

# 2017 – 2042 Forest Management Plan J.D. Irving Northern Maine Woodlands

## **Public Summary**

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IRVING WOODLANDS, LLC

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## SUMMARY

This document outlines a forest management strategy for J.D. Irving's Northern Maine Woodlands that is ecologically sustainable, economically viable and socially responsible; while achieving the landowner's objectives. The forest management strategy is fully aligned with the Maine Forest Service's Outcome Based Forestry (OBF) policy.

This management plan utilized 2015 LiDAR data, updated forest activity and inventory information, Remsoft™ wood supply/optimization models, and expert field knowledge to develop a 100-year strategy meeting specific management and OBF objectives, and Forest Stewardship Council® (FSC® C041515) and Sustainable Forestry Initiative® (SFI®) certification requirements. Ten years of this strategy (2017-2026) have been spatially mapped, providing the basis for our short term annual operating plans.

Operational and technological advances in forestry practices have been incorporated into this management plan. The forest inventory has been updated using 2015 LiDAR data, and all harvest and silviculture activity has been updated to January 1, 2017. Our growth and yield expectations have been updated using the most recent (2016) ground plot data available. A wide array of even-aged and uneven-aged treatment options were used to meet the stand and forest level objectives.

These northern Maine woodlands are managed to achieve economic, social, environmental and ecological objectives. The forest has been zoned into the general forest, where timber production is a primary objective, and special management zones including unique sites, deer wintering areas, and mapped riparian zones, each of which has specific environmental, habitat or social objectives. These mapped special management zones make up more than 19% of the total land base area. In addition, there are many features that are presently not mapped, including small streams, nest and den sites, rare plant sites, etc., which are conserved and protected through our management.

The following summarizes the key results of this 2017-2042 management plan:

- The sustainable Spruce-Fir Annual Allowable Cut (AAC) level after all operational net-downs is 585,000 m<sup>3</sup>/year. This is made up from several distinct zones: 334,000 m<sup>3</sup>/year from mature natural stands in the general forest, 166,000 m<sup>3</sup>/year from managed stands, and 85,000 m<sup>3</sup>/year from special management areas. These AACs are based upon utilizing all harvested merchantable trees down to an 8 cm (inside bark) top size.
- In the longer term, the sustainable Spruce-Fir harvest level will increase to 630,000 m<sup>3</sup>/year by year 2032, and to 790,000 m<sup>3</sup>/year by year 2037.
- The Hardwood AAC is 440,000 m<sup>3</sup>/year. This is a long term sustainable level.
- The long term sustainable AAC levels of saw material for Cedar is 61,000 m<sup>3</sup>/year and for white pine is 6,000 m<sup>3</sup>/year. It is important to note that these species may fluctuate on an annual basis resulting from “fallout” of the actual harvest prescriptions.

- Harvesting in managed stands (planted areas and pre-commercially thinned areas) will be steadily increasing over the duration of this management plan. A 1,460 ha/year commercial thinning level and 590 ha/year of clear cut harvesting is initially planned for managed stands during the first five years (2017-2022) of this management plan.
- A commitment to undertake suitable tree planting and pre-commercial thinning of natural regeneration (PCT) programs is imperative to ensure the sustainability of the short and long term AAC for Spruce-Fir. This management plan includes a planting program of 2,000 ha/year and a pre-commercial thinning program of 1,300 ha/year.
- Table (1) outlines the AAC summarized by species group for each forest management zone on the land base over the next ten years.

Table 1. Summary of AAC harvest volumes (m<sup>3</sup>/year) by forest zone and species group.

Forest Zone	SF (m <sup>3</sup> /yr)	Hwd (m <sup>3</sup> /yr)	Wp (m <sup>3</sup> /yr)	Cedar (m <sup>3</sup> /yr)	Other Sw (m <sup>3</sup> /yr)
<b>General Forest</b>					
Cc Natural Stands	184,000	139,000	2,000	17,000	7,000
Non-cc Natural Stands	144,000	236,000	1,000	26,000	9,000
CT Planted stand	45,000	1,000	0	0	0
CT PCT stand	48,000	2,000	0	0	0
CC Planted stand	8,000	1,000	0	0	0
CC Pct Stand	65,000	10,000	2,000	1,000	1,000
Slope Harvest	6,000	10,000	0	0	0
<b>Conservation Forest</b>					
R. Buffer Harvest	35,000	15,000	0	8,000	1,000
DWA Harvest	40,000	20,000	1,000	7,000	1,000
Inoperable Harvest	2,000	2,000	0	1,000	0
Unique Site Harvest	2,000	0	0	0	0
Late Success Harvest	6,000	4,000	0	1,000	0
<b>Total(s)</b>	<b>585,000</b>	<b>440,000</b>	<b>6,000</b>	<b>61,000</b>	<b>19,000</b>

The strategies and policies incorporated into this management plan are designed to achieve the Landowner’s objectives, the State of Maine’s Outcome Based Forestry objectives, and FSC<sup>®</sup> and SFI forest certification goals and objectives. We are utilizing the best scientific knowledge and insights available today. We implement these strategies daily over a complex set of conditions and circumstances. We are confident this management plan can be operationally executed on the ground. We are proud of this management plan and we feel that it is environmentally, economically, and socially responsible.

***J.D. Irving, Limited***  
***September 2017***

## LANDOWNER COMMITMENT

J.D. Irving, Limited and its affiliated and subsidiary land ownership or forest management companies are committed to responsible and sustainable forest management. We want to be known as good stewards of natural resources, and wildlife. We are committed to meeting all legal requirements in every jurisdiction that we operate. We want to be partners with our workers, contractors, suppliers and customers. We will try to be good neighbors and we will actively work to support our communities. We will provide traditional recreational opportunities on our lands that do not conflict with or compromise our goals and objectives.

- **Outcome Based Forest Management:**

We are committed to meeting all terms and requirements related to our Outcome-Based Forest Management Agreement with the Maine Department of Agriculture, Conservation, and Forestry. This includes compliance with the State’s criteria, goals, and outcomes of forest sustainability; and conforms to a recognized third-party forest certificated standard.

- **Third Party Certification:**

We appreciate, and we believe that independent third-party verification of our forest management is important for public credibility and confidence. We intend to maintain both our Forest Stewardship Council® (FSC®) and our Sustainable Forestry Initiative (SFI) certifications for our Maine timberlands. We also intend to maintain an effective and verified ISO 14001 registration for all our operations and all the lands we manage. While at the present time we are not aware of any conflicts between any of the certification standards we utilize, and the laws or regulations where we operate; should any such conflict arise, we will bring it to the attention of both our certifier and the certification body. We are committed to track the origin of our forest products in an independent third party verified “chain-of-custody” system.

- **Management Planning and Implementation:**

We are committed to developing technologically advanced Management Plans for every land base that we own or manage. The primary purpose of these Management Plans is to determine an ecologically sound, economically appropriate, and socially responsible management strategy for the local area. Each Plan will establish habitat and biodiversity objectives and constraints. The Management Plan will determine a sustainable harvest level for each major tree species group, along with harvest and intensive silviculture treatment levels.

We will review and revise our Management Plans periodically, or when there has been a significant change to the assumptions of our Plan (sale or purchase of lands, mill closures, catastrophic occurrence, etc.).

We are committed to respecting the harvest and silviculture levels and other major provisions of our current Management Plans. While there may be annual variations due to market conditions, mill schedules, or other economic constraints; we will balance harvest and silviculture levels over at least a ten-year time frame.

- **Forest Inventory, Health, Growth and Yield:**

We are committed to improving the growth and long-term yield from the lands we own. We will work actively to maintain our lands in a healthy condition, relatively free of disease or insect infestation. We will be vigilant in forest fire preparedness, readiness and response.

We will continuously monitor forest health, development, growth and yield on our lands. This will be achieved through staff training and observation, regular aerial reconnaissance, and an intensive ground sampling program.

We will maintain expert staff focused on maintaining our forest inventory accurate and precise. We are committed to continue to be recognized as leaders within the fields of GIS, forest modeling, intensive silviculture, forest mensuration, growth and yield, and tree improvement.

- **Continuous Improvement:**

We are committed to continuously improving every aspect of our management and our operations. We will monitor, measure, and report on our performance and our improvement.

We will follow “Lean”, “Six Sigma” and “DMAIC” methodologies to drive and sustain improvements. We will follow a management system and dedicate significant staff resources to finding and implementing continuous improvement.

- **Public Monitoring Summary**

Each year we will make available a comprehensive public summary of our management activities and the state of our forest inventory and habitats on our Maine Timberlands.

## FOREST MANAGEMENT OBJECTIVES

Our key strategies and objectives are:

- Ensure our management is fully aligned with J.D. Irving Limited's Company objectives, Best Management Practices, and Standard Operating Procedures.
- Ensure our management is fully consistent and is on track to meet the goals and objectives of our Outcome Based Forestry Agreement with the Maine Forest Service. These criteria are:
  - ✓ Soil productivity
    - Standard operating procedures have been established for all harvest and road construction operations to avoid significant reduction to site productivity.
  - ✓ Water quality, wetlands and riparian zones
    - Standard operating procedures have been established to protect water quality and aquatic habitats during our harvest and road construction operations. These procedures meet or exceed current regulatory guidelines.
  - ✓ Timber supply and quality
    - Our timber supply objective is to maximize the long-term sustainable flow of quality timber products from the lands we manage.
    - Our timber quality objective is focused on growing high quality, saw log and veneer products. This includes:
      - Spruce and Balsam Fir trees of sufficient soundness and stem size will be directed to the manufacturing of dimensional lumber.,
      - Sugar Maple, Yellow Birch, White Birch, Ash, and Red Maple will be managed and merchandized to produce saw logs and veneer grade products.
      - White Pine and Cedar will be merchandized to produce solid wood products.
  - ✓ Biological diversity
    - Maintain an appropriate balance of forest cover types and age class distribution.
    - We have reviewed all of our lands for the occurrence of rare or outstanding features, representing important key habitats. These sites have been catalogued and best management strategies have been developed to protect their unique characteristics.

- Our harvesting operation sites are screened to identify special wildlife habitats, rare plants and other unique landscape features for retention during harvesting operations.
  - All identified Deer Wintering Areas (DWA) are managed consistent with habitat objectives developed in consultation with Maine’s Inland Fisheries and Wildlife Department.
  - All clear-cutting activities are conducted for sound silvicultural reasons and will be ecologically appropriate for the site.
  - A proportion of the land base must be maintained in “old forest” conditions meeting specific wildlife and habitat requirements.
- ✓ Economic and social considerations
- Our management activities will provide wood to our mills and other regional mills at costs allowing for competitive manufacturing.
  - We have an established stakeholder committee made up of a wide spectrum of public interest groups.
  - We will continue to provide historic and traditional recreational opportunities that do not conflict with our management objectives and values.
- ✓ Forest health
- Protecting the forest from fire, insects, and disease is a fundamental component of our management program.
  - We are committed to investments in tree planting, pre-commercial thinning (PCT), and silvicultural stand improvement treatments to ensure the long-term health and sustainability of the lands we manage.
- ✓ Non-timber forest products
- Non-timber forest products are utilized when their use does not compromise other forest management objectives. Examples include; gravel, ash for basket making, burls, mushrooms, and fiddleheads.
- ✓ Aesthetics
- We will consider and incorporate aesthetics in our management activities where visual impacts may be of concern.
- ✓ Public accountability
- We maintain independent third-party certification on the lands we manage.

## LAND BASE DESCRIPTION

### OVERVIEW

The forestland managed by Irving Woodlands LLC in Northern Maine is approximately 519,000 hectares. The property stretches from the western border with Quebec and to the eastern border with New Brunswick, with the majority of the land being in Aroostook County. The Maine lands under management by Irving Woodlands are shown below (Figure 1) by percent Irving Woodlands ownership class.

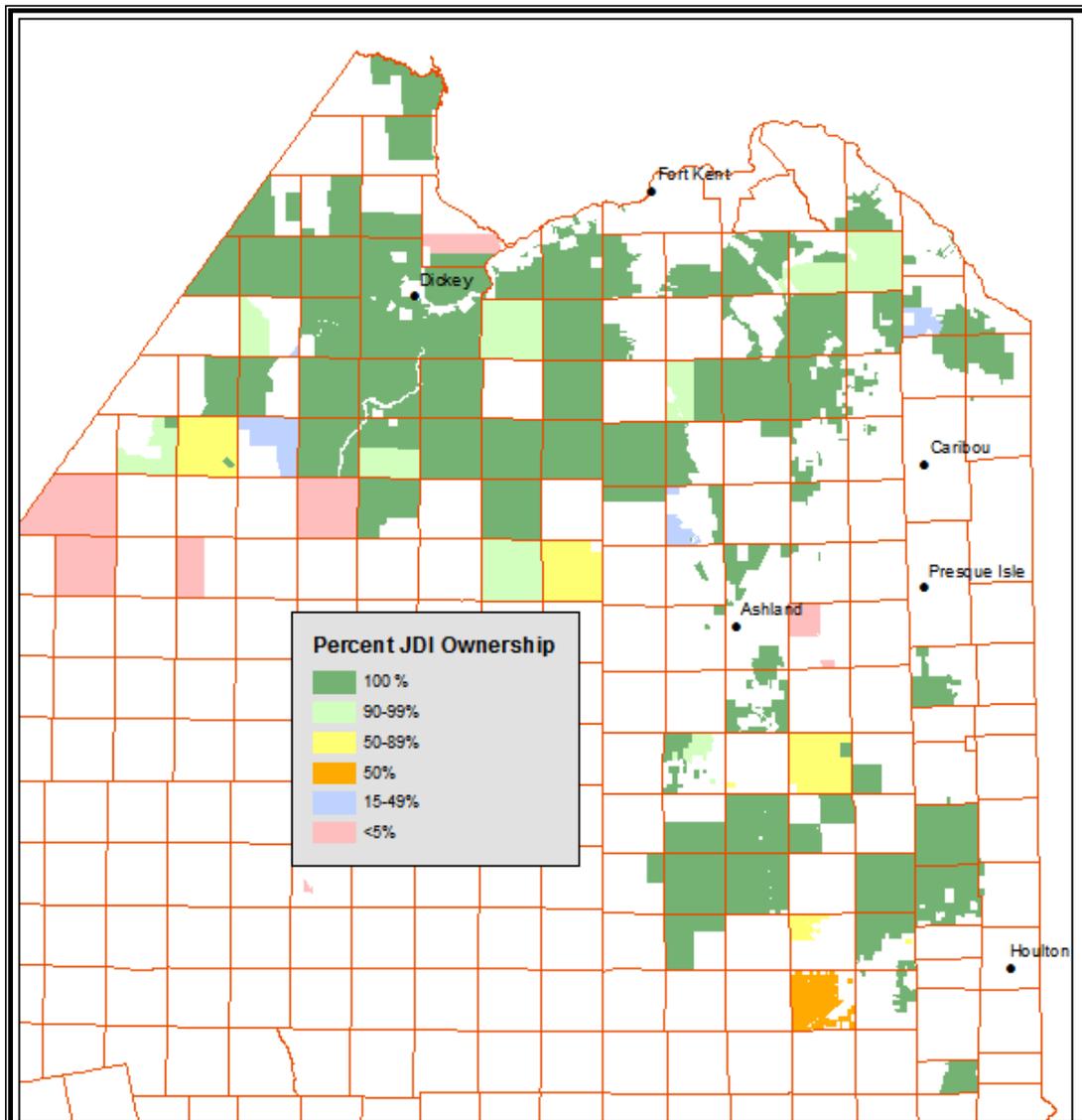


Figure 1. JD Irving, Limited's percent ownership of freehold lands in northern Maine.

## THE FOREST

Approximately 95 percent of the GIS mapped JDI Maine land base (519,000 hectares) is productive forest land. The remaining lands include non-forest areas such as roads, water, wetlands, and other enduring features (Figure 2).

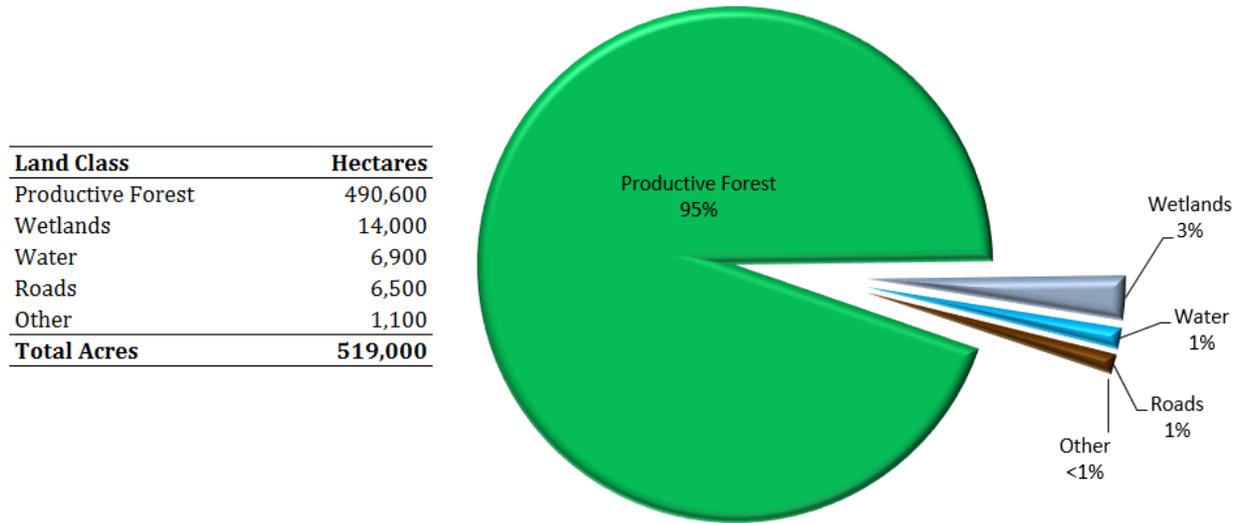


Figure 2. Summary of total area by land class managed by JD Irving in Northern Maine.

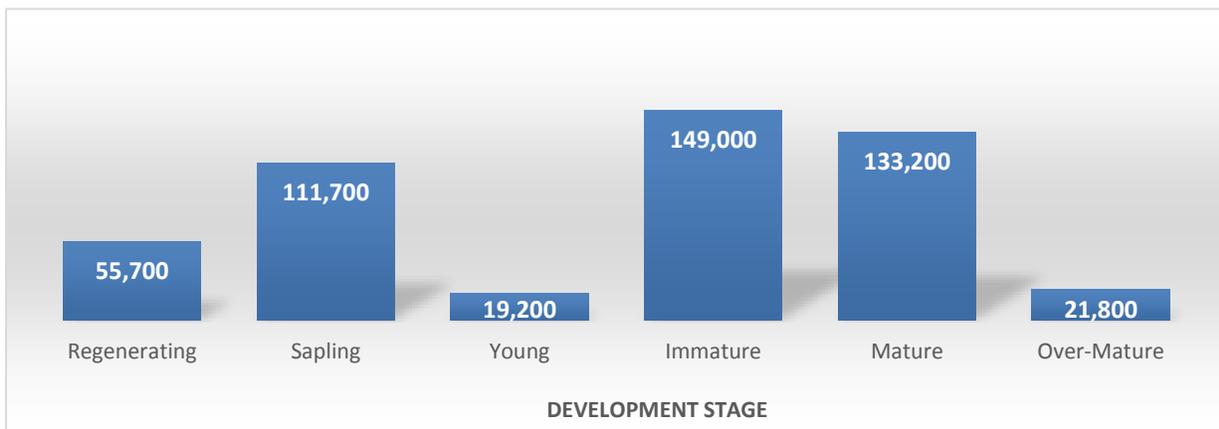


Figure 3. Area in the productive forest land base by development stage.

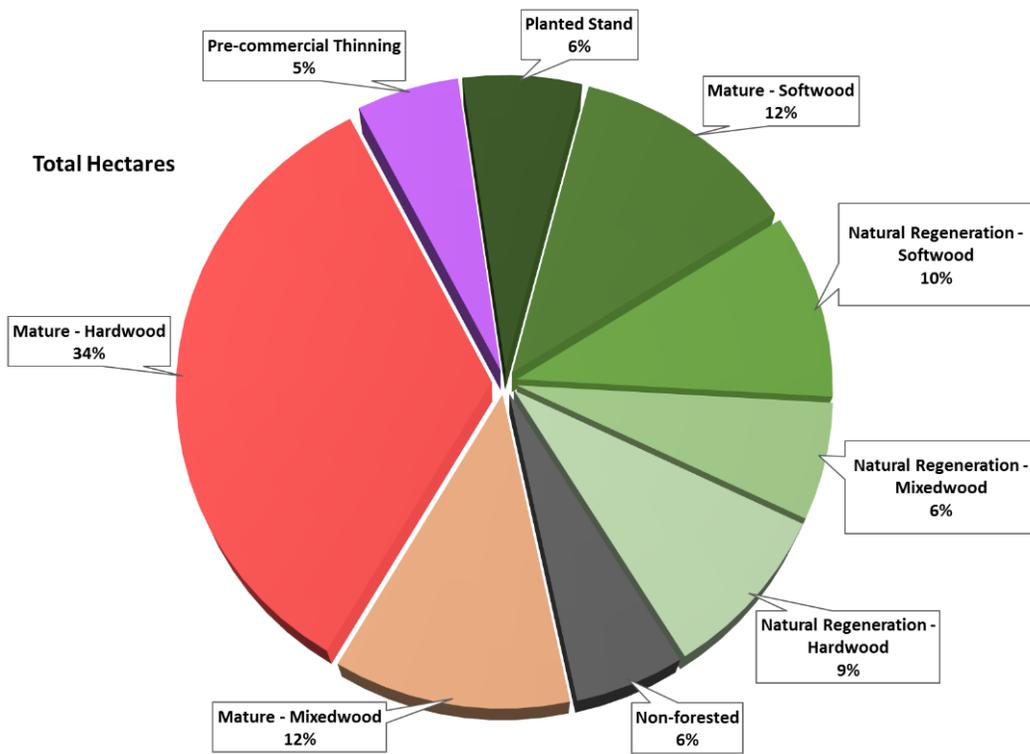


Figure 4. Distribution of forest area (hectares) by broad forest stand types.

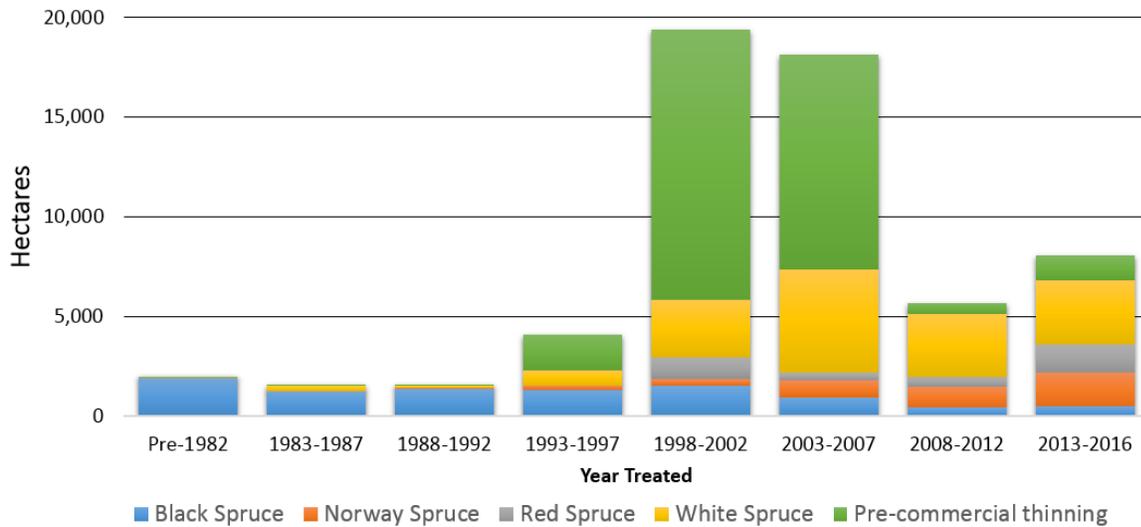


Figure 5. Distribution of planted stands by species and PCT by treatment year.

Table 2. Summary of planted stands (by species) and PCT by treatment year.

Years	Planted Species				Pre-Commercial Thinnings	Total Ha
	BS	NS	RS	WS		
Pre-1982	1,875	0	7	3	39	1,924
1983-87	1,192	3	53	285	12	1,545
1988-92	1,350	53	4	107	93	1,607
1993-97	1,318	219	1	768	1,769	4,076
1998-02	1,542	293	1,106	2,876	13,559	19,376
2003-07	945	832	400	5,195	10,769	18,141
2008-12	460	990	508	3,160	558	5,676
2013-16	476	1,703	1,444	3,178	1,252	8,053
<b>Total Ha</b>	<b>9,159</b>	<b>4,093</b>	<b>3,523</b>	<b>15,571</b>	<b>28,051</b>	<b>60,397</b>

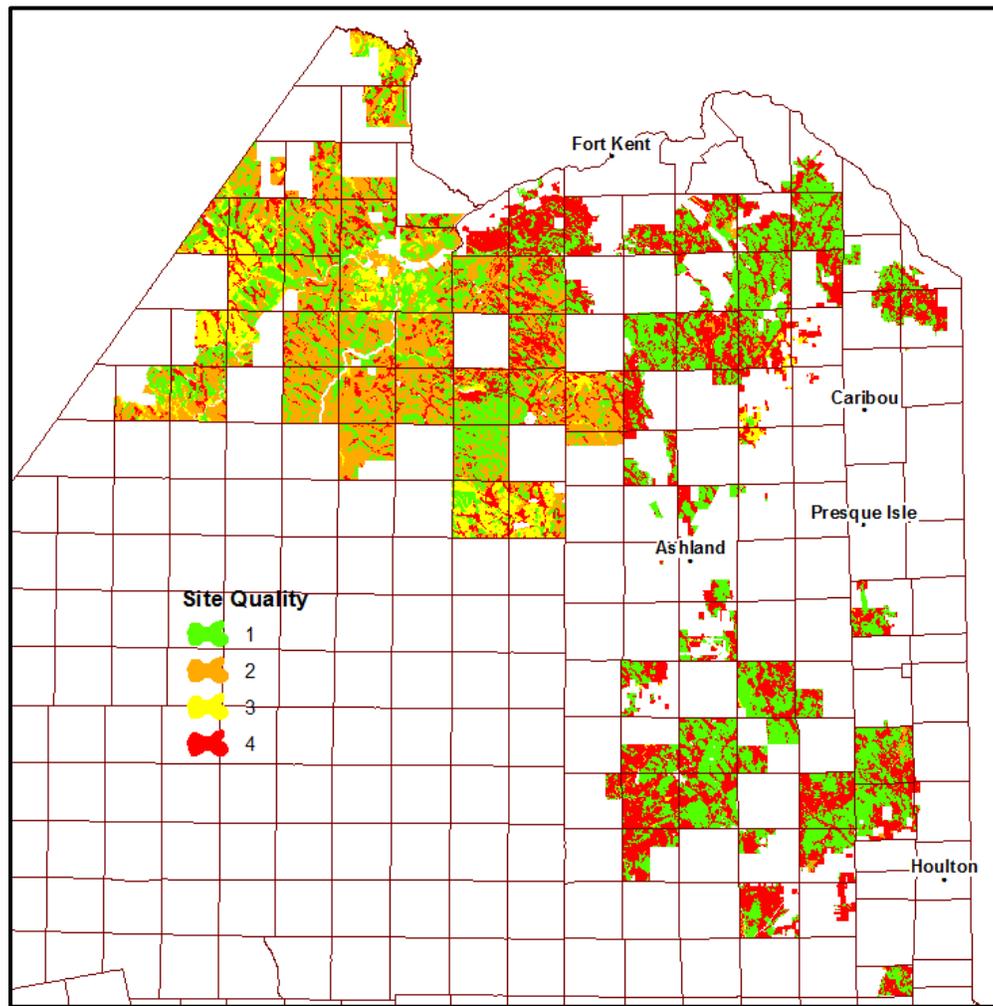


Figure 6. Site classification distribution for land JDI manages in northern Maine.

## ZONING

Although the forest can be divided between productive and non-productive zones, it can also be described in terms of management objectives. For this management plan, the zone being managed primarily for timber production and utilization is referred to as the General Forest and makes up 81% of the forest area (Figure 10). Approximately 79% of this zone is “operable” using conventional harvest systems. Another 1.2% is on steep slopes greater than 40% (6,400 hectares) requiring specialized harvest methods and equipment, while an additional 1.4% (7,200 hectares) has restricted operability due to low volumes, wet sites, or is inaccessible.

Likewise, Special Management Zones, where objectives other than timber determine management activities, account for 19% of the land base (Figure 10 and Table 5). These special management zones include:

- Mapped Riparian zones – The Riparian zone has a primary objective of protecting water quality and maintaining wildlife corridors. It is important to note that there is also a large area of unmapped watercourse buffer zones (that are accounted for as part of the within block net-down).
- Deer wintering areas (DWA) – The DWA zone represents areas with a primary wildlife habitat objective, and more specifically is made up of areas that provide moderate thermal winter cover. These DWA zones are actively managed based on an area-by-area basis and detailed plans.
- Unique Sites – Each site has a unique feature with the primary objective being the protection of that feature.
- Late Successional Areas – The primary objective of late-successional (older growth) area is to maintain a minimum component of certain, specific long-lived stand types within our management areas. These long-lived types include tolerant hardwood, tolerant mixed-wood, Cedar, Pine-Hemlock, and softwood stands.

These management zones are not mutually exclusive. For example, DWA zones that overlap with riparian zones would be classified as riparian zones since riparian zones have a higher reservation priority on JDI land bases. There is a total of 7 management zones on the JDI Maine woodlands.

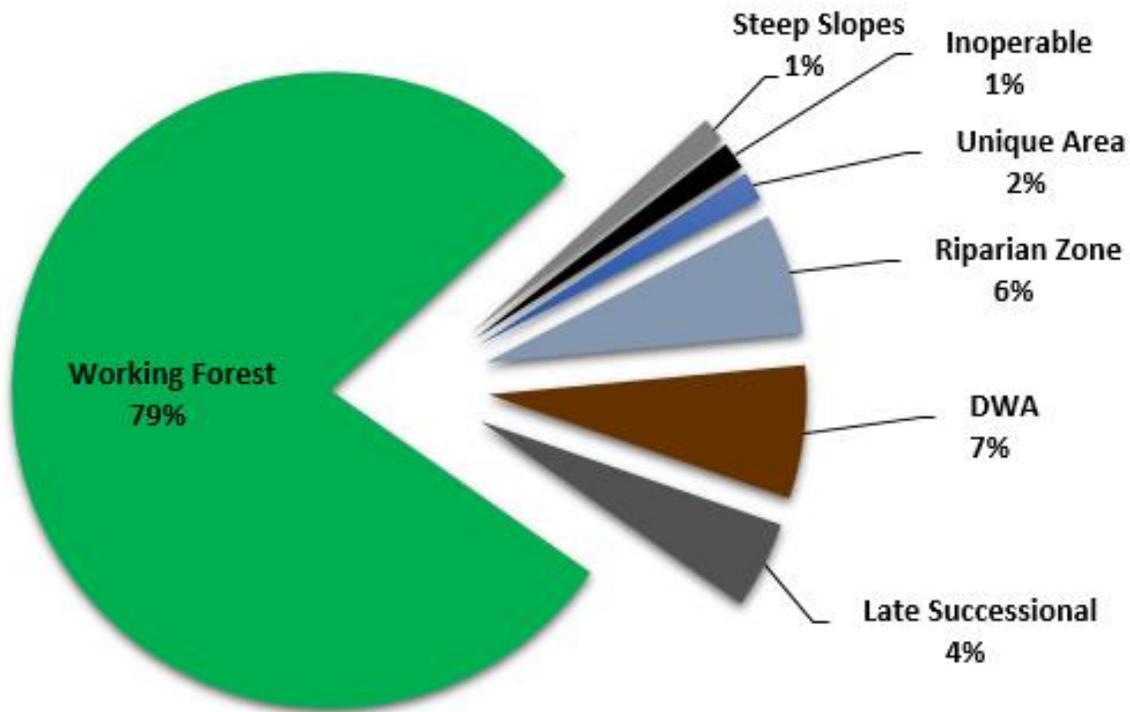


Figure 7. Area distribution by forest Management Zone.

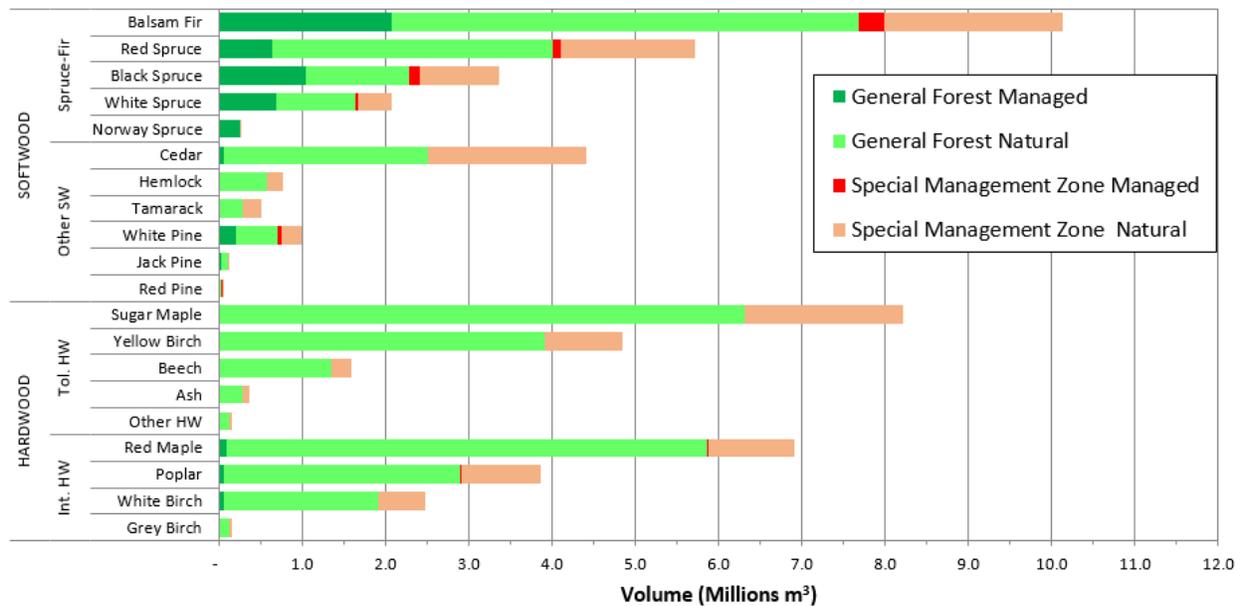


Figure 8. Distribution of merchantable growing stock (m<sup>3</sup>) by species, forest type, and management zone.

## SPECIAL MANAGEMENT ZONES

Special management zones, where objectives other than timber guide management activities, account for 19% of the land base in Maine. These zones include Deer Wintering Areas (7%), mapped Riparian Buffers (6%), Unique Areas (2%) and Late Successional Areas (4%).

### DEER WINTERING AREAS (DWA)

DWA have been the subject of a regulatory protection program under the Land Use Planning Commission (LUPC) since the early 1970s. This program has substantial weaknesses from both the landowner's and public agency's perspectives. The resolution is the creation of cooperative agreements between Irving Woodlands and the Maine Department of Inland Fisheries and Wildlife (IF&W) on a land base larger than the core areas previously zoned by LUPC. These agreements have:

- Identified broader areas of deer usage using historic data and observation information not allowed under the regulatory program.
- Allowed Irving Woodlands and IF&W to mutually agree to management objectives (spatial cover objectives over long time periods).
- Allowed fewer regulatory hurdles to conducting timber management operations.

The primary objective of these agreements will be to provide adequate, long-term wintering habitat for deer. Our current cooperative DWA management area is 32,985 hectares.

### UNIQUE AREAS PROGRAM

Our company's unique areas program accounts for 7,720 hectares in Maine which has evolved from Maine Natural Areas Program (MNAP), the original critical areas program of the early 1970s. These sites range from native burial sites, to rare or special plant communities. Each area will be managed to protect the value of the site. We have completed a thorough review of our forest holdings for special plant communities in partnership with MNAP, and continue to work with MNAP when new areas are identified. The purpose of this partnership is to assist MNAP in conducting a high quality Landscape Analysis to identify areas likely to support rare natural communities, outstanding examples of common communities, and/or habitat for rare plants. Our role in this effort has been to provide detailed maps and photos, GIS technical assistance and support, and financial assistance to MNAP. We annually petition the Maine Historic Preservation Commission (made of members from University of Maine, Maine State Museum, Department of Conservation and citizens with expertise in historic preservation) for information of any new sites of cultural, historical or archeological significance that may have been detected on our lands.

## **RIPARIAN ZONES**

Forest management activities around wetlands, watercourses and within riparian zones will meet or exceed all regulatory standards. Operations will be conducted under the following principles:

- Irving Woodlands will effectively implement company best practices to protect water quality and aquatic habitats.
- Watercourses other than P-GP and P-SL1 districts will have a 30-meter special management zone along all mapped watercourses, with no clear-cut openings within 15 meters of a mapped watercourse.
- We will consider input from external stakeholder groups regarding restoration of aquatic habitat.
- We will maintain a 30-meter special management zone along all mapped non-forested wetlands greater than 2 hectares in size, with no clear-cut openings within 15 meters of a mapped wetland.
- Identified vernal pools will be protected according to the “Forestry habitat management guidelines for vernal pool wildlife”.

For management planning purposes, the most accurate mapped representation of these streams is the USGS 7.5-minute maps. Both DEP and LUPC have endorsed this level of mapped brooks and streams as the most important needing enhanced protection. Our riparian policy covers the USGS mapped streams and additional unmapped brooks we have determined on the ground. The riparian zone will be configured to the local terrain and conditions, which may vary from a strict perpendicular measurement. Presently, the total area in mapped riparian zones is 38,040 hectares, which represents over 7% of the entire land base.

## **LATE SUCCESSIONAL AREAS**

This management plan addresses the maintenance of the diversity of forest ecosystems through five forest community types which represent the range of important naturally occurring forest types on the land base (Table 3). As outlined in our JDI Late-Successional Forest Policy, we are planning to maintain our land base such that 10% of the defined forest types are maintained in an Old or Very Old category. More specifically, 3% will be maintained or managed to the Very Old Category while the remaining 7% to the Old category. Specific targets for each of the five communities have been established for the JDI Maine land base (table 3).

Table 3. Summary of the five late-successional forest communities community identified spatially.

	Late Successional Type	Maine (Target)		Mapped	
		Old	Very Old	Old	Very Old
MAINE	Pure Tolerant Hardwood	5,561	2,383	4,793	3,144
	Tolerant Hd Mixedwood	1,745	748	1,748	753
	Cedar	3,323	1,424	3,320	1,426
	Pine - Hemlock	92	39	110	36
	Softwood	7,145	3,062	7,147	3,065
	<b>Total Hectares</b>	<b>17,866</b>	<b>7,656</b>	<b>17,118</b>	<b>8,424</b>

## PUBLIC INPUT AND ACCESS POLICIES

Public input is incorporated into our management planning from a number of different avenues. We have an organized stakeholders group made up of local business owners, government agencies, environmental groups, outdoorsmen, neighbors and other interested parties. This group meets numerous times annually. Other important public input is received through day to day communication, conversations with concerned citizens, complaints, and through meetings with local government and community professionals.

Approximately sixty percent of the lands west of Route #11 and south of route #161, are part of the nonprofit cooperative recreational management North Maine Woods (NMW) program. The NMW area is a cooperative program organized by major private forest landowners and the State Agencies with natural resource responsibilities. The simple objective is to provide quality recreational opportunities on forestlands under active forest management. The program has been in place since 1965. Controlled gate access to the area under NMW management is in place. There are several purposes for these gates;

- to collect user fees to support the operation of the program and maintenance of recreational facilities,
- to monitor visitor locations for their own personal safety, and
- to provide some level of control regarding forest fire protection and vandalism.

On Irving Woodlands ownership outside the NMW program, access and recreational activities are also supported. A more fragmented ownership with many intersecting public roads makes a NMW gate system impractical in these areas.

## HARVEST PRESCRIPTIONS

The harvest prescriptions we utilize sort into two distinct groups:

1. **Even-aged Management:** prescriptions where the forest stand is managed as predominantly one or two age-classes, and where the stand is ultimately replaced with a young age-class. This grouping includes the regeneration systems of clear-cutting, over-story removal and shelterwood harvest, as well as intermediate treatments such as commercial thinning. Even though these treatments are categorized as even-aged, they often include the management and maintenance of two-storied or three-storied stands. Below is the array of prescriptions under this grouping:
  - **Clear-cuts:** Removes most of the merchantable stems of all species within the definition of operability. The treatment is generally applied in mature to over-mature stands and leads to the creation of new, even-aged stands through either natural regeneration, planted trees, or a combination of both. Operational variations include leaving residual islands or patches of standing timber largely for wildlife purposes and defining block boundaries and shapes to be less square and angular and better fitting to natural stand boundaries. We have described these modifications under the term – variable retention clear-cuts.
  - **Over Story Removal:** Over story removal harvest prescriptions remove most of the merchantable stems of all species in a single treatment entry. This even aged management prescription is targeted to protect and release well established regeneration in the under story. Tree planting is not required following an over story removal harvest.
  - **Commercial Thinning:** Commercial thinning is generally prescribed in planted stands or previously pre-commercially thinned areas. The primary objective of this treatment is to remove a portion of the trees, usually focusing on lower quality stems, in order to allow the remaining trees to continue growing vigorously. This prescription generally removes 40-60% of the merchantable volume. Depending upon the species, density, and site productivity, commercial thinning may be prescribed in stands varying from 18 to 30 years old. Once a stand has been commercially thinned, it is locked out from harvest eligibility for at least the next 10-year period.
  - **Shelterwood Prescriptions:** Shelterwood treatments are often practiced in stands with a goal of promoting understory trees, natural regeneration and/or salvaging imminent mortality. In most situations, this prescription is even aged management. Depending upon the specific shelterwood prescriptions, 40% to 70% of the standing volume may be removed in the first pass, focusing on the lower quality and less vigorous trees. The second entry is normally delayed by 10 to 25 years, depending upon the specific stand conditions and objectives. There are some variations on the standard shelterwood that may be prescribed in specific circumstances in including irregular shelterwood and some group selection methods (see Table Z for more detailed criteria).

2. **Uneven-aged management:** prescriptions where the forest is managed to maintain and expand several age classes with an objective to retain a forest canopy indefinitely. This grouping typically includes individual tree selection and riparian zone treatments. Where a truly balanced uneven aged forest can be created, it will be pursued. But some forest conditions under these prescriptions will indefinitely maintain a dominant development. The array of prescriptions under this grouping includes:
- **Riparian – Selection Harvest:** The purpose of selection harvesting in riparian stands is to regenerate and maintain an uneven-aged forest structure. This prescription typically occurs in riparian zones but may also occur in areas deemed special management zones.
  - **Single Tree Selection:** Single tree selection harvest is usually classical uneven-aged management. Ideally, this prescription targets tolerant hardwood, tolerant mixed wood or any cedar dominated stands. Sometimes it may also be used in stands with significant components of Red Spruce. In addition, harvesting in riparian zones, recreational, aesthetically important, or other constrained zones may require that a single tree selection treatment is utilized. Typically, uneven aged management may remove 40% of the stand volume each entry, depending upon the specific stand condition with subsequent entries separated by 20 to 30 years. The objective of the single tree selection treatment is generally to develop a full range of age and diameter classes in the stand; as well as to provide a suitable diversity of tree species at all times.

Harvest treatments are performed using the following harvesting systems (See BMP's for machine selection process and harvest techniques):

- **Mechanical Harvester Single Grip (MHS):** MHS harvesting incorporates various at-the-stump processors combined with forwarders (porters) used to transport wood to the roadside.
- **Mechanical Full Tree (MFT) Harvesting:** MFT harvest systems utilize a fellerbuncher, grapple skidder, delimeter, slasher, chipper, and grinder combinations.
- **Mechanical Processor in Box (MPB) Harvesting:** MFB harvest systems utilize a fellerbuncher, grapple skidder, processor, chipper, and grinder combinations.
- **Mechanical Processor at Roadside (MPR) Harvesting:** MPR harvest systems utilize a fellerbuncher, grapple skidder, delimeter, chipper, and grinder combinations.
- **Conventional Hand Crews:** Rare occasion for specialty items. Conventional logging utilizes a cable skidder with a man and chainsaw.