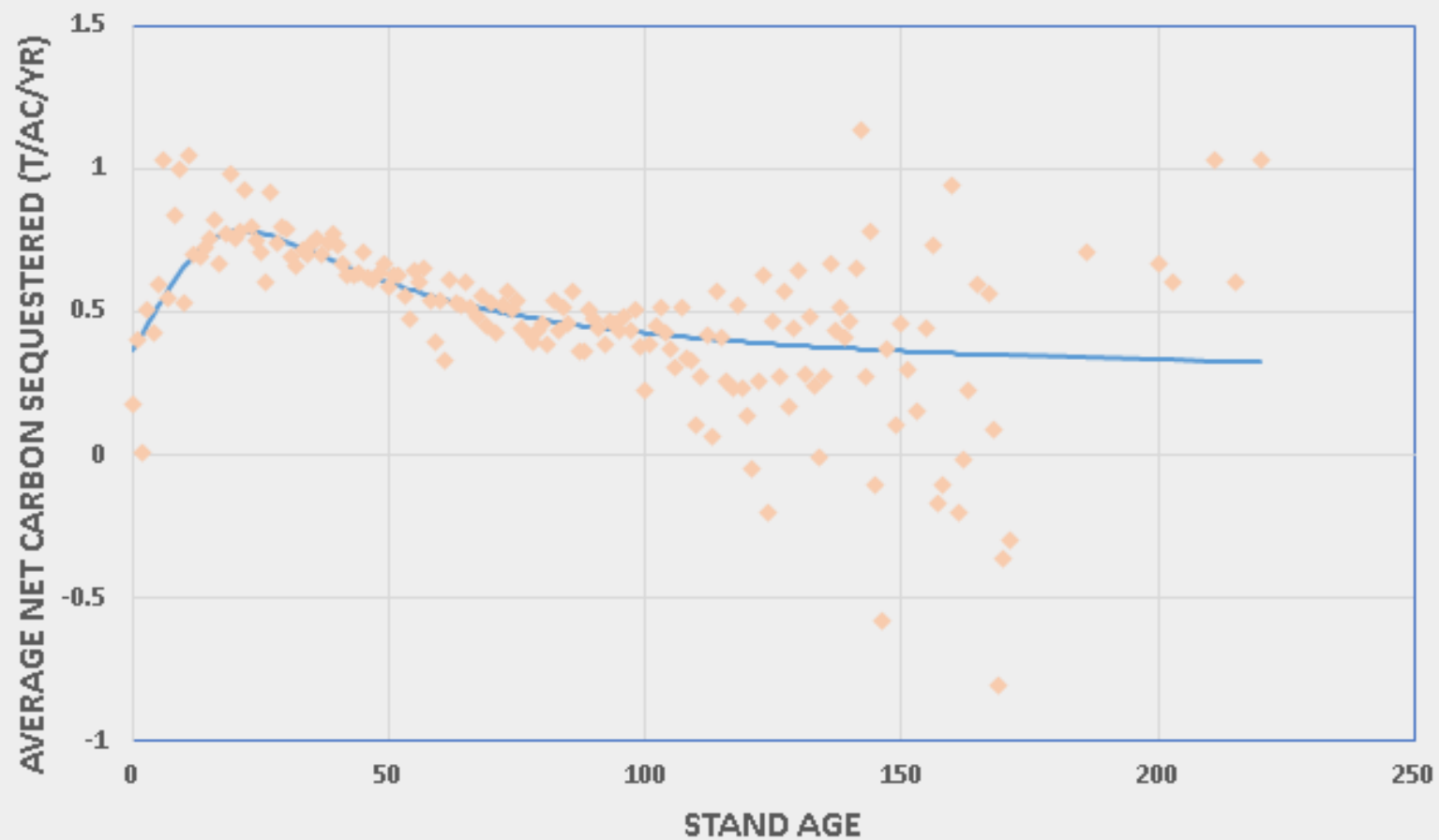
Percentile Live Tree Carbon stocks in Northeastern Highlands by Basal Area

Percentile	BA (ft ² /ac)	C Prediction (ton/ac)
0	0.0	0.0
1	22.1	7.2
2	39.9	12.9
3	52.9	17.1
4	59.2	19.2
5	66.3	21.4
10	78.5	25.4
15	92.1	29.8
20	102.1	33.0
25	109.7	35.5
30	114.4	37.0
35	121.2	39.2
40	126.6	41.0
45	133.7	43.3
50	140.4	45.4
55	145.8	47.2
60	153.3	49.6
65	159.3	51.6

AVERAGE NET CHANGE IN CARBON SEQUESTRATION RATES OVER TIME IN MASSACHUSETTS FORESTS

◆ Average sequestration rate for stands of a given age

— Trend of sequestration rate with stand age



Stand Descriptions – Canopy Continued..

Carbon

Described broad strategies and actions to maintain or increase carbon benefit. These can include strategies that benefit sequestration, storage, or both, with specific actions detailed in stand descriptions.

The Sample Family Climate Stewardship Plan

“(ST-1) This strategy would sustain some carbon stock losses in the short-term, but increase sequestration and create the conditions for higher carbon stocks in the long-term.”

“This stand (ST-2) also has the highest current carbon stocks, and is likely to maintain or increase carbon sequestration rates in the future as the growing season lengthens.”

“Carbon stocks are somewhat low in this stand, as a result of past disturbance. However, the more variable structure is a positive for carbon sequestration rates.”

Stand Descriptions Continued

Midstory

Describe the Diversity of:

- **SPECIES** – proportion of at risk trees?
- **STRUCTURE** – what is the canopy height and what is the percent cover and Distribution?

What is the forest health of the midstory canopy – tree vigor? Any pests or pathogens

The Sample Family Climate Stewardship Plan

“The midstory density is fair. HK, BB, RM WP”(St-1)

“The overstory White Pine is healthy, Hemlock has elongate scale and woolly adelgid “(St-1)

“Mid-story density is low due to the last thinning where many of the suppressed trees were removed. Remaining stems are straight with vigorous crowns. About 60% of the trees are considered **at-risk** for climate change.” (St-1)

Understory and Regeneration

- **Structural Diversity**– what is the percent cover and distribution
- **Stressors**– location and percent cover of invasive vegetation
- **Stressors -Deer browse**
- **Regeneration** – seedling abundance, species diversity, - what is the proportion of at risk trees?

Sample Family Climate Stewardship Plan

Structural Diversity “The understory density and distribution in this stand is currently fair. “(St-1)

Stressors “The invasive plants multiflora rose, Asiatic bittersweet, and Japanese barberry were also found in small amounts throughout this stand – <10% of the area, but dense where present.” (St-1)

Deer Browse “There is heavy deer browse on oak, while herbivory is having less of an impact on other species, such as black birch and maples.” (St-1)

Regeneration “Regeneration of hemlock and white pine, established after the last harvest, is abundant in some areas.” Seven tree species were listed in this layer.

“Approximately 50% of the understory is made up of at-risk species” (St-1)

Stand Descriptions Continued

Site Features

- **Infrastructure – erosion and soil disturbance (roads, stream banks), are there culverts or other structures?**
- **Water quality – are there steep slopes? what is the condition of the filter strips?**
- **Are there **risks** due to increased precipitation or storms events to the infrastructure?**
- **Describe the operability of the site**
- **Snags – adequate/not adequate?**

The Sample Family Climate Stewardship Plan

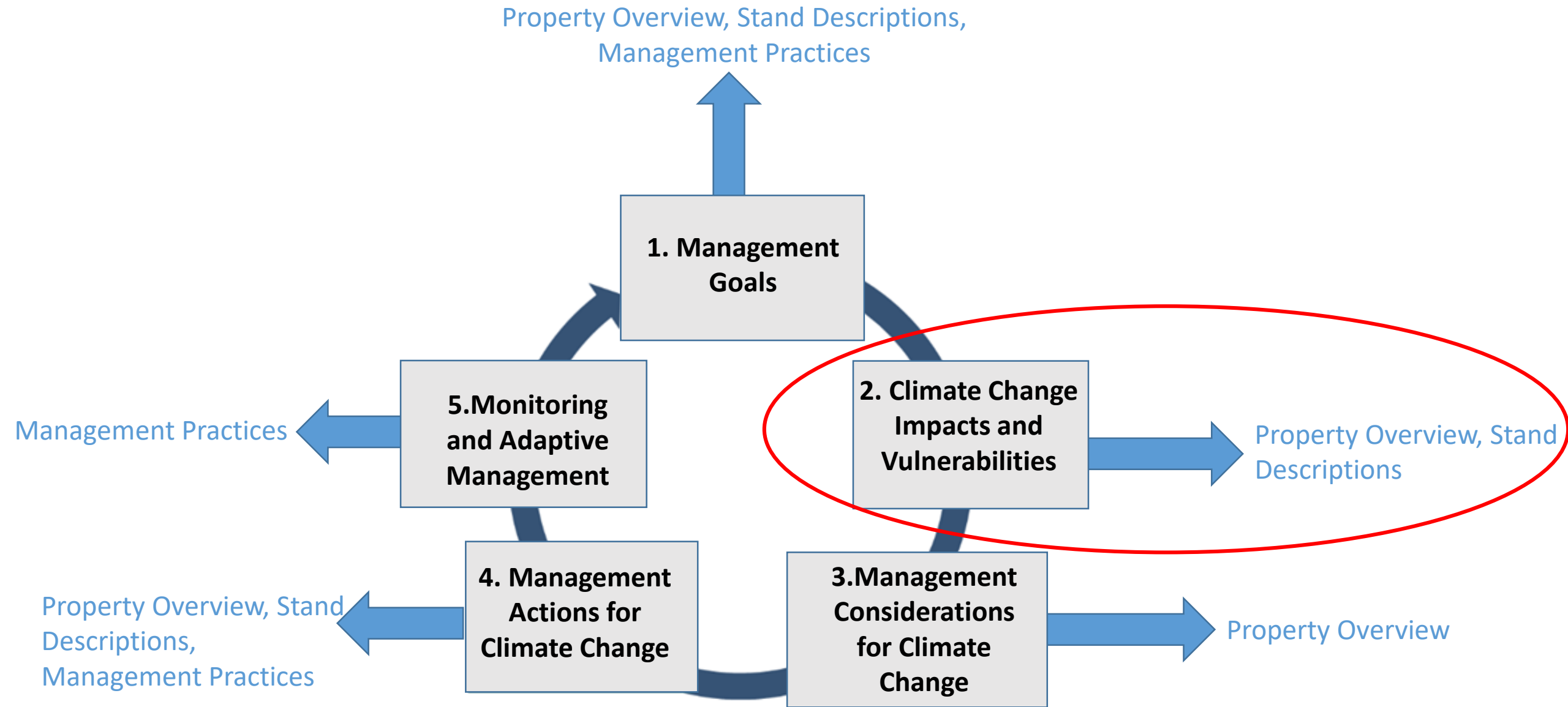
Infrastructure: Erosion is not currently a concern

Water Quality/Filter Strip “..this stand is quite flat
“...“Hemlock is concentrated along the stream and is an important feature, maintaining shade, habitat value, and scenic value.” (St-2)

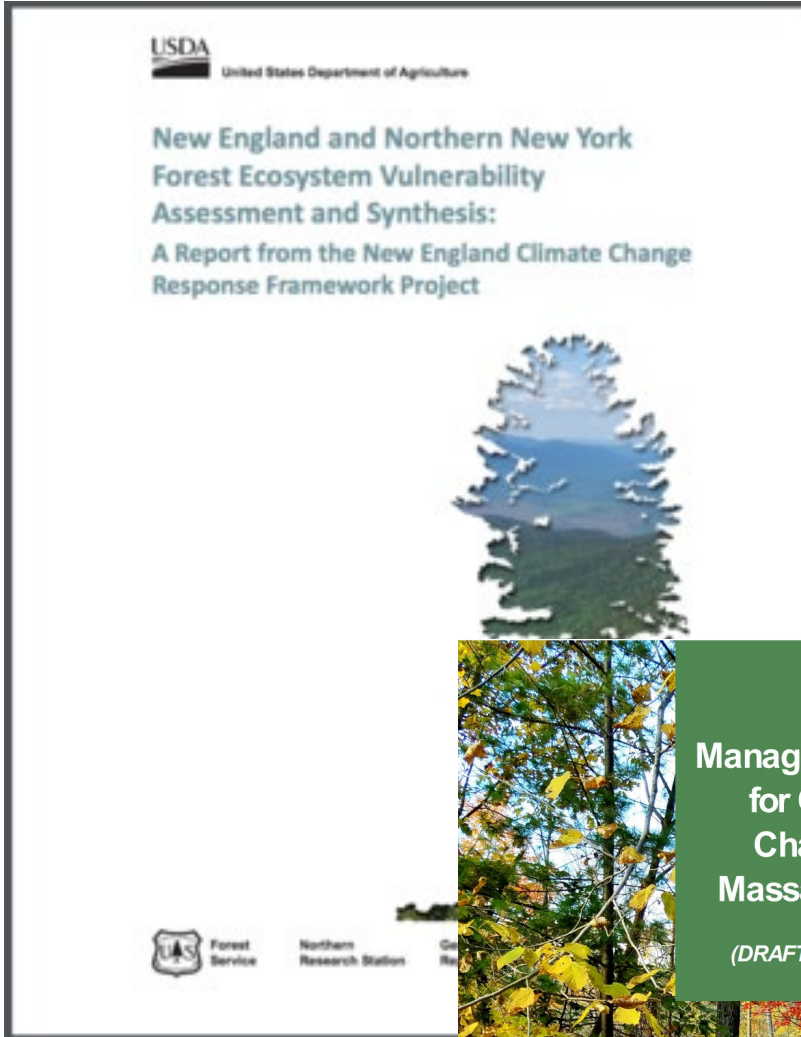
Risks to Water Quality “the shaded stream corridor that keeps the water cool and provides good habitat for fish and other aquatic species is at risk of becoming somewhat less shaded if the hemlocks and conifers present along its banks decline.”

Risks due to increased precipitation to infrastructure

“The stream has a braided channel and shows signs of moving throughout the flatter areas of the stand. Increased storm events will probably increase the movement of the stream. Management of the stand will become more challenging without frozen soil conditions. The Sample family has 2 small footbridges and is concerned about flooding and the movement of the stream channel”



Climate Change Impacts and Vulnerabilities – An Assessment



- Elevated drought risk
- Increases in extreme precipitation events
- Increases in storm frequency and intensity
- Increases in insect pests and forest pathogens
- Elevated risk of wildfire
- Increasing impact of herbivory
- Increases in invasive plants
- Reduced habitat for some northern tree species
- Increased habitat for some southern tree species
- Higher sea levels
- Shorter duration of frozen ground conditions
- Altered hydrology in streams or wetlands

Climate Vulnerability – Stand Descriptions

- Identify the key **climate risks**
- Discuss your overall evaluation of how vulnerable the stand is to climate change and discuss the related stressors in the **near (<20 years) term** and **long term (50 + years)**
- **Carbon Connections**

Sample Family Climate Stewardship Plan

“Of the three stands on the property, **climate risks** are highest in this stand, which is also the largest by far.” (St-1)

“In the **near term**, conditions are more dire for hemlock as **invasive hemlock scale** (along with some hemlock woolly adelgid) is widespread “ (St-1)

“**There is heavy deer browse on oak regeneration.**” (St-1)

“Although currently robust, **white pine is also projected to decline** over a **longer** timeframe.”

Carbon stocks are somewhat low in this stand, as a result of past disturbance. However, the more variable structure is a positive for carbon sequestration rates. Drier soil conditions may negatively impact both carbon stocks and sequestration rates for tree species susceptible to drought. (St-3)

Climate Vulnerability-Continued

- **Describe adaptation options**

Adaptation Options:

“A passive approach will likely lead to an increasing amount of dead hemlock and ultimately other species....”

“Active management could help reduce mortality and shift the species composition of the stand to include a greater component of hardwoods (especially oaks and hickories) with better climate adaptation capacity, while still retaining a large amount of pine and retaining hemlock”

Desired Future Condition

Desired Future Condition of the Stand:

describe the species, age class distribution, future product potential, anticipated ecological attributes, and other stand characteristics expected for the stand based on current condition and anticipated management practices.

The Sample Family Climate Stewardship Plan

The DFC is an uneven-aged mix of good quality, native trees and shrubs. The desired composition includes a higher percentage of oaks and hickories while still retaining a large amount of pine and as much hemlock as possible.

A harvest which continues to create canopy gaps and enlarges gaps created during past management will move this stand toward a more uneven-aged condition with a higher stand complexity, which is an important strategy for many of our responsibility birds as well as climate adaptation and mitigation.

Compare Stands at a Glance

Prioritize *Actions by Risk*

Forest Stand Summary

For the purposes of this report a forest stand is an easily defined area that is relatively uniform in composition and structure.

Stand	Acres	Forest/Habitat Type	Important Observations regarding Bird Habitat, Climate Change, Carbon Or Unique Features and Attributes	Climate Risk	Carbon/Acre
1	61	White Pine – Hemlock	<p>Variable topography</p> <p>Conifers - an important habitat feature, hemlock stands favored by black-throated green warbler. Some soft mast species.</p> <p>Abundant conifer regeneration, but oaks impacted by deer browse.</p> <p>Coarse woody debris, leaf litter, and nesting cavities enhance habitat</p> <p>Hemlock experiencing health issues - both hemlock and white pine have poor adaptation capacity.</p> <p>Soils are susceptible to drought</p>	Moderate to High – due to species composition, droughty soils, and topography	34.6 t/ac
2	11.3	Oak – Hardwood	<p>Stream buffer area with scenic waterfall; flatter than other stands</p> <p>Hemlocks in stream buffer are an important habitat feature</p> <p>Emerald ash borer expected to kill most white ash (minor component)</p> <p>Oaks and hickories provide hard mast for wildlife. Good coarse and fine woody debris, and leaf litter.</p> <p>Invasive plant presence higher than Stand 1, but lower than Stand 3</p>	Low to Moderate – except concerns near stream buffer	51.9 t/ac

Are your woods at risk?

Climate change will not affect all forest species, communities, and parts of the landscape in the same way. Your woods have unique conditions – factors such as soil type, elevation, slope, and past land use history – that may make it more or less vulnerable to changing conditions. A forester can help you understand how climate change and other stressors may affect your woods – and what you can do about it.

Increases in extreme precipitation events: Extreme precipitation events are becoming more common and can lead to flooding, soil erosion, and sedimentation.

Increases in storm frequency and intensity: Climate change may increase the intensity, scope, or frequency of weather events such as windstorms and ice storms.

Elevated drought risk: Warmer temperatures and altered precipitation patterns can increase risk of drought and associated tree mortality.

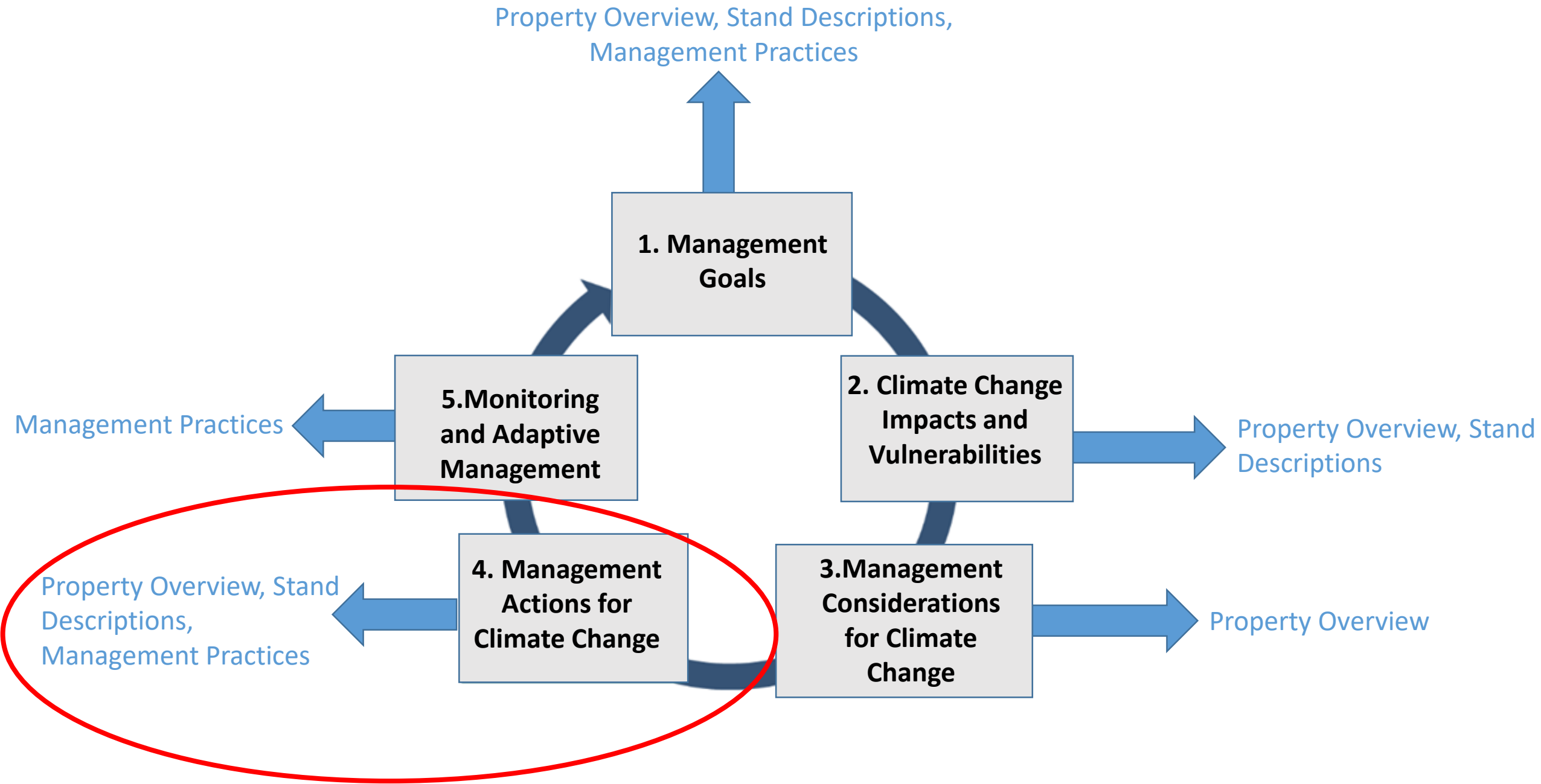
Increasing occurrence of wildfire: More frequent days with weather conditions suitable for fire, plus increasing fuel loads due to other disturbances, may increase the risk of wildfire.

Increases in insect pests and forest pathogens: Insect pests like hemlock woolly adelgid and southern pine beetle can expand their range northward under a warmer climate.

Increases in invasive plants: Invasive species will benefit from warmer temperatures and longer growing seasons, affecting forest growth and composition.

Reduction in tree species habitat: Some tree species in Massachusetts are projected to have reduced habitat suitability, including red spruce, eastern hemlock, and eastern white pine.

Rising sea levels: Sea levels will continue rising, and intensifying coastal storms may increase coastal forest dieback and replacement with salt marshes.



Adaptation Actions

This activity is from Step 4 “Management Actions for Climate Change” in your Forester Guide

Management Goals or Objectives	Adaptation Action	Benefits, Drawbacks, and Barriers
Promote a diversity of tree ages and sizes - Unevenaged stand with higher stand complexity	Create more gaps in some cases larger gaps <ul style="list-style-type: none">- Group Selection- Expanding gap	Diverse species mix that comprise vertical layers in the canopy improves bird habitat and promotes climate resiliency
Prevent and control invasive plants	Control invasive plants	Will incur a cost, but with cost share assistance the project is feasible Requires multiple treatments
Manage damage to young trees from excessive deer browsing	Identify high quality tree seedlings for retention utilize tree shelters Increase deer control through hunting Utilize post-harvest tree tops to prevent browsing	Utilizing tree shelters will incur a cost and they require monitoring and maintenance – project would be feasible with cost share Post-harvest top retention may restrict access for walking

Management Practice Narratives – What's New?

Help the landowner understand the practices recommended with explanation of technical terminology

Practices should relate to the landowner's goals to help them understand why a particular practice is recommended

Required for Bird Habitat and Climate plans. This narrative should describe the desired future condition and management actions that will help achieve those conditions. Also describe benefits to bird habitat, climate change, and forest carbon as applicable to the plan type and forest

- Desired Condition – Describe desired characteristics for the future condition of the forest.
- Management Action – Describe the management recommendation(s) that will achieve the desired condition.
- Benefits – Summarize key benefits on the following items to reflect landowner goals.
 - o Bird Habitat and Responsibility Birds – List Responsibility Birds or habitat features that would be expected to benefit. See resources below.
 - o Climate Change Adaptation – Describe how the management actions reduce climate risks, enhance resilience, and/or enable forests to adapt to anticipated future conditions.
 - o Forest Carbon – Identify how management influences short- and long-term carbon sequestration and storage, including both enhancement of carbon and/or reducing risk of carbon loss.
- Barriers can be physical, time, cost, etc

Management Practice Narratives

Desired Condition – describe the desired characteristics for the future condition of the forest

Management Action – Describe the management recommendation that will achieve the desired condition

Benefits – Summarize the key benefits on the following items to reflect the landowner goals:

Climate Change Adaptation - Describe how the management actions reduce climate risks, enhance resilience, and/or enable forests to adapt to anticipated future conditions.

Forest Carbon – Identify how management influences short- and long-term carbon sequestration and storage, including both enhancement of carbon and/or reducing risk of carbon loss.

Barriers can be physical, time, cost, etc

Sample Family Climate Stewardship Plan

Desired Future Condition: Larger canopy openings help increase oak and hickory in addition to retaining pine and hemlock

Management Action: A harvest which continues to create canopy gaps and enlarges gaps created during past management will move this stand toward a more uneven-aged condition with a higher stand complexity, which is an important strategy for many of our responsibility birds as well as climate adaptation and mitigation.

Benefits Adaptation: Shifts composition towards a higher % of species and varied structure better adapted to future conditions

Benefits Carbon: Short- term reduction; long term gain

Management Recommendations

For the purposes of this report, management practices with an object code of *CH61* are required to be accomplished as a commitment to the Massachusetts Current Use Program. Practices with object codes of *STEW* are voluntary and are provided as suggestions of activities that can help you achieve your woodland objectives.

Summary of the Management Recommendations for your property

ST#	Obj Code	Desired Condition	Management Action	Benefits			Value/Cost/Cost Sharing Opportunity
				Bird Habitat & Focal Birds	Climate Change Adaptation	Forest Carbon	
1	STEW	Larger canopy openings help increase oak and hickory in addition to retaining pine and hemlock	Group & single tree Selection harvest; (NRCS practice = Forest Stand Improvement)	Canopy openings benefit birds and other wildlife species	Shift composition towards a higher % of species and varied structure better adapted to future conditions	Short-term reduction; long term gain	Likely net \$ gain; eligible for NRCS EQIP practices 655, 666
2	STEW	Canopy openings favor healthy trees and create a new age class; stream corridor protected	Single tree & group selection harvest	Canopy openings benefit birds and other wildlife species	Shift composition toward species and varied structure better adapted to future conditions	Short-term reduction; long term gain	Likely net \$ gain; eligible for NRCS EQIP practices 655, 666

The Landscape view option may offer the most space

Management Recommendation Summary Chart

Object Code – actions with an object code *CH61* are required to be accomplished as a commitment to the Massachusetts Current Use Program. Practices with object codes of *STEW* are voluntary and are provided as suggestions of activities that can help landowners achieve their objectives

Desired Condition –future condition of the forest such as even-aged or uneven-aged

- Management Action – silvicultural recommendation or action such as invasive species removal

- Benefits
 - Expected Result of management – summarize key benefits on the following items. Bird Habitat and Responsibility Birds – List Responsibility Birds or habitat features that would be expected to benefit. See resources **page XX**.
 - Climate Change Adaptation – Describe how the management actions reduce climate risks, enhance resilience, and/or enable forests to adapt to anticipated future conditions.
 - Forest Carbon – Identify how management influences short- and long-term carbon sequestration and storage, including both enhancement of carbon and/or reducing risk of carbon loss.
- Barriers can be physical, time, cost, etc

Combined Climate-Smart Practices List

The 14 forest management practices below come from two sets of meetings of landowners, foresters, academics, loggers, land trusts, state and federal agency staff, and regional planners in New England in 2020-2021.

By definition, climate-smart practices have both carbon benefits (across varying time frames) and help to climate change. However, we’ve indicated the primary focus (carbon or adaptation) of the process for each practice below. This list is current as of January 2022.

A = Practices from the Massachusetts Forest Climate Resilience Program pilot, designed to help forests adapt to climate change. Practice development was led by Massachusetts Audubon and the Northern Institute of Applied Science, along with many stakeholders.

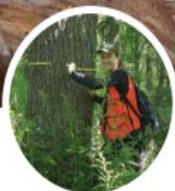
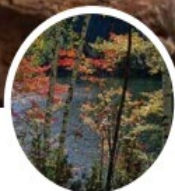
C = Practices from the Natural Climate Solutions Accelerator grant project in Massachusetts and Vermont, designed to increase forest carbon stock within 20 years. Practice development was led by The Nature Conservancy and the Northern Institute of Applied Science, along with many stakeholders.

A New Climate Practice Resource Guide

Active management		
Creating gaps to promote regeneration	C	Balance creation of gaps to promote regeneration with retention of existing carbon stocks when forests are undergoing harvests. For example, retain a minimum number of large-diameter live trees, snags (see NEFF’s Exemplary Forestry standards), and live-but-dying trees (future snags), and limit gap creation to no more than 20% of the parcel.
Retaining more carbon in a thinning	C	Limit the removal of trees in <u>thinnings</u> to retain large-diameter live trees, snags, and species diversity. For example, set aside between 25-50% of the stand as unharvested (retention) areas, and thin to partway between the A and B lines on a stocking chart, maintaining tree diameter.
Enhance adaptive capacity in forests (Resilience)	A	This practice is designed to improve the health and function of the current native forest vegetation in response to climate change. Silvicultural activities under this practice are designed to (1) reduce the impact from current and future stressors and disturbances, (2) diversify forest conditions to increase the capacity for adaptive responses, and (3)
		promote future-adapted regeneration of the current native plant community when forest regeneration (i.e., initiation of a new age cohort) is a desired outcome.
Facilitate forest transition to better match future conditions (Transition)	A	This practice is designed to facilitate transitions in forest communities toward assemblages that are expected to be better adapted to future conditions and support anticipatory adaptation where climate change is expected to exceed the capacity of the existing forest community to cope with climate change impacts and associated stressors (e.g., highly vulnerable or impacted systems).

Healthy Forests for Our Future:

A Management Guide to Increase Carbon Storage in Northeast Forests



The Nature
Conservancy



Climate-smart forest management practices

Protect forests

1. Avoid forest loss

Grow new trees and forests

2. Green developed areas
3. Reforest
4. Plant trees to increase forest stocking

Reduce stressors

5. Remove invasive vegetation
6. Protect seedlings and saplings from deer browse

Manage forests

7. Increase time between harvests
8. Establish forest reserves
9. Create gaps to promote regeneration
10. Retain more carbon in a thinning

Our hope is that within this list you will find practices that provide climate benefits and fit your forest goals for carbon storage and other values. We recognize that you might want to manage your forest in a way that decreases carbon stocks in the short term, for example to meet a financial need, to produce a certain type of wood product, or to provide habitat for a particular species that interests you. If climate benefits are among your most important goals, *Healthy Forests for Our Future* can help you shape your future forest.

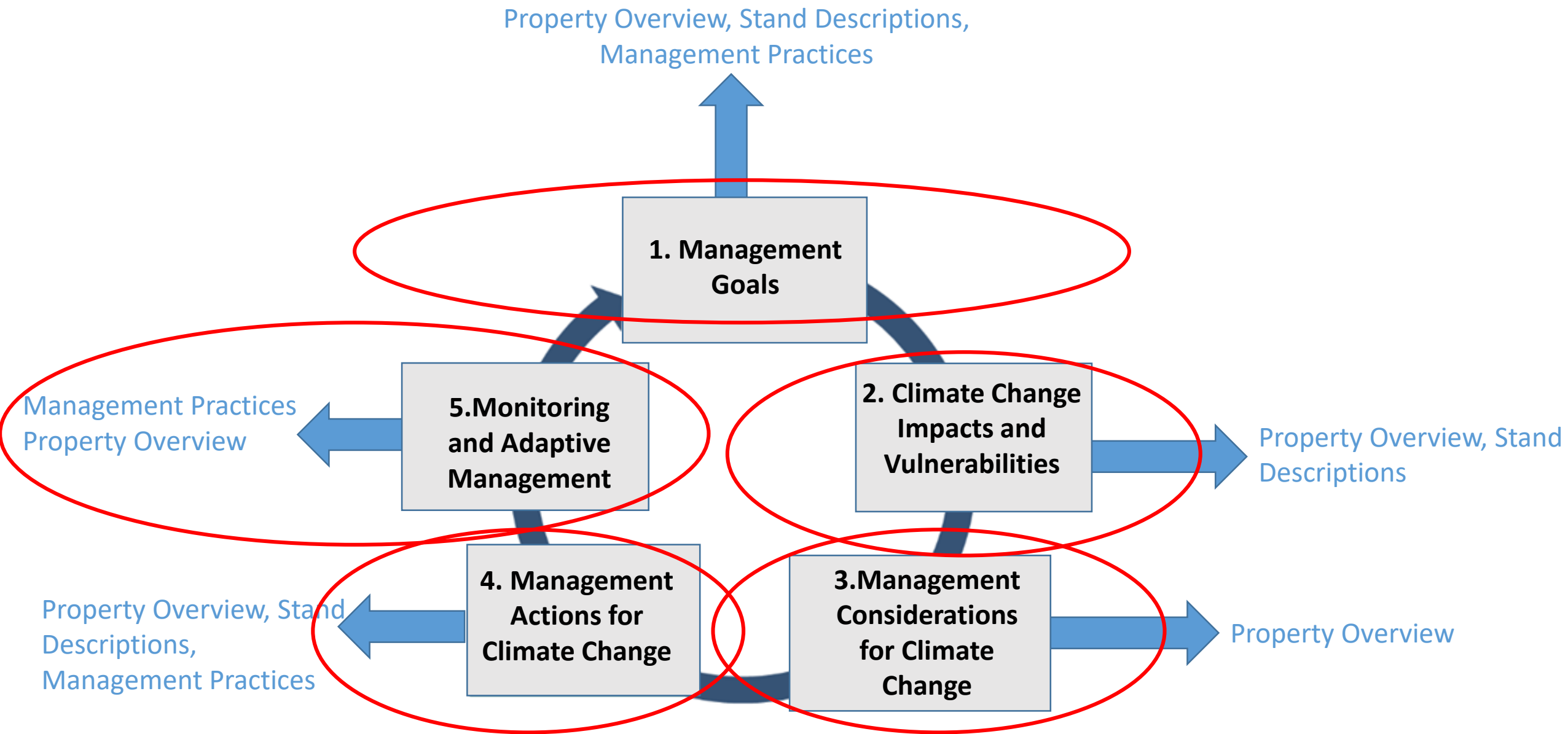
Monitoring and Adaptive Management

Adaptation Step 5

This is a good chance for landowner participation

Monitor:

- Condition of the hemlocks
- Regeneration- deer impacts, success or failure post harvest
- Invasive plant spread



Property Overview – What's New

For Climate plans, include a Climate (or Climate Change and Carbon) section that includes the following items:

- Climate Change Impacts and Vulnerabilities: Provide a description of climate change impacts and associated property-level vulnerabilities that are expected over the next 50+ years for all major forest communities that are present on the property. See [Forester Guide Document pages 7-9] for a summary of climate impacts and additional resources. These may include items such as: extreme rainfall, storms, altered seasonality, drought stress, and tree species changes.
- Climate Change Challenges and Opportunities for Management: Based on expected climate change impacts and vulnerabilities for the property identify:
 - Major climate change challenges and opportunities with regards to management objectives, including situations where climate change may create significant barriers to achieving the landowners' goals. [Forester Guide Document pages 15-16]
 - Potential effects, positive or negative, of climate change impacts on forest carbon—with more robust discussion when the landowner identified this as a management goal. [Forester Guide Document pages 16-19]
 - The general management approach, to resist climate change, build ecosystem resilience, and/or help transition forests toward future conditions. Include management actions or reason for management approach to aid landowner understanding [Forester Guide Document pages XX]

- Carbon Storage and Sequestration Opportunities: (In climate plans with carbon goals identified)
 - Estimation of existing forest carbon stocks. [Estimating Carbon for Forest Stewardship Climate Plans Document]
 - The carbon estimation document provides tables (one for live trees and one for dead trees within each ecoregion) relating carbon stocks in metric tons per acre (t/ac) to basal area in square feet per acre (ft²/ac). These tables can be used to estimate carbon stocks for your Forest Stewardship Climate Plan.
 - Description of potential carbon sequestration and any significant barriers to continued carbon benefits into the future.
 - The carbon estimation document provides a graphic representation of how sequestration rates change in relationship to stand age [Estimating Carbon for Forest Stewardship Climate Plans Document]
 - Include qualitative discussion of other carbon pools, such as downed woody debris, forest floor, or soil carbon.
 -

Described broad strategies and actions to maintain or increase carbon benefit. These can include strategies that benefit sequestration, storage, or both, with specific actions detailed in stand descriptions. Include whether afforestation and agroforestry may take place to meet carbon and other landowner goals.

Property Overview Tell the Story

Highlight the most **important landowner goals** and the activities/management recommendations that will be employed to meet them **STEP 1 OF ADAPTATION PLANNING**

Describe the “Climate Change Impacts and property level Vulnerabilities” expected over the next 50 years for all major forest communities on the property (**Step 2 Adaptation Planning**)

Challenges and Opportunities (Step 3 Adaptation Planning) -From your determination of expected impacts and vulnerabilities – **identify:**
Challenges and opportunities regarding the landowner management objectives
Effects of climate change impacts on forest carbon (positive or negative effects)
General management approach? – resist, resilience or transition? –Include the management actions or the reason for the management approach to help the landowner understand

“Many of the Samples’ **goals** relate to creating a healthy, resilient forest, which is the foundation of adapting the forest to anticipated climate change. Their identified goals would ensure that the forest both sequester and store carbon over time.”

Populations of key herbivores will be affected

“Deer browse is already observed to be heavy on oak seedlings....”

Challenges

“Managing the forest, largely stocked with species projected to have poor climate adaptation capability, presents a significant challenge.”

Opportunities

“Since red oak, hickories, and other hardwoods are a secondary component of the property, this provides an opportunity for the Sample family to experiment with silvicultural strategies.”

FOR CLIMATE PLANS WITH CARBON STORAGE AND SEQUESTRATION GOALS

Estimation of existing forest carbon stocks. The carbon estimation document provides tables relating carbon stocks in metric tons per acre (t/ac) to basal area in square feet per acre (ft²/ac). **These tables can be used to estimate carbon stocks for your Forest Stewardship Climate Plan.**

“The Sample’s forest currently stores more than an estimated 2800 metric tonnes of carbon, an amount equivalent to the CO₂ emissions released from burning 1.1 million gallons of gasoline. “

Description of **potential carbon sequestration** and any significant barriers to continued carbon benefits into the future. The carbon estimation document provides a graphic representation of how sequestration rates change in relationship to stand age

“...the Sample’s have an opportunity to increase long-term carbon storage and overall sequestration by continuing active management...”

Include qualitative discussion of **other carbon pools**, such as downed woody debris, forest floor, or soil carbon.

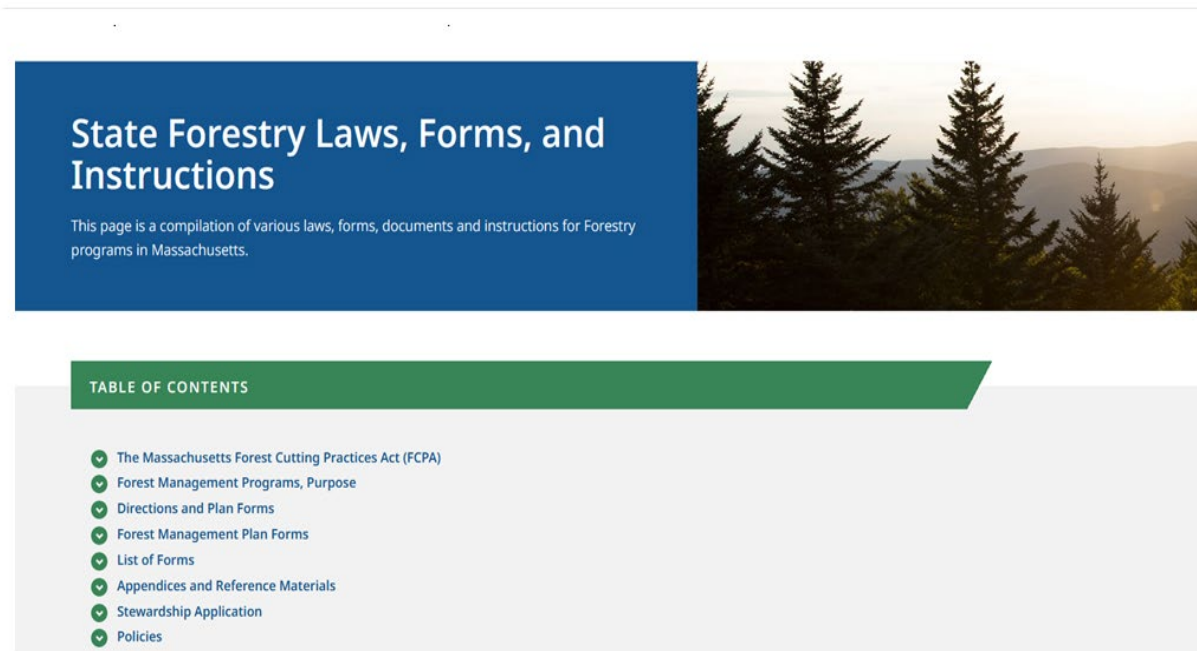
“The soil carbon pool is one of the largest pools in the forest ecosystem. The soil carbon will be protected during timber harvesting by ensuring that the soil is in a stable condition”

Describe **broad strategies** and actions to **maintain or increase carbon benefit**. These can include strategies that benefit sequestration, storage, or both, with specific actions in descriptions.

While periodic harvests will lead to short-term carbon loss, this strategy will aim to regenerate species projected to grow well in the future and maintain an overstory of healthy trees needed to meet both storage and sequestration goals.

Other New Resources – DCR Website with a new URL

<https://www.mass.gov/info-details/state-forestry-laws-forms-and-instructions>



It has a table of the forms just like in the directions

Forms Reference Table

Name of Form	Required for:			
	61/61/61B	Stewardship	Bird Habitat	Climate
Cover Page				
How to use this Report			X	X
Property Information Form	X	X	X	X
Property Information Form Overflow				
Landowner Goals Form		X	X	X
Property Overview, Regional Significance, and Management Summary		X	X	X
Stewardship Issues: No longer required <i>Replaced by Caring for your Woods series</i>				
Stand Summary Table (link)			X	X
Stand Descriptions Form	X	X	X	X
Management Summary Table (link)			X	X
Management Practices Form	X	X	X	X
Signature Page	X	X	X	X
Certificate for Chapter 61/61A/61B Forest Lands	X			

Forester Certification Program

In order for foresters to be eligible to conduct field inventory and prepare a written Climate Forest Stewardship Plan under the DCR Climate Forestry Program, a forester will need to be certified by demonstrating a base knowledge of the Climate Stewardship Plan requirements, the methods and procedures for conducting a climate impacts and adaptation/carbon assessment and demonstrating the appropriate level of detail in a written Climate Stewardship Plan.

Certification Procedure

- 1) Attend 1 DCR sponsored classroom/field training led by Massachusetts Audubon, DCR staff, and trained experts.
- 2) Conduct a field visit and prepare a written Climate Stewardship Plan jointly with a Massachusetts Audubon Climate Specialist: climateforestry@massaudubon.org
- 3) Individually conduct a field visit and prepare a written Climate Stewardship Plan to be reviewed jointly by DCR service forester and a Massachusetts Audubon ornithologist

Once the training has been completed the forester may apply for Climate Stewardship funds from DCR. The first complete Climate Stewardship Plan will be reviewed by DCR and Mass Audubon.

Adams
Ashfield
Charlemont
Cheshire
Clarksburg
Conway
Hawley
Heath
Leyden
Monroe
New Ashford
North Adams
Peru
Rowe
Shelburne
Williamstown
Windsor

**Application for Working Forest Initiative Cost-Share MUST BE APPROVED
PRIOR TO SUBMITTING COMPLETED PLAN TO DCR**

When applicable—cost-share reimbursement rates for Foresters for the Birds or Climate Forestry or combining Climate Forestry and Foresters for the Birds are “in addition to” NEW cost-share reimbursement rates.

For example, a landowner with a 100-acre property that is not currently enrolled in Forest Stewardship or Chapter 61, 61A or 61B programs and is wanting a NEW plan with Climate and Birds would be eligible to receive:

$\$910 + \$13/\text{acre over } 36 \text{ acres} = \$1,742 \text{ plus } \$1,200 \text{ (Climate \& Birds) for a total of } \$2,942$