

Silviculture Trials of Swamp Hardwood

This is a compilation of several swamp hardwood, silviculture trials that were implemented in Wisconsin. The trials include a variety of silviculture methods such as coppice/clearcut, conversion, diameter limit, shelterwood, intermediate thinning, strip clearcut, selection harvest. Most trials were implemented on county forest lands, though a few are on state and private forest lands. The data for the abstracts was compiled from timber sale maps and records. The pre/post sale data included site description, year harvested, type, size, age and site index of the stand. We then gathered more information on soils of the harvested stand and also the surrounding landform and soils. Some trials have more information than others. As we have more time and personnel to assist, this information may expand (hydrology, updated recon etc).

We do have an extensive photo gallery of these projects but did not include here because of the size. We will continue to add to the list and document as we receive the information.

In summary, the documentation of these trials has given us some insight and consideration in managing this type. Much of this covertype across Wisconsin has the same soils: predominately Lupton Cathro or Seeleyville Markey. One observation to note is the surrounding soil and landform information and how it may contribute to nutrient and growth regime in the stand being managed. Water and nutrients flowing from the surrounding landform into the particular stand contributes to the nutrient regime and may influence growth characteristics. Also affecting the nutrient regime is the surrounding soils both the type of parent soil and depth of organic below the particular swamp hardwood stand. If the parent soil is closer to the surface, we found that growth and productivity is greater. Although expensive and difficult to monitor, watertable considerations is important as well as the watershed characteristic (i.e. flow of adjacent streams etc)

As for a silviculture method, we are finding that strip clearcut is a method that has been quite successful from the standpoint of recruiting regeneration (mostly stump sprout), seed origin regen then have a chance to establish and little or no evidence of swamping. The stump sprouts also have a faster growth rate and can out grow deer browse. With the few clear cuts (coppice) and diameter limit methods that we documented, swamping was evident and alder and swamp species take over. With all of these methods, we have to continue to document silviculture trial observations especially the more recent activity.

Colleen Matula, WDNR Forest Ecologist/Silviculturist
1/2013

Project Subject/Title: Oconto County - Compartment 79 Stand 1

Contact Person: Oconto county WDNR liaison

Abstract: In 1991, a shelterwood harvest was conducted on 36 acres in southeastern Oconto County. The goal was to open up the canopy by reducing the crown cover to 70% to encourage swamp hardwood regeneration. An overstory removal was planned to take place sometime in the following 10 to 20 years once the regeneration was 4 to 5 feet tall. A lack of regeneration caused the overstory removal to be put on hold.

Trial Location:

County: Oconto

Township: 29N **Range:** 22E **Section:** 13

GPS Coordinates: Lat: 44°58'51.5" Long: -87°46'45.5"

Property Name: Oconto County Forest

Baseline Stand Data

- *Cover Type:* Swamp Hardwood
- *Acres:* 36
- *Habitat Type:*
- *Soil Type:* Wainola loamy fine sand
- *Year of Origin:* 1900
- *Total Height:*
- *Site Index Species and Site Index:* 64
- *Mean Stand Diameter:* 11-15"
- *Total Basal Area per Acre:* 80 sq. ft
- *Other stand Condition:* Close to Lake Michigan, landform is an old lake bed

Prescription and Methods:

- *Type of Prescription:* Shelterwood
- *Year Initiated:* 1991
- *Establishment Methods:*

A shelterwood harvest was conducted on the western side of stand 1 in compartment 79. The objective was to reduce the crown cover to 70% and encourage regeneration in order to have a removal harvest in 10-20 years after the regeneration was 4-5 feet in height.

- *Data Collection Methods:*

The stand was revisited in 2009 and in 2014. In 2009, basal area, site index, mean diameter, crown area and regeneration were all measured. In 2014, a regeneration survey was taken as well as an ocular stand assessment and comparison to adjacent stands.

Results: The regeneration survey in 2009 found that there were about 480 stems per acre. Basal area was found to be 64 square feet per acre and the average diameter was 9.4 inches. In 2014, regeneration numbers were slightly lower. All of the regeneration measured was green ash. There was a lot of grass and raspberry competition throughout the stand and patches of black chokeberry as well.

Discussion/Recommendations: The overstory looked healthy with only a small amount of dieback. Internal brown rot was observed in the green ash. The low amounts of regeneration were negatively impacted from deer browse. The lack of sunlight due to excessive crown cover could be a limiting factor to the amount of regeneration present. The overstory removal was not conducted because of the lack of regeneration throughout the stand.

Project Subject/Title: Oconto County Compartment 79 Stand 2

Contact Person: Oconto County Liaison

Abstract: An intermediate thinning was conducted in a swamp hardwood stand located in southeast Oconto County in 2003 and 2004. The stand mainly consisted of pole timber and small sawtimber. The harvest results were to be compared to an adjacent shelterwood harvest that was conducted about 10 years prior to the intermediate thinning.

Trial Location:

County: Oconto

Township: 29N **Range:** 22E **Section:** 13

GPS Coordinates: Lat: 44°58'56" **Long:** -87°46'24"

Property Name: Oconto County Forest

Baseline Stand Data

- *Cover Type:* Swamp Hardwood
- *Acres:* 150
- *Habitat Type:*
- *Soil Type:* Cormart loamy fine sand
- *Year of Origin:* 1955
- *Total Height:*
- *Site Index Species and Site Index:* 59
- *Mean Stand Diameter:* 5-11"
- *Total Basal Area per Acre:* 85 square feet
- *Other stand Condition:* Close to Lake Michigan, landform is an old lake bed

Prescription and Methods:

- *Type of Prescription:* Intermediate Thinning
- *Year Initiated:* 2003/2004
- *Establishment Methods:*

An intermediate thinning was conducted to reduce the overstory in attempt to release residual trees and help promote swamp hardwood regeneration.

- *Data Collection Methods:*

The stand was revisited in 2009 and in 2014. Regeneration surveys and ocular site assessments were taken in both years. Basal area, site index, and mean diameter were taken in 2009.

Results: The basal area of the stand in 2009 was 54 square feet per acre. Mean diameter was 10.7" and site index was 59. The total amount of regeneration in 2009 was 400 stems per acre which consisted of mainly green ash. There was slightly more regeneration counted in 2014.

Discussion/Recommendations: The overstory was healthy with only a small amount of dieback. Grass, raspberry and patchy black chokecherry were present throughout the stand. The small amount of ash regeneration was hit hard by deer browsing. Stand was pretty similar to the adjacent swamp hardwood stand that was shelterwood harvested previously. Basal area was noticeably lower in the intermediately thinned area as compared to the shelterwood area.

Swamp Hardwood –Intermediate Thinning

Project Subject/Title: Oconto – section 14

County: Oconto

TRS: T 29N r 22w sec 23,24

Contact Person: Oconto county liaison

Year Initiated: 2008

Abstract/Prescription: This is an intermediate thinning in predominately pole timber size stand . First entered (thinning in 1991). Close to Green Bay of Lk. Michigan. Influenced by the water fluctuations of the lake.

Presale Statistics:

Type = 5-11"DBH; Predominately green ash but some black ash.

BA=85 sq. ft.

Acres = 52

Age=90 yrs, Origin=1900

SI= 52

70 MBF

Cords=100

Post sale: Stand revisited in 2007 –

Regeneration= good lots of stump sprouts, need to check regeneration

Soils=Seeley Marley Muck surrounded by Cormart fine sand (lake bed outwash)

Mean diameter=9 DBH

Crown area=

Discussion:

Healthy but some dying tops – grass and raspberry understory, stumps visible

Good regeneration though some deer browse

Close to Lk Michigan

Swamp Hardwood – Shelterwood

Project Subject/Title: Chippewa county 355

County: Chippewa

TRS: T 32N r 7w sec 31sesw

Contact Person: Chippewa county liaison

Year Initiated: 1974

Abstract/Prescription: This is a shelterwood harvest - marked to 50% crown closure. Very small sale. In 1974, regen stocking was 1300 stems/ac. Question? Did overstory removal occur? Most likely but don't have good stand history.

Presale statistics:

Type: 11-15" /5-11"DBH predominately black ash sawtimber

BA: 100 sq. ft.

FHT= FI

Acres = 10

Revisited= 1982

Regeneration = 1383/ac mostly AB

Notes from postsale 1980: understory ready for partial release

21 MBF

Post sale: Stand revisited in 2009 –

BA=61 sq. ft. mostly poletimber

Regeneration= 538 stems/ac mostly AB

SI = 57

Soils= Lupton Muck very wet

Mean diameter=7.6"DBH

Crown area= 16"DBH= 648 sq ft

Discussion

Original notes from 1974 depict this stand as healthy and vigorous. Upon return in 2009 there was lots of cavity holes, some crown dieback, visible stumps

Moderate regeneration; small sale area/low volume. No stand data after 1974.

Swamp Hardwood – Intermediate thinning

Project Subject/Title: Chippewa county 518

County: Chippewa

TRS: T 32N r 7 sec 31nwnw

Contact Person: Chippewa county liaison

Year Initiated: 1979-81

Abstract/Prescription: Selectively marked and harvested in 1979 then 1980
/salvage of blown down sawtimber. Not much stand data after the harvest.

Presale statistics:

Type: Stand was sawtimber 15” plus/5-11” predominately black ash

Acres: 27

BA: 100 sq. ft.

Age:100 yrs

Postsale :Stand revisited in 2009

BA=56 sq. ft. (41poles, 13 small sawtimber);

Regeneration= 1,220stems/ac mostly AB.

SI = 51

Soils= Lupton Muck

Mean diameter=6.5”

Crown area= 16”DBH= 992 sqft

Discussion

Not a lot of information on this stand. Visited stand in 2009 and found lots of cavity holes, some crown dieback, visible stumps Lots of regeneration; slow growth and some dieback.

Project Subject/Title: Iron County – March Madness

Contact Person: Iron county liaison

Abstract:

This is a strip clear cut that was initiated in western Iron County in the winter of 2009. The stand consisted of mainly black ash in the poletimber to small sawtimber size. The goal of this trial was to successfully regenerate the swamp hardwood cover type while minimizing negative impact to the soil and residual timber.

Trial Location:

County: Iron

Township: 44N **Range:** 01W **Section:** 01

GPS Coordinates: Lat: 46°19'6.6" Long: -90°26'31.2"

Property Name: Iron County Forest

Baseline Stand Data

- *Cover Type:* Swamp Hardwood
- *Acres:* 39
- *Habitat Type:*
- *Soil Type:* Lupton Cathro Muck
- *Year of Origin:* 1921
- *Total Height:*
- *Site Index Species and Site Index:* 45
- *Mean Stand Diameter:*
- *Total Basal Area per Acre:* 102 sq.ft./ac
- *Other stand Condition:* Wet

Prescription and Methods:

- *Type of Prescription:* Strip Clear Cut
- *Year Initiated:* 2009 (Winter Harvest)
- *Establishment Methods:*

Strip clear cut with 30 foot cut strips and 66 foot uncut strips. The stand was harvested in winter using a Ponce processor and slash mats to minimize rutting.

- *Data Collection Methods:*

Three 1/1000 acre regeneration plots per strip were established. Both the cut and uncut strips were sampled.

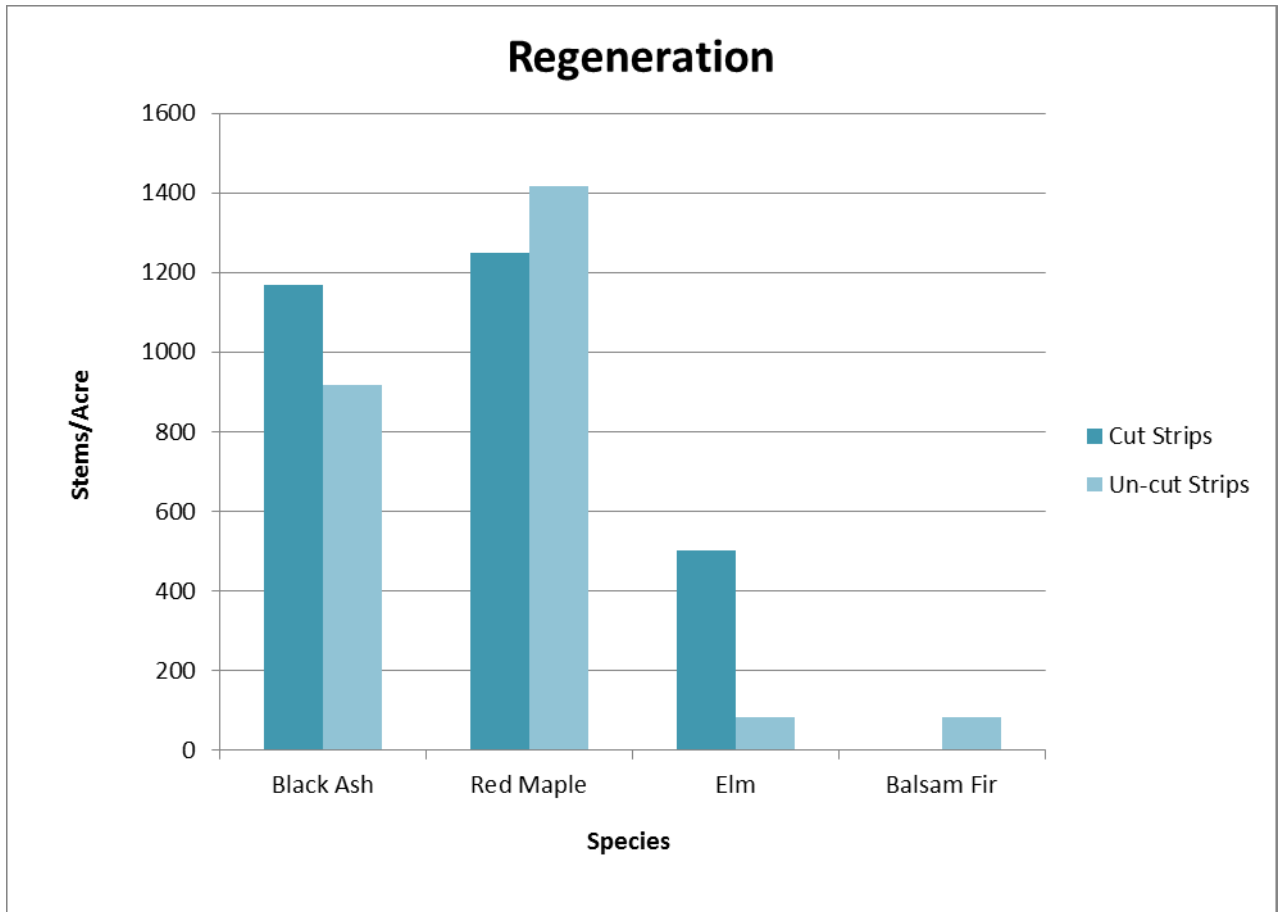
Results:

In 2009 the results of a regeneration survey were 700 stems/acre with most of the regeneration being black ash. Results of a regeneration survey in 2012 showed that there were 2,000 stems/acre with a mixture of stump and seed origin. In 2014 another regeneration survey was conducted in both the cut and uncut strips. There were 3,000 stems/acre in the cut strips with the majority of the regeneration being black ash and red maple. The uncut strips had 2,500 stems/acre. Elm, willow, and balsam fir were also present but in low numbers.

Discussion/Recommendations:

There were a lot of cavity holes and some crown dieback. Tag alder is present in the stand but not abundant enough to outcompete the regenerating black ash and red maple. The majority of the regeneration occurring in the cut strips is from stump sprouting but there is also some seed origin regeneration as well. Deer browse was not an issue in this stand because the regeneration was able to surpass the deer within 2 years of the end of the sale.

Timber mats were used to prevent rutting; it was apparently very wet underneath as the equipment moved over the sphagnum mat. When the stand was revisited in 2014, the entire stand was pretty wet. There was some puddling in the cut strips and some standing water in the uncut strips.



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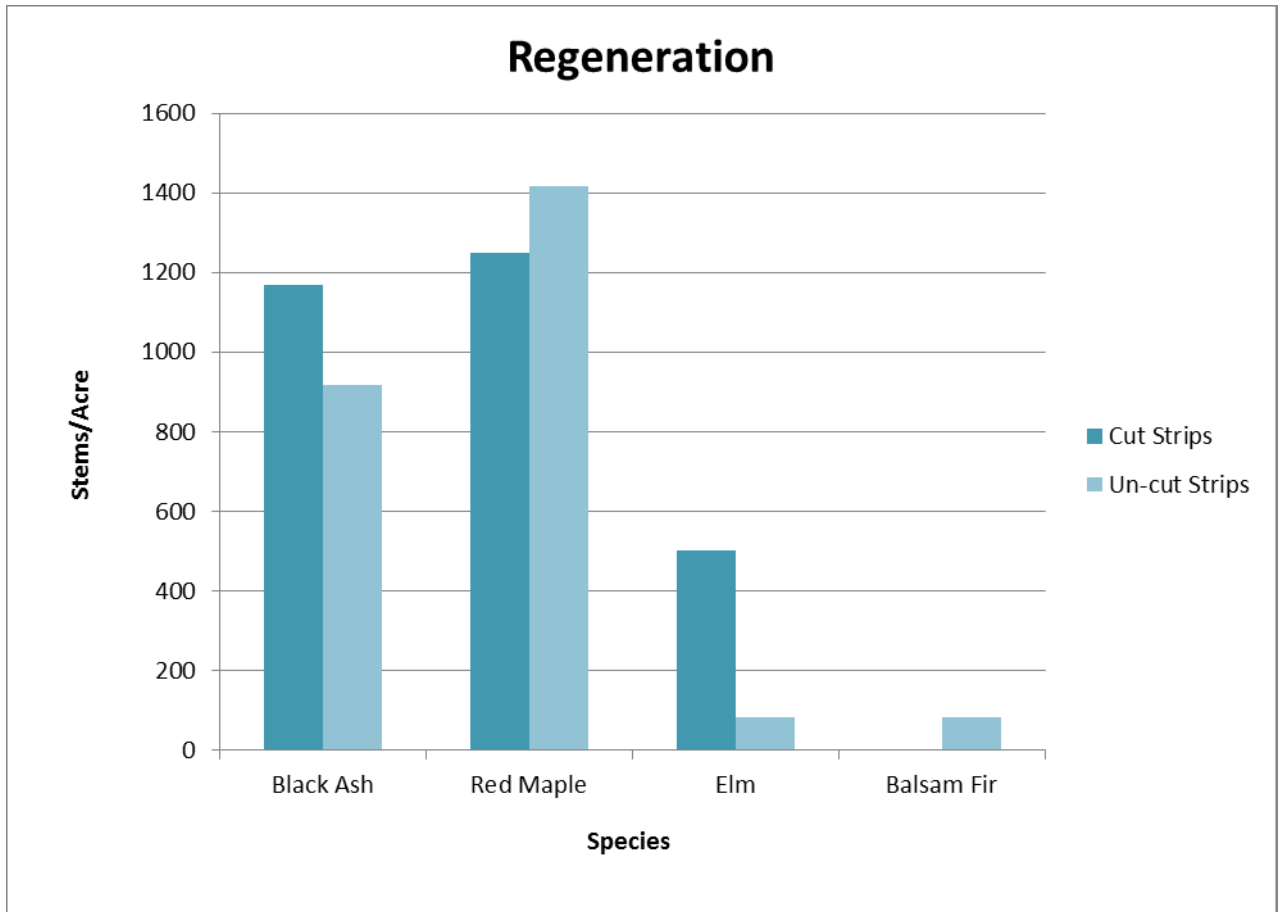
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Swamp Hardwood - Salvage

Project Subject/Title: Flambeau River state forest – Lake of pines

County: Sawyer

TRS: T 38N r 3w sec 22,23,14,11

Contact Person: Heidi Brunkow

Year Initiated: Blowdown of 1977

Abstract/Prescription: The silvicultural prescription is Salvage harvest after blowdown. The 1982 notes remarked that stand is not typical lowland swamp hardwood --- has an upland look to it? Near Lake of the pines lake, several wetlands in the area. 3 gravel roads surround the stand. Mixed species stand of AB, BA, OR, MH, BY.

Presale Statistics

Type: 05-11 sh DBH

Acres:49

SI: 51

BA: 40 sq. ft. at the time of blowdown

1982 notes remarkd on BY and MR seedlings established.

Postsale: Stand revisited in 2009 –

BA=93 mostly poletimber with some sawtimber

Regeneration= 1,430stems/ac mostly AB.

SI = 51

Soils= Lupton Muck

Mean diameter=5.3”

Crown area= 13 ft DBH=323 sq ft

Discussion

Lots of cavity holes, some crown dieback, visible stumps

Lots of regeneration; SE aspect; hummock present; musclewood prevalent; road surrounds stand. A mixed species stand but predominately black ash in overstory and understory.

Swamp Hardwood – Strip Harvest and Thinning

Project Subject/Title: Flambeau 408

County: Sawyer

TRS: T 37N r 3w sec 20,29

Contact Person: Heidi Brunkow

Year Initiated: 1988

Abstract/Prescription: The Silviculture prescription was partial strip cut in a portion of the stand and **Thinning:** Strip clearcut in 50 ft cut strip with thinning in adjacent 60 strip. Another mixed species stand with AB, BY, H, MR. This is located ½ mile from the Flambeau River and other wetlands in the area.

Presale Statistics

Type = 5-11"shDBH

BA=85 sq. ft.

Acres = 9

Age=32 yrs

SI= 59

Postsale: Stand revisited in 2009 –

Regeneration=290 stems/ac predominately AB/BY/MR in select harvest/875 stem in cut strip

BA= 68 sq ft. in select harvest strip

Soils= Lupton Cathro with some Pewabic fine sandy loam (drumlin)

Mean diameter=10"DBH in selection harvest

Crown area= 16"dbh= 198 sq ft

Discussion

Lots of musclewood and ironwood, hummock present; Could be typed as a different cover type (red maple?). Lots of species diversity however, muscelwood and ironwood are heavy competitors.

Swamp Hardwood- Diameter Limit Harvest

Project Subject/Title: Lincoln –wildwood ave

County: Lincoln

TRS: T 34N r 4e sec 31 senw

Contact Person: Kevin Kleinschmidt

Year Initiated: winter harvest partially cut in 1985 and finished ? trouble with having it completed due to poor conditions

Abstract/Prescription: The silvicultural prescription is a diameter limit harvest – 3 stick and greater. The Newwood River is adjacent to this wetland stand.

Presale Statistics

BA=88 sq. ft residual should be 39 sq. ft.

Type = 05-11”sh/11-15”sh DBH

Acres = 49

Age=129 yrs

SI= 35

Soils = Lupton Cathro Markey Muck – a moraine drainageway muck until 60 in to sand – surrounded by Magnor Silt (moraine)

Hydrology = Newwood River nearby

The area encompasses a large black ash swamp. Flow through drainage present.

Goal is to salvage older black ash (those with dieback). The AB stand had the appearance of 3-aged stand (some 9-14” size, 3-6” poles 60yrs, and good amount of seedlings)

Volume = 30 MBF ash, 420 cord pulpwood

Post sale: Stand revisited in 2009 –

Marsh grass and cattails dominate; hardly any ash regeneration; very wet

Appeared to have swamped out; watertable rose.

Discussion:

This silviculture prescription is not recommended. If this is considered, one should address the following: hydrology, established regeneration, invasive species, stand quality and other considerations.

Project Subject/Title: Coppice with Reserves – Ashland #892

Contact Person: Tom Piikkila (715)274-4020 WDNR Liaison Forester

Abstract: A 45 acre swamp hardwood stand in Ashland County was set up for a coppice with reserves harvest in 2008. The presale recon of the site showed that there was a variety of species present in clumps throughout the site including black ash, red maple, balsam fir, white cedar and yellow birch. Because the stand is located near the Chippewa River and several other small creeks and wetlands, it would have to be harvested in the winter to prevent damage from logging equipment.

Trial Location:

County: Ashland

Township: 42N **Range:** 01E **Section:** 10

GPS Coordinates: Lat: 46°7'46.5" Long: -90°21'27.8"

Property Name: Ashland County Forest

Baseline Stand Data

- *Cover Type:* Swamp Hardwood
- *Acres:* 20
- *Habitat Type:* FnAbArOn
- *Soil Type:* Lupton cathro poorly drained organic
- *Year of Origin:* Before 1860
- *Total Height:*
- *Site Index Species and Site Index:* 37
- *Mean Stand Diameter:* 11-15" Swamp Hardwood/5-9" Conifer
- *Total Basal Area per Acre:*
- *Other stand Condition:*

Prescription and Methods:

- *Type of Prescription:* Coppice with reserves
- *Year Initiated:* 2008-2009 (Winter harvest)
- *Establishment Methods:*

Originally, 45 acres were supposed to be harvested; only 20 acres were actually cut. Because of the proximity of wetlands and several creeks nearby, a winter harvest was needed to minimize rutting.

- *Data Collection Methods:*

The site was visited in 2009 after the harvest, and in the summer of 2014. Visual observation and multiple 1/1000 acre plots were established to determine the amount of regeneration in the stand as well as the hydrology of the site.

Results:

A regeneration study in 2009 showed a total of 1283 stems/acre in the harvested area. The vast majority of this regeneration was black ash with a minor component of red maple. A visual survey in 2014 showed numerous black ash and red maple regeneration throughout the site. Both the harvested and unharvested areas were very wet. Tag alder and cattails were present in the harvested area.

*2014 – Only an ocular assessment was able to be done due to the amount of standing water in stand.

Discussion/Recommendations:

The stand and surrounding areas are very wet and difficult to work in. Black ash stump sprouts appeared to be vigorous and well stocked. In certain areas, alder and other undesirable species outcompeted swamp hardwoods and conifers.

Project Subject/Title: Shelterwood Harvest – Ashland #896

Contact Person: Matt Schultz, Ashland county forest

Abstract:

A shelterwood harvest was prescribed for a swamp hardwood stand located in eastern Ashland County. The stand and adjacent area have mixed species present including black ash, yellow birch, cedar, red maple and hemlock. There are many wetlands adjacent to the stand.

Trial Location:

County: Ashland

Township: 43N **Range:** 01W **Section:** 06

GPS Coordinates: Lat: 46°13'40.3" **Long:** -90°32'7.28"

Property Name: Ashland County Forest

Baseline Stand Data

- *Cover Type:* Swamp Hardwood
- *Acres:* 4
- *Habitat Type:* FnAbArOn
- *Soil Type:* Tula-wormet Gogebic/Gogebic Pence
- *Year of Origin:* Before 1860
- *Total Height:*
- *Site Index Species and Site Index:* 37
- *Mean Stand Diameter:* 5-9" Conifer/5-11" Swamp Hardwood
- *Total Basal Area per Acre:* 103 square feet
- *Other stand Condition:* Depth to watertable – 0/30 inches to fragipan

Prescription and Methods:

- *Type of Prescription:* Shelterwood Harvest
- *Year Initiated:* 2008 Winter harvest
- *Establishment Methods:*

The stand was marked down to a basal area of about 50 square feet per acre. It was harvested in the winter of 2008 using slash mats with a harvester and shortwood forwarder.

- *Data Collection Methods:*

The stand was revisited in February of 2009 and in the summer of 2014. Residual basal area was taken along with regeneration surveys and an ocular assessment of hydrology and deer browse.

Results:

The first time the stand was revisited in 2009, the residual basal area was 53 square feet per acre. There were only 133 balsam fir stems per acre in the stand and a lot of deer present.

When the stand was visited again in the summer of 2014 there were a total of 3,875 stems per acre of all species measured in the regeneration plots. The majority of the regeneration was black ash and red maple. Balsam fir, black spruce, yellow birch, and willow were also present but only as a minor component. There was some puddling throughout the stand.

Discussion/Recommendations:

Nearly all of the regeneration present was a result from stump sprouting. There was some tag alder present but it was not a serious competitor with the regenerating tree species. Some of the regeneration was vigorous while some was smaller and negatively affected from deer browse. Although the stand was relatively wet, the conditions at the time may not have been a good representative of the area because of the high amounts of rain received prior to the site visit.



Swamp Hardwood – Intermediate thinning
Project Subject/Title: Washburn/Sawyer #0506
County: Washburn/Sawyer
TRS: T 42N r 9,10W sec 19,24

Contact Person: Hayward Forester
Year Initiated: 2008 winter harvest

Abstract/Prescription: The silv prescription is an Intermediate Thinning. The stand has significant buckthorn throughout. Restricted surface flow of water due to road on west side of stand. Namekagon river nearby. Pure black ash stand - very little diversity.

Presale Statistics:
Type = 05-11”sh DBH
Acres = 34
Age=80
SI= 52
Soils= Lupton Cathro Tawas – organic muck depressions of moraine surrounded by Wozny stony complex

Part of a larger sale

Postsale : Stand revisited in 2009 –
Buckthorn a problem within stand
Drainage impeded by a very old road – restrict flow
BA = 85 sq ft; mostly poletimber
Avg Diameter = 7” DBH
Crown = 361 sq. ft

Harvested in winter with processor and shortwood skidder
Some epicormic branching
Regeneration= 700 stems/ac (too early to count established regen – followup needed)

Discussion
This prescription was applied due to concerns about buckthorn and the watertable.

Swamp Hardwood – Strip Clearcut

Project Subject/Title: Price – Ogema – Private land

County: Price

TRS: T 34N r 1E sec 26

Contact Person: Kyle schmidt

Year Initiated: 4 strips cut in 2003/ 3 strips in 2005 winter harvest

Abstract/Prescription: This prescription is a Strip clearcut harvest over a couple of yrs (strips side by side). 3 chain strips – (200ft wide). Wetlands and small creeks nearby

Presale statistics

Type = 11-15”sh/5-11”sh DBH

Acres = 40

Age=75

SI= 45

Soils= Lupton Cathro

Post sale: Stand revisited in 2009 –

Regeneration= Harvest '03 – 6000/ac; Harvest 05=4400/ac 10 ft tall AB/MR

Crown = 6”dbh =143 sq ft

Some tag Alder and cattails, sedge and swamp grass; regeneration looks good; some deer browse

Discussion

As with this prescription, dependent on returning to harvest remaining strips. Was able to harvest successive yrs --- watertable did not appear to have risen – Much established AB and MR regeneration

Swamp Hardwood

Project Subject/Title: Price - Kennan

County: Price

TRS: T 35N r 2w sec 31

Contact Person: Kyle Schmidt

Year Initiated: 2008 winter harvest

Abstract/Prescription: Strip clearcut (cut 50ft/uncut 100 ft) various size strip

Presale Statistics:

Type = 05-11"sh DBH

Acres = 83

Age=70

SI= 50

BA=150 sq ft.

Soils= Capitola-Cabena – muck (a couple inches) over silt loam – drainageway or depression from a moraine

Harvested with processor, double bunk forwarder

30MBF AB; 500 cords pulpwood

Post sale: Stand revisited in 2009 –

Regeneration= vigorous stump sprout appeared to outgrow deer browse

Heavily browsed by deer; adequate regen --- Surrounding area is one big swamp graduates into more swamp conifer adjacent to.

No rutting and harvest went well. No swamping

Discussion

Swamp Hardwood
Project Subject/Title: Prentice
County: Price
TRS: T 36N r 2E sec 29

Contact Person: Kyle Schmidt
Year Initiated: 2005 winter harvest

Abstract/Prescription: Selection harvest

Presale Statistics:

Type = 11-15"sh/05-11"sh DBH

Acres = 60

Age=100

BA=130 sq ft.

SI= 45

Soils= Lupton Cathro (moraine drainageway) surrounded by Magnor silt loam

Postsale: Stand revisited in 2009 –

Regeneration= very little seed origin had to be careful since lots of alder

Residual BA – 80 – 100 sq. ft.

Some rutting occurred; Whole tree harvest

Stump sprouts 3-5' tall. This was a very wet stand – standing water but froze before harvest – no problems.

Discussion

Project Subject/Title: Price 9-05

Contact Person: Kyle Schmidt (715)356-5211 WDNR Forester

Abstract: A strip clear cut was prescribed for a 60 acre swamp hardwood stand in southern Price County. The goal of the harvest was to successfully regenerate the swamp hardwood species present in the stand. Old mill creek as well as other wetlands adjacent to the stand made it necessary to harvest the stand in the winter of 2007.

Trial Location:

County: Price

Township: 36N **Range:** 02W **Section:** 20

GPS Coordinates: Lat: 45°35'31" **Long:** -90°38'43"

Property Name: Price County Forest

Baseline Stand Data

- *Cover Type:* Swamp Hardwood
- *Acres:* 60 (20 acres cut)
- *Habitat Type:*
- *Soil Type:* Lupton Cathro muck
- *Year of Origin:* 1914
- *Total Height:* 64'
- *Site Index Species and Site Index:* 36
- *Mean Stand Diameter:* 7.7"
- *Total Basal Area per Acre:*
- *Other stand Condition:*

Prescription and Methods:

- *Type of Prescription:* Strip clear cut
- *Year Initiated:* 2007
- *Establishment Methods:*

A strip clear harvest was conducted in the winter of 2007. The cut strips were set up to be 30 feet wide and the uncut strips were 60 feet wide. The stand was harvested using a JD tracked processor with and a single bunk.

- *Data Collection Methods:*

After the harvest, the stand was revisited in 2009 and in 2014. Regeneration surveys were taken in both the cut strips and the uncut strips. An ocular exam was also

taken which assessed the overall health of the stand and potential competition in the understory.

Results: The regeneration survey from 2009 found that there were 690 stems per acre in the uncut strips and 1300 stems per acre in the cut strips. Similar results were noticed in 2014 when the site was revisited. Nearly all of the regeneration was black ash except near the edges of the stand. Ash regeneration resulted from stump sprout origin.

Discussion/Recommendations: The ash regeneration looked to be vigorous and was consistently represented throughout the cut strips. In 2014 it was noted that the stand was relatively wet with some puddling present. This was most likely a result of the wet spring and early summer. There was tall, thick swamp grass found throughout the stand and some raspberry present as well. A lot of dead tops were present in the uncut strips.

Swamp Hardwood

Project Subject/Title: Price 10-05

County: Price

TRS: T 38N r 1e sec 17

Contact Person: Kyle Schmidt

Year Initiated: 2007 winter harvest

Abstract/Prescription: Selection harvest

Presale Statistics

Type =

Acres =

Age=

SI=

JD tracked processor, forwarder – 420 cords/\$15/cd

Postsale: Stand revisited in 2009 –

Regeneration=690 stems/ac uncut --- 1300 stem/ac cut

BA= 85

Soils= lupton cathro

Mean diameter=8.4" DBH

Crown area= 12 ft DBH=520 ft.

Discussion :

Tag alder!!; no ash regeneration except for; very wet but froze before harvest.

Heathly crowns – good stems; good flow; good job harvested

Some ring shake noted on the log pile

Swamp Hardwood

Project Subject/Title: Phillips School Forest (Catawba)

County: Price

TRS: T 35N r 1w sec 9

Contact Person: Rich Windmoeller

Year Initiated: 2008 winter harvest

Abstract/Prescription: Strip clearcut 2 chains wide (120ft)/ Conversion trial – future is to plant conifer in other strips

Presale Statistics:

Type = 05-11"/11-15"/0-5" DBH swamp hardwood surrounded by upland hardwood

Acres = 20

FHT= FnArI

Age=80

SI= 51

Soils= Lupton Cathro muck surrounded by Magnor very stony – groundmorain/drumlin. Up to 28 inches of Muck with loam underneath as parent soil

Post sale: Stand revisited in 2009 –

Regeneration= stump sprouts and sedge in strip

Summer of 2009 this area was site prep with dozer and then planted in red maple seedlings (in early fall). Site prep went well because of a drought year. Following spring (2010), the entire site swamped out due to wet spring/lots of rain. Lots of wetland vegetation, seedling survival was very poor. Surrounding upland area has aspen sprouts filling in from a previous clearcut harvest.

Discussion:

After previous 7 years of drought, it appeared that this application (dozer site prep and planting) would have been ideal conditions. However, this does highlight how hydrologically sensitive these sites can be. Conversion trials are important to conduct and this one showed how even after one wet spring season can alter the hydrology and impact previous plans. The watertable could be close to the surface at this site as well. Generally this area and entire county has hydrology implications.

Swamp Hardwood

Project Subject/Title: Thunder ck ash

County: Oneida

TRS: T 37N r 4E sec 18

Contact Person: Tim friedrich

Year Initiated: 2007 winter harvest

Abstract/Prescription: Intermediate thinning (harvesting larger 12") some canopy gaps to release adv. Regen

Presale Statistics:

Type = 5-11"sh/15+c DBH

Acres = 43

Age=75

SI=

BA=100 sq. ft. Saw logs with 1 ½ logs. Most trees larger than 12inches will be harvested

Soils= Carbondale Lupton Markey muck surrounded by Goodman Silt Loam (moraine)

**Scattered black ash, yellow birch and cedar. AB advanced regen 3 feet in height
Canopy gaps created**

Post sale:Stand revisited in 2009 –

Regeneration=

Residual BA=80 sq. ft.

Harvest looked good no problems

This area is a very large wetland – the site was wet but froze good before harvest.

17MBF AB; 180 cords pulpwood

Discussion

Harvested during the winter with good snow pack. Contractor did a good job with placing tops down before equipment tracked through stand. No rutting observed

Swamp Hardwood

Project Subject/Title: Washburn – selection – comp.66 std 10

County: washburn

TRS: T 41N r 12w sec 4

Contact Person: Amy Morales, wdnr washburn county liaison

Year Initiated: 2007 winter harvest

Abstract/Prescription: Single tree Selection Harvest – continue uneven-aged mgt for this stand. Marked high risk, over mature trees to 80 sq ft or basal area. Lots of well-developed poles. A few gaps were created to encourage regeneration

Presale Statistics:

Type = 05-11/11-15 DBH

BA =120 sq. ft

Acres =38

Age=125 (with some tree 140 yrs)

SI= 45

Mean diameter= 9in

Soils= Seeleyville Markey Muck

Post sale:Stand

Volume at the time of harvest was 85 MBF and 300 cds.

Discussion: This is part of a larger area where there are several different silv methods in swamp hardwood being applied. There was no follow-up or notes on post harvest. Need followup

Swamp Hardwood

Project Subject/Title: Washburn – Partial harvest – diameter limit

County: Washburn – comp 66 std. 2

TRS: T 41N r 12w sec 9

Contact Person: Amy Morales, wdnr washburn county liaison

Year Initiated: 2005 winter harvest

Abstract/Prescription: Diameter Limit – harvest all black ash, yellow birch and basswood with stump diameter greater than 15 inches (measured at 6 inches above ground level). Small sawtimber and poletimber will remain after harvest.

Presale Statistics

Type = 05-11/05 DBH

Acres = 39

Age=105

SI= 45

BA: 55 sq ft.

Mean dia.= 8 inches

Soils= Seeleyville Markey Muck

Postsale

52 MBF AB, 5 MBF B, 5 MBF BY 140 cds of mixed

Discussion

Near Chicog creek and part of a larger area of swamp hardwood management.

No notes taken post harvest. Need followup

Swamp Hardwood

Project Subject/Title: Washburn – strip cut

County: Washburn – comp 66 std. 33

TRS: T 41N r 12w sec 8,9,16,17

Contact Person: Amy Morales, wdnr washburn county liaison

Year Initiated: 1988 winter harvest and 2012 remaining strips

Abstract/Prescription: Strip harvest 60 foot cut strip/ 60 foot uncut. The final strips in 2012 harvested only older trees and low vigor. Many small poles and saplings were left. Adjacent stand of swamp hardwood harvested single tree selection and one small clearcut.

Presale Statistics

Type = 05-11/11-15 DBH

Acres = 45?

Age=106

SI= 45

Soils= Seeleyville Markey Muck surrounded by Keweenaw-Saynor-Vilas

Post sale:

Results:

From the 1988 harvest Lots of diversity...Lots of mixed spp regeneration now at pole size in the cut strip – yellow/white birch, black ash, red maple – stocking around 50 sq. ft BA. Some seedlings 600 stems/ac. In uncut strip – alder and willow along with large black ash 100 sq.ft. BA.

From the 2012 harvest lots of seedling/sapling and poles left leaving 50 sq.ft of basal area in the remaining strop

Discussion:

The 1988 harvest appeared to be a successful harvest in this large wetland complex – the surrounding soils may be indication of success for the parent soil may be close to surface --- lots of diversity. No rutting and no swamping.

No notes taken from 2012 harvest –need followup

Swamp Hardwood

Project Subject/Title: Washburn - Clearcut

County: Washburn comp 66 std 34

TRS: T 41N r 12w sec 16,17

Contact Person: Amy Morales, wdnr washburn county liaison

Year Initiated: 1976/77 winter harvest

Abstract/Prescription: Clearcut

Presale Statistics

Type = 05 swamp hardwood – predominately black ash

Acres = 4.5

Age=

SI= 34

Soils= Bowstring muck surrounded by uplands of Keweenaw-saynor-Vilas

45 cords pulpwood

Post sale: Stand revisited in 2009 –

Results: Watertable rose, cattails and sedge no seedlings/regen

Originally stump sprouts 200 stems/ac (1977)

Definitely organic muck; not successful

Discussion

Hydrology was a concern at this site. Watertable close to the surface. Lots of existing alder

Swamp Hardwood

Project Subject/Title: Goodman - Private

County: Marinette

TRS: T 36N r 17w sec 4,9

Contact Person: Karen Gardner, Huber consulting

Year Initiated: 2008 winter harvest

Abstract/Prescription: Strip clearcut

The pre-harvest stand was a about a 60/40 mix of hardwood (y.birch, r.maple, b. ash, s.maple) and softwood (cedar, spruce. b.fir, hemlock). There are 3 strips which I tried to keep about 100-120 feet wide but one of them is wider. So far we are mostly seeing hardwood stump sprouting and advance regeneration. There is a large Tamarack a little to the NW of one of the strips.

Presale Statistics

Acres =

Age=

SI=

Soils= Seeleyville and Markey Muck – depressions in outwash plain, organic, very poorly drained, 0-21 in. muck over sand.

Postsale Stand revisited in 2009 –

Lots of stump sprouts... May be successful because of depth to parent soils

Discussion

Project Subject/Title: Swamp Hardwood Conversion

Contact Person: Colleen Matula – WDNR Silviculturist - 715-274-4138

Abstract: The goal of this project is to find and demonstrate viable management practices to use for conversion of black ash dominated lowlands to other timber species in the event of an Emerald Ash Borer attack. Currently, little has been done on the sites because of failed attempts in regeneration and flooding potential. In the Great Lakes states, there is an urgent need to explore options in converting black ash dominated lowland to other tree species to avoid losing forests.

Trial Location:

County: Sawyer

Township: 42N **Range:** 08W **Section:** 15

GPS Coordinates: Lat: 46°7'7" **Long:** -91°21'24"

Property Name: Uhrenholdt Memorial State Forest

Baseline Stand Data

- *Cover Type:* Swamp Hardwood
- *Acres:* 1-2 acres
- *Habitat Type:* FnAbArOn
- *Soil Type:* Seelyeville and Markey
- *Year of Origin:* 2010
- *Total Height:*
- *Site Index Species and Site Index:*
- *Mean Stand Diameter:*
- *Total Basal Area per Acre:*
- *Other stand Condition:* Northwest corner of stand more wet than the rest of the stand.

The goal of this project is to find and demonstrate viable management practices to use for conversion of black ash-dominated lowlands to other timber species in the event of an Emerald Ash Borer attack. Currently, little has been done on these sites because of failed attempts in regeneration and flooding potential. In the Great Lakes states, there is an urgent need to explore options in converting black ash-dominated lowland to other tree species to avoid loss of forests.

Project Elements and Projected Costs:

1. The site (approximately 1 acre) was previously tag alder and black ash (habitat type FnAbArOn). It was mowed using a fecon mower during the winter of 2009-10. (estimated cost for 8 hours- **\$1500**)
2. After mowing, a plastic mesh fence was constructed around the site to limit or eliminate deer and rabbit browsing. One of the four permanent sample plots will be outside the fence. (estimated cost for 850' of 7' tall fence - **\$2500**)
3. An herbicide application was done in June of 2010 to kill sprouting, herbaceous and grass competition. (estimated cost - **\$160**)
4. Hand planted containerized and bare root seedlings of tamarack, black spruce, and red maple in late August or early September 2010. (estimated cost for labor and travel only (seedlings provided by nursery) - **\$350**)
5. Established four fixed permanent, 1/50th acre plots to record success of planted seedlings and natural seeding and to document any competition. (estimated cost **\$100**)
6. Direct seed site with black spruce and tamarack in late September 2010. (estimated cost **\$100**)
7. Evaluate results in late July 2011. Data such as survival, height growth, browse effects and other factors will be measured. Data will also be compared to other conversion trials established (Phillips School Forest planting in 2009; future trials on state lands established in 2011 if funding is available; future trials on county lands established in the future).
8. Evaluate results in late July 2012. Remove fence after evaluation.
9. Additional plots in other locations will be needed to validate results learned here and will be established in coming years if funding is available.

TOTAL ESTIMATED COST - \$4870

- 12/07/2009: Site approximately 1 acre in size (square/rectangular in shape; wet area to the south of Stand 1 (PW 15+)) selected and cleared using Fecon (140HP). The Fecon was down for several weeks after this due to problems with the starter.

Page 2 – SH Conversion

- 07/20/2010: Sprayed with herbicide mix of Arsenal, Glystar and Chameleon. [80oz of Arsenal Powerline (26.7% isopropylamine salt of imazapyr); 64 oz of Glystar Plus(41% glyphosate); 8 oz of Chameleon (non-ionic spreader sticker – Alkyl polyoxyethylene ethers, polymerized resins and fatty acids)].
- 07/27/2010: Installation of 8ft plastic fence/steel fence posts around perimeter of site. Material cost for fence was \$1186.51, plus about 48 man hours to install.
- Hand sprayed parts of the site with Glystar Plus again to kill areas that were missed during the first application. 9-21-10. Still has some competition that looks to be alive.
- 9-23-10 received 2.5-3 inches of rain. Now has standing water on the NW corner of the site.
- Laid out and hand planted a variety of seedlings 9-27/28-2010 in rows running north to south – about 80 man hours to plant total. Flags placed every 4' between tree rows placed 2'x2'. Planted tamarack 2-0 bare root, tamarack container 6mo

from Toumey, black spruce bare root and container, white pine 3-0 bare root, white spruce 3-0 bare root, black ash 3-0 bare root, yellow birch 2-0 bare root, red maple 2-0 bare root, trembling aspen container 5 mo from Hayward, hemlock 3-0 bare root, will plant balsam 3-0 bare root Minnesota next spring. **Site was extremely rocky and root covered making planting large seedlings difficult.** Planted through water standing on north side which will probably kill those seedlings. Planting quality on the larger seedlings was questionable. Row by row inventory of planted seedlings was taken 10-5-10 by Dave and Gordy recording heights of every 6th seedlings and if it was on a dry, wet, or underwater site. Less water was evident on the site compared to the day of planting.

Discussion

Follow up is needed at this site since the primary investigator retired.

In a 2012 site visit, the tamarack seedlings survival were very successful and about 3 feet in height. Other seedlings such as no.white cedar, black spruce and yellow birch were surviving but no record of growth.

This soil profile of this site exhibited a shallow organic muck layer over sandy outwash/loam. This soil profile may be conducive to limiting flooding at the site since no swamping was observed over the few years of observation.

Seedlings that were planted included; tamarack 2-0 bare root, tamarack container 6 months, black spruce bare root and container, white pine 3-0 bare root, white spruce 3-0 bare root, black ash 3-0 bare root, yellow birch 2-0 bare root, red maple 2-0 bare root, trembling aspen container 5 months, hemlock 3-0 bare root and balsam fir 3-0 bare root.

- *Data Collection Methods:*

Row by row inventory of planted seedlings was taken a week after the planting in 2010. The height of every 6th seedling was recorded and if it was dry or not. In 2012 the site was revisited and an ocular assessment was done. The site was revisited again in 2014 and an estimate of seedling survival was taken as well as average height of the seedlings in every row.

Results: (as of August 2014)

Species	Survival %	Average Height (ft.)	Height Range (ft.)
Red Maple	47%	3.1'	1-6'
Yellow Birch	37%	3.9'	2-6'
Trembling Aspen	37%	1'	1-2'
Black Ash	77%	2.9'	2-5'
White Pine	83%	3.3'	2-5'
Balsam Fir	0%	-	-
Tamarack (Container)	92%	5.9'	2-10'
Tamarack (Bare Root)	90%	5.3'	2-8'

Black Spruce(Container)	73%	3.7'	1-6.5'
Black Spruce (Bare Root)	66%	3.4'	1-5.5'
White Spruce	58%	2.9'	1.5-4.5'
Hemlock	35%	1.7'	1-3'

Discussion/Recommendations: Survival and growth of the conifers was superior to that of the deciduous tree species. The fence had been knocked down prior to the visit in 2014. Deer browsing was observed and had more of an effect on the deciduous seedlings. Sedges were dominant throughout the site, especially in the wetter areas. Tree survival and growth was better on the dryer areas. Natural seeding of red maple and white pine were present throughout the site.

Project Subject/Title: Swamp Hardwood Uneven-age Trial - Net Zero

County: Oneida

TRS: T36N, R4E Sec. 35

Contact Person: Woodruff WDNR forester, Woodruff

Type of Prescription: Single Tree Selection with Gaps

Year Initiated: 2010

Abstract:

In 2010, a 30 acre swamp hardwood stand was marked for a thinning. This stand was part of a larger timber sale, the bulk of it being an upland northern hardwood thinning. The total timber sale area was 139 acres (see attached map).

This 30 acre swamp hardwood stand is an even-aged stand, with a year of origin of 1930. From the 10 recon plots taken, it was a 100% black ash poletimber stand. Average height of black ash present was 64 feet tall. The site index of the stand was 46. The stocking of the stand at the time of recon was 118 square feet BA/acre. Trees tallied averaged 3-4 sticks. Average diameter of the stand was 7" DBH. The canopy of the stand was closed. There was little to no woody understory present, including alder. Rennhak Creek, a non-navigable stream with no defined bed or bank, ran through the length of the stand. An estimate of 8 cords/acre was to be harvested from this stand.

The prescription for a SH stand in the Silvicultural Handbook with a SI of 46 is to make partial cuts when stocking reaches 100 sq. ft. BA/acre. The Generally Accepted Practice is to manage the stand as all-aged, with an upper diameter of 12" DBH. General Technical Report, NC-115, "Managing Black Ash in the Lake States" recommended the creation of canopy gaps to encourage black ash regeneration, in addition to the thinning.

Prescription:

1. The stand was marked using individual tree selection, with a target BA/acre of 80 square feet.
2. The goal was to leave about 10 sq. ft. BA/ac in each diameter from 5" through 12" DBH (table 46-1, Silvicultural Handbook).
3. All trees larger than 12" DBH were cut (except for several den trees).
4. A 50-foot pre-established canopy gap per acre was created to encourage ash regeneration (and to be honest, to cut some volume from this stand).
5. An attempt to delineate the creek for BMPs with a green paint line failed, as the creek dropped underground repeatedly.

Results: The sale was sold in March of 2012 and harvested in February 2013 – in 10 days. The stand was linear in nature with a total length of ½ mile and an average width of 5 chains (see map). Two dangle head 6 wheeled Caterpillar 550 processors harvested the trees (see pictures below). A double bunk 6 wheeled Caterpillar 574 forwarder was used to forward the wood out of the stand. The harvesters had tracks in place on the boggy axels of the machines. The forwarder had tracks on the rear tandem axels of the machine. The processor built 8-9' wide skid lanes perpendicular to the length of the stand every 25 feet. The operators cut trees and used the tops as a travel mat for the processor and forwarder. With this harvesting method, they repeatedly crossed the frozen creek without breaking through the soil or ice. Rutting was extremely minimal, with no ruts

meeting the BMP definition. A freeze road for skidding was constructed along the west edge of the stand in the alder for the length of the stand.

Discussion/Recommendations:

- Residual basal area/acre following the harvest was 85 square feet.
- The canopy gaps were clean cut and averaged 50 - 66 feet in diameter.
- Very little damage was done to residual trees
- Little to no rutting occurred, even with the presence of a creek
- A thinning cut of 8 cords per acre in a SH stand can be operable, depending on the stand
- With the sale just being cut this month, it is too early to determine the results of the trial. It is not anticipated that the thinning will cause appreciable diameter growth in remaining stems. While most remaining stems have been crown released, tops are extremely small. The belief is that these trees are meant to “wick up water” to prevent the stand from swamping on this wet site until advance regeneration is established. It remains to be seen if canopy gaps will allow for the establishment of advance regeneration, or if alder will take over the openings.

