Climate Change Adaptation Plan

Black Ash Management

April 12, 2017

Prepared by Les Benedict

Prepared using the Adaptation Workbook - AdaptationWorkbook.org

Property details

Ownership: State

An examination of climate change impacts to a black ash management project that was conducted in partnership between the Saint Regis Mohawk Tribe and State and Federal and academic agencies.

Climate Adaptation Plan	**Black Ash Management**
Project Details	State ownership An examination of climate change impacts to a black ash management project that was conducted in partnership between the Saint Regis Mohawk Tribe and State and Federal and academic agencies.
Management area(s)	**Lowland and riparian forest**
Regional Climate Change Impacts & Property-Level Considerations	The following climate change impacts are regional expectations drawn from published resources. Under each regional climate change impact statement, property-level considerations describe how the general trend might be meaningful at the scale of the property. **Temperatures in New England are projected to increase 3.5 to 8.5 °F by the end of the century, with the greatest warming expected to occur during winter.** Property considerations: Warming could result in early leaf out and early flowering. The leaves and flowers will be susceptible to frost damage were a sudden cold snap to occur following early leaf out and early flowering. **The growing season in New England and northern New York is generally expected to increase by 20 days or more by the end of the century, due to fewer days with a minimum temperatures below 32°F.** Property considerations: It is known that invasive plant species are favored with increased growing season over native species that respond to the growing seasons they have adapted to. Invasive plant species then outcompete native species for resources while they are active and native species are dormant. **The winter season will be shorter and milder across New England and northern New York, with less precipitation falling as snow and reduced snow cover and depth.** Property considerations: Black ash favor conditions of high water in the spring generated from snow. This will affect the depth of water at the beginning of the spring melt. **Precipitation patterns will be altered, with projected increases in annual precipitation and potential for reduced growing season precipitation in New England and northern New York.** Property considerations: Black ash favor conditions of high water from spring melt to early summer. Reduced precipitation particularly in the spring would result in reduced annual growth, affecting the quality of trees used in basketry. **Intense precipitation events will continue to become more frequent in New England and northern New York.** Property considerations: Black ash and ash in general are anemophilous. Intense rain events can impact pollination and in term reproduction through seeding by interfering with the dispersion of pollen from male trees to female trees. **Warmer temperatures and altered precipitation in New England and northern New York will interact to change soil moisture patterns throughout the year, with the potential for both wetter and drier conditions depending on the location and season.** Property considerations: Drier conditions are unfavorable for black ash as they are water tolerant. Water intolerant trees would then compete for black ash. This might require more frequent and intense management activities. Ash dieback is strongly correlated to water stress. Low periods of rainfall followed by fungal attack cause the dieback. Air pollution other fungi, viruses and mycoplasma contribute to the dieback. **Certain insect pests and pathogens will increase in occurrence or become more damaging in New England and northern New York.** Property considerations: Ash in general are threatened by the Emerald Ash Borer and ash dieback. Multiple threats may compound viability of ash. It could result in the loss of trees and reduce their quality for use in basketry. **Many invasive plants will increase in extent or abundance in New England and northern New York.**

Property considerations: Invasive plant species can outcompete black ash and result in quality and quantity of basket grade trees.

Many northern and boreal tree species will face increasing stress across much of New England and northern New York.

Property considerations: Stress could affect the quality and quantity of basket grade trees.

Habitat will become more suitable in New England and northern New York for some southern species.

Property considerations: This is not likely to affect the project unless the southern species favor hardwood wetlands type sites.

Forest composition will change across the landscape in New England and northern New York.

Property considerations: Forest composition is not well understood for black ash. It is unknown how change in associate species would affect black ash.

Low-diversity systems are at greater risk from climate change.

Property considerations: Loss of diversity could interfere with any relationships between black ash and other organisms. These relationships are not understood.

Species in fragmented landscapes will have less opportunity to migrate in response to climate change.

Property considerations: The current status of black ash is that they now exist in a fragmented landscape. The impact would likely not be measureable.

Systems that are more tolerant of disturbance have less risk of declining on the landscape

Property considerations: Black ash sites are not tolerant of disturbance and would have a higher risk of declining. This would limit the availability of black ash for basketry.

Climate Adaptation Plan for Individual Management areas

The following plan details the management goals and objectives for a particular component of the project. Included below is a detailed review of potential climate impacts and site level considerations, along with an evaluation of objectives, potential adaptation responses (tactics) and monitoring variables to assess success over time.

Plan for specific Management area	Lowland and riparian forest Diverse forested wetlands are found in depressions and low-lying areas, along waterways, and in floodplains. Dominant species may include ash, red or silver maple, swamp white oak, sycamore, American elm, and river birch.
Management Goal Management Objective(s)	Increase the availability of basket making resources. Decrease the number of competing tree species *(3 months)* Alter relative stand density, changing from 40 to 30 by thinning *(3 months)* Increase natural regeneration *(10 years)*
Management Goal Management Objective(s)	Develop silviculture practices for black ash stands. Measure black ash stands that have been managed to determine net effect. *(10 years)*
Potential identified impacts for Lowland and riparian forest	**Lowland and riparian forests may have limited tolerance to changes in precipitation and water tables.** Property considerations: This would definitely limit the availability of quality and quantity of black ash for basketry. **Many tree species could tolerate limited increases in flooding and drought under climate change.** Property considerations: This would produce a positive effect for black ash which thrives under increased flooding. Drought would negatively impact black ash. **Many of the dominant tree species are projected to have similar or increased habitat, including American elm, eastern cottonwood, and silver maple.** Property considerations: Silver maple in particular would displace black ash. **Some tree species in lowland and riparian hardwood forests are expected to decline by the end of the century (northern white-cedar, black ash, balsam fir, yellow birch, and paper birch).** Property considerations: The effect would prevent black ash from being available for basketry. **Invasive species such as Japanese stiltgrass and buckthorn are expected to become more problematic under climate change.** Property considerations: Impacts from invasive plant species would reduce the availability of black ash **Insect pests and forest diseases could become more problematic these forests under a warmer climate.** Property considerations: The effect would be a loss of black ash available for basket making.
Potential impact of climate change on	Disruptive

health and function of system	
Adaptive Capacity of system to climate change impacts or disturbances	Low-Moderate
Vulnerability determination	High

Evaluation of climate change impacts on goals and objectives

Climate change might make management objectives for this property harder or easier to achieve, presenting challenges and opportunities. This section also includes a simple rating and description for the feasibility of meeting management objectives under current management. This is a critical step to evaluate whether management objectives are robust, or whether any might need to be changed.

Management Goal	Increase the availability of basket making resources.
Management Objective	Decrease the number of competing tree species *(3 months)*
Challenges	Climate change impacts may favor other tree and plant species, interfering with management activities that have been implemented.
Opportunities	Climate change may increase moisture and reduce stress in ash trees and reduce ash mortality.
Feasibility of meeting objectives after evaluation of climate impacts on system	Low Comments: Climate change impacts may favor invasive insect pest species such as Emerald Ash Borer, increase its spread and spread rate. Stressed ash send out chemical signals that they are stressed and attract EAB. The impacts to ash will be compund.
Other Considerations	Comments: Ash has a very high cultural value for native americans, it is considered irreplaceable. Ash generally is not highly valued nor as a matter of practicality managed by state and private forest managers in favor of more profitable tree species, e.g. maple, cherry.

Responding to climate change impacts

The following adaptation actions (tactics) were identified to help prepare for climate change impacts. Each adaptation tactic is linked to one or more Adaptation Strategies and Approaches, providing connections to climate change adaptation and forest management and conservation. Refer to the Adaptation Workbook for a complete list of Adaptation Strategies and Approaches.

Note - Tactics that are recommended can be implemented or explored further. However, some adaptation tactics might not be recommended for implementation on this property, which may be due to a combination of barriers and drawbacks or external factors.

Adaptation Tactic	**Identify sites in region with assistance with NYSDEC. Timing - within next 6-months. Visit sites and put in GIS database. Enhance sites for regeneration by seed for later seed collection and storage. Create pool of basket grade seeds for a period of about 10-years.**

Strategy	**Maintain or create refugia**
Approach	Prioritize and maintain unique sites
Benefits of this tactic	Previous efforts were research based. Now that we have learned how to do this and understand logistics it will be easier. Primary benefit is to generate a reserve of basket grade trees for an extended period of time.
Drawbacks and barriers of this tactic	May conflict with NYSDEC priorities. Primary barriers are manpower and funding resources. May have to rely on volunteer efforts.
Timeframe to implement	6-months
Practicability	*An adaptation tactic is practicable if it is both effective & feasible to implement and to ultimately achieve desired intent.*
... practicability of tactic?	High
Recommendation for implementation	*The decision to recommend a tactic may be based on the likelihood of success, potential tradeoffs, cost, and other factors.*
... recommend tactic?	Yes

Monitoring adaptation actions

Monitoring is critical for understanding if management actions are effective or if management should be altered in the future to account for new information. The following monitoring variables were described for this particular management objective and adaptation tactics.

Monitoring variables used to evaluate if tactic is achieving desired management objective(s)	Number of basket trees per acre Number of basket trees harvested Percentage of bolt that is usable by basket maker/number or splint bundles per tree Species composition percentage Regeneration Stocking guide for black ash
Monitoring Variable 1	
Threshold or Criteria for Evaluation of adaptation tactic	>2 trees per acre stem diameter average annual ring growth mm basal area >or= to 50% of bolt is usable Black ash <or= 20%, but no less than 5% and no greater than 20% Tree seedlings by species, length class, and other explanatory variables, such as forest-type group TEK
Implementing monitoring efforts (frequency, time of year, etc)	The stands where the management has occurred should now be measured, as they were treated in 2009-2011. Stem diameter, increment bore (ring growth rate), trees evaluated through traditional environmental knowledge.

Evaluation of climate change impacts on goals and objectives

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Management Goal	Increase the availability of basket making resources.
Management Objective	Alter relative stand density, changing from 40 to 30 by thinning *(3 months)*
Challenges	Climate change impacts may alter stand conditions.
Opportunities	If climate change reduces competing species and favors black ash it may be beneficial. However, loss of diversity may make ash open to pests and pathogens.
Feasibility of meeting objectives after evaluation of climate impacts on system	High Comments: The benefit may only be short term, e.g. 10 years, because the long term effect of loss of associate species is not known as the interactions between ash and other species is not well understood.
Other Considerations	Comments: Naturally occurring ash occurs in small pockets and sites, typically less than what can be defined as a stand, and therefore are passed over in larger forest stand management practices. They typically occur in wetlands where normally management activities of any sort aren't conducted because these areas are legally restricted.

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Strategy	**Maintain or create refugia**
Approach	Prioritize and maintain unique sites
Benefits of this tactic	Previous efforts were research based. Now that we have learned how to do this and understand logistics it will be easier. Primary benefit is to generate a reserve of basket grade trees for an extended period of time.
Drawbacks and barriers of this tactic	May conflict with NYSDEC priorities. Primary barriers are manpower and funding resources. May have to rely on volunteer efforts.
Timeframe to implement	6-months
Practicability	*An adaptation tactic is practicable if it is both effective & feasible to implement and to ultimately achieve desired intent.*

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Recommendation for implementation	*The decision to recommend a tactic may be based on the likelihood of success, potential tradeoffs, cost, and other factors.*
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Implementing monitoring efforts (frequency, time of year, etc)	The stands where the management has occurred should now be measured, as they were treated in 2009-2011. Stem diameter, increment bore (ring growth rate), trees evaluated through traditional environmental knowledge.

Evaluation of climate change impacts on goals and objectives

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Management Goal	Increase the availability of basket making resources.
Management Objective	Increase natural regeneration *(10 years)*
Challenges	It is not known how climate change would impact natural regeneration. The assumption can be made that the trees reproductive cycles have adapted to conditions over a 10,000 year time period. Climate changes may occur at a rate that ash may not be able to adapt to.
Opportunities	No opportunities come to mind.
Feasibility of meeting objectives after	Low

evaluation of climate impacts on system	Comments: Long-term climate change impacts to natural regeneration may affect the continuation of ash. With EAB impacts added to decreased natural regeneration the outlook for ash is poor.
Other Considerations	Comments: There are no local resources to manage natural regeneration concerns of this magnitude. State and federal resources aren't likely to be put toward ash regeneration particularly when they are challenged with other priorities.

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Strategy	**Maintain or create refugia**
Approach	Prioritize and maintain unique sites
Benefits of this tactic	Previous efforts were research based. Now that we have learned how to do this and understand logistics it will be easier. Primary benefit is to generate a reserve of basket grade trees for an extended period of time.
Drawbacks and barriers of this tactic	May conflict with NYSDEC priorities. Primary barriers are manpower and funding resources. May have to rely on volunteer efforts.
Timeframe to implement	6-months
Practicability	*An adaptation tactic is practicable if it is both effective & feasible to implement and to ultimately achieve desired intent.*
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Recommendation for implementation	*The decision to recommend a tactic may be based on the likelihood of success, potential tradeoffs, cost, and other factors.*
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Adaptation Tactic	**Create refugia in island locations. Collect seeds from black ash, stratify and germinate, care for in nursery. Identify island communities along Atlantic coast where movement of materials is highly regulated and can be managed and where distance across water barrier is likely to prevent EAB. Develop cooperative agreements with island communities. Plan out planting design.**
Strategy	**Maintain or create refugia**
Approach	Establish artificial reserves for at-risk and displaced species

Benefits of this tactic	Isolation of the basket trees from EAB. Production of basket grade trees. Retention of species as live specimens as an alternative to seed stock
Drawbacks and barriers of this tactic	Seed source due to cyclical reproduction may be a barrier. Uncertainty about viability in using seed from one area and planting in other areas.
Timeframe to implement	As soon as possible.
Practicability	*An adaptation tactic is practicable if it is both effective & feasible to implement and to ultimately achieve desired intent.*
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Management Goal	Develop silviculture practices for black ash stands.

Management Objective	Measure black ash stands that have been managed to determine net effect. *(10 years)*
Challenges	There would be a limit to the long-term ability to make measurements. The need to manage ash may become moot if there is no ash left to manage.
Opportunities	Learning how to manage ash before it disappears will be helpful to future generations when it becomes possible for ash to survive.
Feasibility of meeting objectives after evaluation of climate impacts on system	High Comments: It is highly feasible to learn as much about ash before it disappears.
Other Considerations	Comments: Ash is an important component of forest composition, existing in bottomland, lowland and high land. It may be more valuable than is being considered but won't be fully understood until it is lost.

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Implementing monitoring efforts (frequency, time of year, etc)	The stands where the management has occurred should now be measured, as they were treated in 2009-2011. Stem diameter, increment bore (ring growth rate), trees evaluated through traditional environmental knowledge.

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