

New 2018/19	Value	Objective	Indicator	Indicator		Forest Management Plan Target	PFMS - Projections			Assessment	Monitoring	Reporting
				Plan Start	Goal Level		Short (0-5 years)	Medium (6-10 years)	Long (10+ years)			
1	2018/19	Biological Diversity	Softwood forest area within each of the three forest sections on the FM, respectively, which are Seaboard/mean River (SR), Higrock (HR), and Nelson River (NR) forest sections	SK 166,408 hectares HR 1,361,974 hectares NR 1,244,937 hectares	Maintain the amount of softwood forest area projected to be present on the productive forest that would result from implementing the spatial harvest sequence	SK 559,933 hectares HR 1,362,773 hectares NR 1,244,602 hectares	SK 462,705 hectares HR 1,363,000 hectares NR 1,241,276 hectares	SK 559,933 hectares HR 1,362,773 hectares NR 1,244,602 hectares	SK 556,330 hectares HR 1,356,045 hectares NR 1,236,865 hectares	Adhering to the Forest Management Plan Preferred Forest Management Scenario Spatial Harvest Sequence. To be assessed in 5-year Forest Reports	Forest Report (5-year)	
2		To maintain a forest with an age class structure and composition that resembles that of a fire-driven forest ecosystem that is capable of supporting a broad range of species	Softwood (S), softwood/hardwood (SH), and hardwood (H) species group forest area by old or older (O) and very old (VO) age classes within each of the three forest sections on the FM, respectively, which are Seaboard/mean River (SR), Higrock (HR), and Nelson River (NR) forest sections	SK Softwood O 19,385 hectares VO 69,235 hectares Mixedwood O 10,862 hectares VO 4,336 hectares Hardwood O 25,149 hectares VO 10,651 hectares HR Softwood O 112,448 hectares VO 171,699 hectares Mixedwood O 13,319 hectares VO 13,229 hectares Hardwood O 16,432 hectares VO 14,142 hectares NR Softwood O 222,256 hectares VO 271,893 hectares Mixedwood O 26,111 hectares VO 18,543 hectares Hardwood O 35,877 hectares VO 35,238 hectares	Maintain the amount of old (O) and very old (VO) open stage forest area by species group projected for replacement on the productive forest that would result from implementing the spatial harvest sequence	SK Softwood O 78,483 hectares VO 108,149 hectares Mixedwood O 12,481 hectares VO 9,082 hectares Hardwood O 19,827 hectares VO 27,575 hectares HR Softwood O 181,624 hectares VO 227,184 hectares Mixedwood O 19,209 hectares VO 18,892 hectares Hardwood O 24,763 hectares VO 22,723 hectares NR Softwood O 296,131 hectares VO 392,151 hectares Mixedwood O 25,303 hectares VO 40,633 hectares Hardwood O 10,321 hectares VO 64,489 hectares	SK Softwood O 74,133 hectares VO 96,547 hectares Mixedwood O 11,288 hectares VO 7,179 hectares Hardwood O 22,721 hectares VO 20,246 hectares HR Softwood O 143,065 hectares VO 202,773 hectares Mixedwood O 10,481 hectares VO 19,006 hectares Hardwood O 24,193 hectares VO 15,753 hectares NR Softwood O 206,000 hectares VO 285,972 hectares Mixedwood O 29,809 hectares VO 28,693 hectares Hardwood O 24,854 hectares VO 51,067 hectares	SK Softwood O 78,483 hectares VO 108,149 hectares Mixedwood O 12,481 hectares VO 9,082 hectares Hardwood O 19,827 hectares VO 27,575 hectares HR Softwood O 181,624 hectares VO 227,184 hectares Mixedwood O 19,209 hectares VO 18,892 hectares Hardwood O 24,763 hectares VO 22,723 hectares NR Softwood O 296,131 hectares VO 392,151 hectares Mixedwood O 25,303 hectares VO 40,633 hectares Hardwood O 10,321 hectares VO 64,489 hectares	SK Softwood O 162,375 hectares VO 428,876 hectares Mixedwood O 19,159 hectares VO 37,207 hectares Hardwood O 26,639 hectares VO 35,783 hectares HR Softwood O 162,375 hectares VO 428,876 hectares Mixedwood O 19,159 hectares VO 37,207 hectares Hardwood O 26,639 hectares VO 35,783 hectares NR Softwood O 326,865 hectares VO 399,614 hectares Mixedwood O 33,993 hectares VO 35,146 hectares Hardwood O 3,797 hectares VO 10,344 hectares	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 5-year Forest Reports	Forest Report (5-year)	
3		Nature forest area within identified harvestable Wildlife Management Areas (WMA)	53%	61%	61%	54%	61%	36%	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 5-year Forest Reports	Forest Report (5-year)		
4		To maintain a forest landscape condition with suitable ecosystem representation through the retention of all forests within protected areas or any other areas excluded from forest management activity	0 hectares	0 hectares	0 hectares	0 hectares	0 hectares	0 hectares	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 5-year Forest Reports	Forest Report (5-year)		
5		Ecosystem diversity	Trees retained within a harvested area to support stand-level structure and wildlife habitat	An average of 0 to 2% of retention of residual retention within each harvest block	0.2%	0.2%	0.2%	0.2%	Block mitigation strategies are determined on a block-by-block basis. Block mitigation strategies are required to be in place prior to Work Permit approval from the Province for each harvest block. Newspawine Forestry Management Corporation maintains an operational guideline 'Selecting Open Trees and General Woody Debris (GWB) - 2010' that targets retaining a minimum of five live per hectare in each block post-harvest. This is assessed and reported on in Canadian Standards Association (CSA) Sustainable Forest Management (SFM) annual reports.	Mitigation required to be in place prior to Work Permit approval from the Province for each harvest block. Canadian Standards Association (CSA) Sustainable Forest Management (SFM) annual reports.		
6		To maintain a forest landscape condition which has retained existing habitat features	Maintain sufficient distance to hiding cover within harvest blocks	Manage retention of residual vegetation to an extent of minimum 10% of area where moose may be a focal species as identified by the Province through mitigation	Manage retention of residual vegetation to an extent of minimum 10% of area where moose may be a focal species as identified by the Province through mitigation	Manage retention of residual vegetation to an extent of minimum 10% of area where moose may be a focal species as identified by the Province through mitigation	Manage retention of residual vegetation to an extent of minimum 10% of area where moose may be a focal species as identified by the Province through mitigation	Manage retention of residual vegetation to an extent of minimum 10% of area where moose may be a focal species as identified by the Province through mitigation	Block mitigation strategies are determined on a block-by-block basis. Block mitigation strategies are required to be in place prior to Work Permit approval from the Province before harvesting can occur.	Mitigation required to be in place prior to Work Permit approval from the Province for each harvest block.		
6		Other habitat elements and structures	Maintain sufficient line of sight within harvest blocks	Manage line of sight as identified by the Province through mitigation	Manage line of sight as identified by the Province through mitigation	Manage line of sight as identified by the Province through mitigation	Manage line of sight as identified by the Province through mitigation	Manage line of sight as identified by the Province through mitigation	Block mitigation strategies are determined on a block-by-block basis. Block mitigation strategies are required to be in place prior to Work Permit approval from the Province before harvesting can occur.	Mitigation required to be in place prior to Work Permit approval from the Province for each harvest block.		
6		Other habitat elements and structures	Maintain sufficient edge between young and old forest within harvest blocks	Manage edge as identified by the Province through mitigation	Manage edge as identified by the Province through mitigation	Manage edge as identified by the Province through mitigation	Manage edge as identified by the Province through mitigation	Manage edge as identified by the Province through mitigation	Block mitigation strategies are determined on a block-by-block basis. Block mitigation strategies are required to be in place prior to Work Permit approval from the Province before harvesting can occur.	Mitigation required to be in place prior to Work Permit approval from the Province for each harvest block.		
6		Other habitat elements and structures	Maintain important migration corridor and carrying habitat elements within an operating area or harvest blocks, particularly for boreal woodland owls	Manage for migration corridors and carrying habitat elements as identified by the Province through mitigation	Manage for migration corridors and carrying habitat elements as identified by the Province through mitigation	Manage for migration corridors and carrying habitat elements as identified by the Province through mitigation	Manage for migration corridors and carrying habitat elements as identified by the Province through mitigation	Manage for migration corridors and carrying habitat elements as identified by the Province through mitigation	Block mitigation strategies are determined on a block-by-block basis. Block mitigation strategies are required to be in place prior to Work Permit approval from the Province before harvesting can occur.	Mitigation required to be in place prior to Work Permit approval from the Province for each harvest block.		
6		Other habitat elements and structures	Maintain sufficient buffers for mineral lakes and other habitat features within harvest blocks	Manage mineral lakes and other habitat features as identified by the Province through mitigation	Manage mineral lakes and other habitat features as identified by the Province through mitigation	Manage mineral lakes and other habitat features as identified by the Province through mitigation	Manage mineral lakes and other habitat features as identified by the Province through mitigation	Manage mineral lakes and other habitat features as identified by the Province through mitigation	Block mitigation strategies are determined on a block-by-block basis. Block mitigation strategies are required to be in place prior to Work Permit approval from the Province before harvesting can occur.	Mitigation required to be in place prior to Work Permit approval from the Province for each harvest block.		
See WPT 1 - Mitigating softwood forest degradation												
See WPT 2 - Mitigating riparian and other riparian habitat degradation												
See WPT 3 - Mitigating riparian habitat degradation in Wildlife Management Areas												
See WPT 4 - Protecting areas within which forestry is prohibited												
See WPT 5 - Retention of residual vegetation												
See WPT 6 - Protecting riparian areas												

New WOTB	Value	Objective	Indicator	Indicator		Forest Management Plan Target	FFM's Projections			Assessment	Monitoring						
				Plan Start	Goal Level		Short (10 years)	Medium (20 years)	Long (30 years)		Assessment	Reporting					
7		To move towards, over time, a forest with landscape pattern resembling a fire-driven boreal forest ecosystem that is capable of supporting a broad range of species.	Young forest patches created by harvest represented within a suitable area distribution range indicates of the natural range of variation as a result of planned harvest activities.	<p>Area</p> <p>0- 30 hectares 0%</p> <p>30- 50 hectares 8%</p> <p>50- 100 hectares 10%</p> <p>100- 200 hectares 18%</p> <p>250- 500 hectares 11%</p> <p>500- 1,000 hectares 18%</p> <p>1,000- 2,500 hectares 42%</p> <p>> 2,500 hectares NA</p>	<p>Area</p> <p>0- 30 hectares 0%</p> <p>30- 50 hectares 11%</p> <p>50- 100 hectares 22%</p> <p>100- 200 hectares 22%</p> <p>250- 500 hectares 13%</p> <p>500- 1,000 hectares 14%</p> <p>1,000- 2,500 hectares 13%</p> <p>> 2,500 hectares NA</p>	<p>Area</p> <p>0- 30 hectares 8%</p> <p>30- 50 hectares 5%</p> <p>50- 100 hectares 9%</p> <p>100- 200 hectares 15%</p> <p>250- 500 hectares 13%</p> <p>500- 1,000 hectares 14%</p> <p>1,000- 2,500 hectares 15%</p> <p>> 2,500 hectares 17%</p>	<p>Area</p> <p>0- 30 hectares 5%</p> <p>30- 50 hectares 4%</p> <p>50- 100 hectares 9%</p> <p>100- 200 hectares 14%</p> <p>250- 500 hectares 8%</p> <p>500- 1,000 hectares 16%</p> <p>1,000- 2,500 hectares 23%</p> <p>> 2,500 hectares 27%</p>	<p>Area</p> <p>0- 30 hectares 8%</p> <p>30- 50 hectares 5%</p> <p>50- 100 hectares 11%</p> <p>100- 200 hectares 22%</p> <p>250- 500 hectares 13%</p> <p>500- 1,000 hectares 17%</p> <p>1,000- 2,500 hectares 15%</p> <p>> 2,500 hectares 17%</p>		Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in the second and third 5-year Forest Reports for forest management plan years 10 and 20.	Forest Report (10 year)						
8			Forest area that is considered preferred habitat for boreal woodlands and caribou within each caribou management unit on the FME, respectively.	<p>Interlake 7,026 hectares</p> <p>Kamuchawee 11,440 hectares</p> <p>Molson 16,818 hectares</p> <p>Nasop 64,926 hectares</p> <p>Partridge Creek 15,280 hectares</p> <p>The Bog 15,292 hectares</p> <p>Wabowden 10,231 hectares</p>	Maintain the amount of preferred caribou habitat projected to be present on the productive forest that would result from implementing the spatial harvest sequence.	<p>Interlake 14,680 hectares</p> <p>Kamuchawee 32,277 hectares</p> <p>Molson 20,767 hectares</p> <p>Nasop 90,844 hectares</p> <p>Partridge Creek 145,711 hectares</p> <p>The Bog 15,032 hectares</p> <p>Wabowden 91,366 hectares</p>	<p>Interlake 14,789 hectares</p> <p>Kamuchawee 18,435 hectares</p> <p>Molson 19,556 hectares</p> <p>Nasop 69,728 hectares</p> <p>Partridge Creek 145,251 hectares</p> <p>The Bog 15,723 hectares</p> <p>Wabowden 85,376 hectares</p>	<p>Interlake 15,689 hectares</p> <p>Kamuchawee 32,277 hectares</p> <p>Molson 20,767 hectares</p> <p>Nasop 90,844 hectares</p> <p>Partridge Creek 145,711 hectares</p> <p>The Bog 15,032 hectares</p> <p>Wabowden 91,366 hectares</p>	Interlake 6,158 hectares	Kamuchawee 70,399 hectares	Molson 10,811 hectares	Nasop 66,461 hectares	Partridge Creek 186,161 hectares	The Bog 6,838 hectares	Wabowden 100,054 hectares	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 5-year Forest Reports.	Forest Report (5 year)
9		To move towards, over time, a forest landscape condition which provides an adequate amount and distribution of boreal woodland and caribou habitat.	Gross FME area that is suitable boreal woodland and caribou habitat as identified using a point processing habitat suitability index (HSI) model within each caribou management unit on the FME, respectively.	<p>Interlake 32,324 hectares</p> <p>Kamuchawee 238,746 hectares</p> <p>Molson 131,232 hectares</p> <p>Nasop 492,589 hectares</p> <p>Partridge Creek 1,331,067 hectares</p> <p>The Bog 203,938 hectares</p> <p>Wabowden 119,188 hectares</p>	Maintain the amount of forest area that is suitable boreal woodland and caribou habitat within each caribou management unit that would result from implementing the spatial harvest sequence.	<p>Interlake 34,789 hectares</p> <p>Kamuchawee 314,727 hectares</p> <p>Molson 144,771 hectares</p> <p>Nasop 494,548 hectares</p> <p>Partridge Creek 1,413,347 hectares</p> <p>The Bog 203,938 hectares</p> <p>Wabowden 480,233 hectares</p>	<p>Interlake 34,241 hectares</p> <p>Kamuchawee 303,769 hectares</p> <p>Molson 144,231 hectares</p> <p>Nasop 494,548 hectares</p> <p>Partridge Creek 1,410,200 hectares</p> <p>The Bog 217,013 hectares</p> <p>Wabowden 477,237 hectares</p>	<p>Interlake 35,700 hectares</p> <p>Kamuchawee 314,727 hectares</p> <p>Molson 144,771 hectares</p> <p>Nasop 494,548 hectares</p> <p>Partridge Creek 1,413,347 hectares</p> <p>The Bog 203,938 hectares</p> <p>Wabowden 480,233 hectares</p>	Interlake 56,700 hectares	Kamuchawee 314,727 hectares	Molson 144,771 hectares	Nasop 494,548 hectares	Partridge Creek 1,413,347 hectares	The Bog 203,938 hectares	Wabowden 480,233 hectares	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 5-year Forest Reports.	Forest Report (5 year)
10	Species diversity		Large young forest patches represented across the 20-year plan duration that will become contiguous and without habitat preference by caribou in the future as a result of ending young forest and planned harvest activities.		Move towards a more aggregated distribution pattern of young forest patches created as a result of ending young forest and planned harvest activities over the 20-year plan duration.	<p>0- 1,000 hectares 23%</p> <p>1,000- 2,000 hectares 11%</p> <p>2,000- 3,000 hectares 18%</p> <p>> 3,000 hectares 48%</p>	<p>0- 1,000 hectares 23%</p> <p>1,000- 2,000 hectares 11%</p> <p>2,000- 3,000 hectares 18%</p> <p>> 3,000 hectares 48%</p>	<p>0- 1,000 hectares 23%</p> <p>1,000- 2,000 hectares 11%</p> <p>2,000- 3,000 hectares 18%</p> <p>> 3,000 hectares 48%</p>		Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in the final 5-year Forest Report for plan-end, forest management plan year 20.	Forest Report (20 year)						
11			Boreal woodland and caribou habitat elements.	See WOT 1 - Maintaining sufficient forest representation. See WOT 2 - Maintaining site and area size goals for forest representation. See WOT 4 - Maintaining habitat elements and products. See WOT 6 - Maintaining riparian and associated habitat.													
12			Forest area defined as moose browse, thermal cover, and general cover.	<p>Browse 139,884 hectares</p> <p>Thermal Cover 1,524,976 hectares</p> <p>General Cover 87,659 hectares</p>	Maintain the amount of moose habitat projected to be present on the productive forest that would result from implementing the spatial harvest sequence.	<p>Browse 75,962 hectares</p> <p>Thermal Cover 1,636,463 hectares</p> <p>General Cover 873,630 hectares</p>	<p>Browse 113,128 hectares</p> <p>Thermal Cover 1,598,782 hectares</p> <p>General Cover 662,576 hectares</p>	<p>Browse 70,962 hectares</p> <p>Thermal Cover 1,636,463 hectares</p> <p>General Cover 873,630 hectares</p>	Browse 161,498 hectares	Thermal Cover 1,263,736 hectares	General Cover 579,424 hectares	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 5-year Forest Reports.	Forest Report (5 year)				
13		To maintain forested areas that would provide browse and cover for moose on the FME, to maintain the distribution of moose habitat on the landscape.	Moose habitat elements.	See WOT 1 - Maintaining sufficient forest representation. See WOT 4 - Riparian and associated habitat representation. See WOT 6 - Maintaining site and area size goals for forest representation. See WOT 10 - Maintaining riparian and associated habitat. See WOT 16 - Maintaining riparian and associated habitat. See WOT 20 - Protecting riparian areas and riparian habitat. See WOT 22 - Riparian habitat management.													
14		To consider the provision of forest area and structures that provide habitat requirements for selected boreal songbird species.	Forest area that is occupied habitat for selected boreal songbird species.	<p>Alber Flycatcher 63%</p> <p>American redstart 22%</p> <p>Black and white warbler 44%</p> <p>Blackburnian warbler 18%</p> <p>Hermit thrush 34%</p> <p>Least Flycatcher 26%</p> <p>Mourning warbler 9%</p> <p>Overland 28%</p> <p>Phoebe woodpecker 38%</p> <p>Red-eyed vireo 11%</p> <p>Winter wren 12%</p>	Maintain the proportion of FME area that is predicted to be occupied by songbird habitat that would result from implementing the spatial harvest sequence.	<p>Alber Flycatcher 59%</p> <p>American redstart 22%</p> <p>Black and white warbler 41%</p> <p>Blackburnian warbler 19%</p> <p>Hermit thrush 33%</p> <p>Least Flycatcher 24%</p> <p>Mourning warbler 11%</p> <p>Overland 32%</p> <p>Phoebe woodpecker 41%</p> <p>Red-eyed vireo 17%</p> <p>Winter wren 26%</p>	<p>Alber Flycatcher 51%</p> <p>American redstart 24%</p> <p>Black and white warbler 42%</p> <p>Blackburnian warbler 20%</p> <p>Hermit thrush 33%</p> <p>Least Flycatcher 24%</p> <p>Mourning warbler 10%</p> <p>Overland 30%</p> <p>Phoebe woodpecker 35%</p> <p>Red-eyed vireo 15%</p> <p>Winter wren 15%</p>	<p>Alber Flycatcher 59%</p> <p>American redstart 22%</p> <p>Black and white warbler 41%</p> <p>Blackburnian warbler 19%</p> <p>Hermit thrush 33%</p> <p>Least Flycatcher 24%</p> <p>Mourning warbler 11%</p> <p>Overland 32%</p> <p>Phoebe woodpecker 41%</p> <p>Red-eyed vireo 17%</p> <p>Winter wren 26%</p>	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 5-year Forest Reports.	Forest Report (5 year)							
					Establish a monitoring program for riparian implementation to gather data for site or future projects and forest management.					To be assessed in 5-year Forest Reports.	Forest Report (5 year)						

New 2023	Value	Objective	Indicator			Forest Management Plan Target	PFMS - Projections			Assessment	Monitoring	Reporting
			Indicator	Plan Start	Goal Level		Short (10 years)	Medium (20 years)	Long (30 years)			
PFM Objective 2 - Ecosystem Condition and Productivity												
15		To maintain a forest landscape condition that supports ecosystem condition and productivity through the maintenance of a non-declining growing stock on the productive forest landbase.	Amount of openable softwood growing stock on the productive forest landbase within each Forest Management Unit (FMU) on the FLM, respectively.		Non-declining in the last quarter (50 years) of the 200-year strategic planning horizon.	Implement the spatial harvest sequence.				FMU 50 +2% FMU 53 0% FMU 58 0% FMU 59 +2% FMU 62 +5% FMU 68 +1% FMU 69 +13% FMU 800 +13% FMU 851 +6% FMU 882 +20%	This strategic level, long term (200 year) goal applied within the forest model is assessed through the selection of the Preferred Forest Management Scenario (PFMS) as an indicator of long-term sustainability during plan development which resulted in the spatial harvest sequence.	Forest Management Plan
16	Forest ecosystem condition and productivity	Increase a forest landscape condition that supports ecosystem condition and productivity by minimizing landscape fragmentation from access development.	Planned construction length of road network and maintained by Canadian Kraft Paper Industries Ltd requests access harvest.		Minimize the length of planned access construction required as a result of implementing the spatial harvest sequence.	Implement the spatial harvest sequence and minimize the length of planned construction to access new harvest areas.	3,444 kilometres	3,093 kilometres		A strategic level, long term (200 year) goal was applied within the forest model and assessed through the selection of the Preferred Forest Management Scenario (PFMS) as an indicator of minimized habitat disturbance from linear fragmentation during plan development which resulted in the spatial harvest sequence.	Actual on the ground access development is determined through the Forest Management Operating Plan and Forest Road Development Plan process. All Forest Management Operating Plan and Forest Road Development Plan are required to be in place for Work Permit approval by the Province before harvesting can occur.	Forest Management Report (5 year), Forest Report (5 year)
			Linear fragmentation from forestry access		Minimize habitat disturbance from linear fragmentation through road decommissioning.	Emphasize the prompt and effective decommissioning of primary and secondary access roads where operations have concluded.				To be assessed in 2-year Forest Management Reports.	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 2-year Forest Management Reports.	Forest Management Report (2 year)
17		To maintain a forest landscape condition that supports ecosystem condition and productivity by adapting to changing climate conditions.	Adaptation options recommended for implementation through the Climate Vulnerability Assessment.		Adapt to climate change impacts to be able to implement the spatial harvest sequence.	Apply the adaptation options developed through the Climate Vulnerability Assessment (CVA) through plan implementation.				The understanding of the Climate Vulnerability Assessment (CVA) as a part of the development of this forest management plan provided the Quebec Forestry Management Corporation with a framework to adapt to climate change. Evaluation of forest adaptation options have been applied to the level of vulnerability for each forest type.	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 5-year Forest Reports and 2-year Forest Management Reports.	Forest Report (5 year)
PFM Objective 3 - Soil and Water Resources												
18		To maintain water resources by minimizing the impact of forestry-related disturbances on a watershed scale.	Proportion of productive forest area within the FLM boundary with recent stand-replacing disturbance for each watershed on the FLM, respectively. Forest model output.	< 11%	Minimize the disturbance level on the productive forest within each watershed that would result from forest management to less than the 10% (proposed) by implementing the spatial harvest sequence.	< 10%	< 9%	< 10%	< 7%	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 5-year Forest Reports. Note that the projected disturbance levels are not able to include inevitable but spatially unpredictable natural disturbances such as wildfire.	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in the first 5-year Forest Report (at plan-end, forest management plan year 20). Note that the estimated disturbance levels are not able to include inevitable but spatially unpredictable natural disturbances such as wildfire. For more information, see Part 2 - Analysis and Modeling, Cumulative Effects subsection 15.2 Watershed and Aquatic Ecosystems.	Forest Report (5 year)
19	Water quantity and quality		Forest wetland losses from within the FLM on the gross watershed boundaries for each watershed that overlaps the FLM, respectively. Cumulative effects assessment output.		Minimize the disturbance level on the wetland of each watershed that overlaps the FLM that would result from forest management to less than the 8% threshold by implementing the spatial harvest sequence.	< 11%				Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 5-year Forest Reports.	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 5-year Forest Reports.	Forest Report (10 year)
20		To maintain a forest landscape condition which has retained existing water resource features.	Forest area harvested from identified riparian reserves and/or other aquatic habitat.	0 hectares	No forest management activities occur within riparian buffers and/or other aquatic habitat.	0 hectares	0 hectares	0 hectares	0 hectares	The buffering of water features is guided by the provincial Forest Management Guidelines for Riparian Management Areas (Manitoba Conservation and Water Stewardship, 2006) with the actual riparian buffer requirements being determined through the back mitigation process on a block-by-block basis. Back mitigation strategies are required to be finalized for Work Permit approval by the Province before any harvest occurs.	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 5-year Forest Reports.	Forest Report (5 year)
21	Soil quantity and quality	To maintain a forest landscape condition which has retained soil quality.	Forest operations that minimize soil disturbance.		Minimize soil and surface disturbance, such as rutting, sinking, and erosion as a result of forest management operations.	Follow provincial and standard forest management practices, guidelines, and procedures.				Adhering to provincial and standard forest management practices, guidelines, and procedures through plan implementation. Compliance with practices, guidelines, and procedures is assessed through the quality impact assessment required to maintain the National Organization for Professional Forestry (NOFP) Environmental System Management (ESM) accreditation.	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 5-year Forest Reports.	Forest Management Plan Forest Report (20 year)
PFM Objective 4 - Base in Carbon Ecological Cycles												
22	Carbon cycle	To support a forest landscape condition that maintains a role in global ecological cycles through forest carbon storage and sequestration.	Estimate of the amount of forest ecosystem carbon stored on the productive forest of the FLM.	> 400 million tonnes	Maintain that there is no net decrease in the proportion of change in stored forest ecosystem carbon that would result from implementing the spatial harvest sequence.	> 420 million tonnes	+3%	+6%		The long term (200 year) assessment of this strategic indicator within the forest model is assessed through the results of the Preferred Forest Management Scenario (PFMS).	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in the first 5-year Forest Report (at plan-end, forest management plan year 20).	Forest Management Plan Forest Report (20 year)
23			Wetland forested wetland area harvested	0 hectares	No harvesting to occur within identified wetland or forested wetland areas to avoid conversion.	0 hectares	0 hectares	0 hectares	0 hectares	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 5-year Forest Reports.	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 5-year Forest Reports.	Forest Report (5 year)

New Metric	Value	Objective	Indicator			PFMS - Projections				Assessment	Reporting
			Indicator	Plan Start	Goal Level	Forest Management Plan Target	Short (0-5 years)	Medium (6-10 years)	Long (10+ years)		
24	Sustainability of benefits	Annual softwood harvest levels (m³/yr) for Forest Management Unit (FMU) on the FLM, respectively.	Annual softwood harvest levels (m³/yr) for Forest Management Unit (FMU) on the FLM, respectively.	Maintain annual softwood harvest levels within each Forest Management Unit (FMU) that would result from implementing the spatial harvest sequence.	Forest Management Plan Target	FMU50 23,702 m³/yr	FMU50 23,699 m³/yr	FMU50 23,702 m³/yr	FMU50 21,290 m³/yr	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 5-year Forest Management Reports for more information on current wood requirements and harvest, see Part 3 – Implementation and Monitoring, Implementation Strategy subsection 16.3 Harvest Operations.	Forest Management Report (2 years) Forest Report (5 year)
						FMU53 95,033 m³/yr	FMU53 94,970 m³/yr	FMU53 95,033 m³/yr	FMU53 86,230 m³/yr		
						FMU58 96,343 m³/yr	FMU58 96,470 m³/yr	FMU58 96,343 m³/yr	FMU58 84,953 m³/yr		
						FMU59 87,932 m³/yr	FMU59 88,014 m³/yr	FMU59 87,932 m³/yr	FMU59 77,288 m³/yr		
						FMU67 308,258 m³/yr	FMU67 308,382 m³/yr	FMU67 308,258 m³/yr	FMU67 306,545 m³/yr		
						FMU68 52,179 m³/yr	FMU68 52,179 m³/yr	FMU68 52,179 m³/yr	FMU68 61,653 m³/yr		
						FMU69 78,932 m³/yr	FMU69 78,961 m³/yr	FMU69 78,932 m³/yr	FMU69 80,363 m³/yr		
						FMU80 12,889 m³/yr	FMU80 12,882 m³/yr	FMU80 12,889 m³/yr	FMU80 14,298 m³/yr		
						FMU801 309,152 m³/yr	FMU801 309,157 m³/yr	FMU801 309,152 m³/yr	FMU801 279,668 m³/yr		
						FMU802 54,247 m³/yr	FMU802 54,247 m³/yr	FMU802 54,247 m³/yr	FMU802 58,886 m³/yr		
25	Sustainability of benefits	To apply industrial and consumer wood needs, while maintaining economic and forest sustainability, to realize a predictable and consistent flow of wood from FLM 2.	Change in the flow of softwood harvest levels between periods for each Forest Management Unit (FMU)	Maintain a sustainable and predictable flow of wood that would result from implementing the spatial harvest sequence.	Implement the spatial harvest sequence.	FMU50 -5%	FMU50 -5%	FMU50 -5%	FMU50 -5%	This strategic-level, long-term (200-year) goal applied within the forest model can only be assessed through the results of the Preferred Forest Management Scenario (PFMS) as an indicator of long-term sustainability. Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence.	Forest Management Plan
						FMU53 +10%	FMU53 -5%	FMU53 6%	FMU53 6%		
						FMU58 -9%	FMU58 -9%	FMU58 6%	FMU58 6%		
						FMU59 -5%	FMU59 -4%	FMU59 5%	FMU59 5%		
						FMU67 -7%	FMU67 -7%	FMU67 +3%	FMU67 +3%		
26	Sustainability of benefits	To apply industrial and consumer wood needs, while maintaining economic and forest sustainability, to realize a predictable and consistent flow of wood from FLM 2.	Volume (m³) of total unutilized harvest volume	Minimize up to or less than the amount of total unutilized volume that would result from implementing the spatial harvest sequence.	14,200 m³	FMU50 -5%	FMU50 -5%	FMU50 -5%	FMU50 -5%	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 5-year Forest Reports.	Forest Report (5 year)
						FMU53 +10%	FMU53 -5%	FMU53 6%	FMU53 6%		
27	Sustainability of benefits	To apply industrial and consumer wood needs, while maintaining economic and forest sustainability, to realize a predictable and consistent flow of wood from FLM 2.	Net residual silviculture budget (Forest renewal spending)	Maintain forest renewal spending that is predictable and realistic.	-\$12,000,000	FMU50 -5%	FMU50 -5%	FMU50 -5%	FMU50 -5%	This strategic-level, long-term (200-year) goal applied within the forest model is a relative value that can only be assessed through the results of the Preferred Forest Management Scenario (PFMS) as an indicator of long-term sustainability. Actual forest management activity costs are assessed and updated in 2-year Forest Management Reports.	Forest Management Plan
						FMU53 +10%	FMU53 -5%	FMU53 6%	FMU53 6%		
28	Sustainability of benefits	To apply industrial and consumer wood needs, while maintaining economic and forest sustainability, to realize a predictable and consistent flow of wood from FLM 2.	Forest area treated post-harvest for vegetation management to ensure regeneration of condition within each of the three forest sections on the FLM, respectively, which are the Saskatchewan River (SR), Highwood (HR), and Nelson River (NR) forest sections.	Maintain the proportion of area treated post-harvest for vegetation management that would result from implementing the spatial harvest sequence.	SK 47% HR 47% NR 47%	FMU50 -5%	FMU50 -5%	FMU50 -5%	FMU50 -5%	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 2-year Forest Management Reports. Forest Renewal Assessments are done to determine silvicultural success and reported on the 2-year Forest Management Report only.	Forest Management Report (2 years) Forest Renewal Assessment (year)
						FMU53 +10%	FMU53 -5%	FMU53 6%	FMU53 6%		
29	Sustainability of benefits	To apply industrial and consumer wood needs, while maintaining economic and forest sustainability, to realize a predictable and consistent flow of wood from FLM 2.	Jack pine forest area scarified post-harvest to ensure regeneration of condition on the FLM.	Maintain the proportion of jack pine area that is scarified post-harvest that would result from implementing the spatial harvest sequence.	85%	FMU50 -5%	FMU50 -5%	FMU50 -5%	FMU50 -5%	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 2-year Forest Management Reports. Forest Renewal Assessments are done to determine silvicultural success and reported on the 2-year Forest Management Report only.	Forest Management Report (2 years) Forest Renewal Assessment (year)
						FMU53 +10%	FMU53 -5%	FMU53 6%	FMU53 6%		
2018 Objective - Society/Responsibility											
30	Fair and effective decision-making	To maintain fair and effective decision-making through ongoing open and respectful communication with local forest-based communities to foster meaningful engagement.	Forest area harvested by Nookapawo Forestry Management Corporation within the Forest Management Unit (FMU) on the FLM, respectively, and lands identified under the Grand Rapids Forestry and Northern Flood Agreements.	Decrease	Decrease	Decrease	Decrease	Decrease	Decrease	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 5-year Forest Reports.	Forest Report (5-year)
31	Fair and effective decision-making	To maintain fair and effective decision-making through ongoing open and respectful communication with local forest-based communities to foster meaningful engagement.	Protections and buffers for Indigenous values	Consistently identify and develop the appropriate protections and buffers for Indigenous values within Heritage Resources, Culturally Significant Areas, and any other areas identified in appropriate engagement.	Develop the appropriate protections and buffers for Indigenous values identified through engagement during implementation.	Identified values would be confidential between the community and Nookapawo Forestry Management Corporation. Nookapawo Forestry Management Corporation would maintain a record and track the value identified through the internal Forest Management Activity Data Management System.	Identified values would be confidential between the community and Nookapawo Forestry Management Corporation. Nookapawo Forestry Management Corporation would maintain a record and track the value identified through the internal Forest Management Activity Data Management System.	Identified values would be confidential between the community and Nookapawo Forestry Management Corporation. Nookapawo Forestry Management Corporation would maintain a record and track the value identified through the internal Forest Management Activity Data Management System.	Identified values would be confidential between the community and Nookapawo Forestry Management Corporation. Nookapawo Forestry Management Corporation would maintain a record and track the value identified through the internal Forest Management Activity Data Management System.	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 5-year Forest Reports.	Forest Report (5-year)
32	Fair and effective decision-making	To maintain fair and effective decision-making through ongoing open and respectful communication with local forest-based communities to foster meaningful engagement.	Open and respectful communications with Indigenous communities to integrate Indigenous values and perspectives into forest management planning on FLM 2.	Maintain opportunities for all Indigenous communities on the FLM to engage and provide feedback on the forest management planning process.	Provide opportunities for Indigenous communities to engage and provide feedback on forest management planning through ongoing Community Information Sessions, providing update letters, and ensuring on-line data information is available on the Nookapawo Forestry Management Corporation website.	Community Information Sessions occur as arranged the development of 2-year Forest Management Opening Plans. All engagement will be maintained and tracked through Nookapawo Forestry Management Corporation's Forestry Management Activity Data Management System. Engagement and public participation are summarized and assessed in Canadian Standards Association (CSA) Sustainable Forest Management (SFM) standard certification annual reports.	Community Information Sessions occur as arranged the development of 2-year Forest Management Opening Plans. All engagement will be maintained and tracked through Nookapawo Forestry Management Corporation's Forestry Management Activity Data Management System. Engagement and public participation are summarized and assessed in Canadian Standards Association (CSA) Sustainable Forest Management (SFM) standard certification annual reports.	Community Information Sessions occur as arranged the development of 2-year Forest Management Opening Plans. All engagement will be maintained and tracked through Nookapawo Forestry Management Corporation's Forestry Management Activity Data Management System. Engagement and public participation are summarized and assessed in Canadian Standards Association (CSA) Sustainable Forest Management (SFM) standard certification annual reports.	Community Information Sessions occur as arranged the development of 2-year Forest Management Opening Plans. All engagement will be maintained and tracked through Nookapawo Forestry Management Corporation's Forestry Management Activity Data Management System. Engagement and public participation are summarized and assessed in Canadian Standards Association (CSA) Sustainable Forest Management (SFM) standard certification annual reports.	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 5-year Forest Reports.	Forest Report (5-year)
33	Fair and effective decision-making	To maintain fair and effective decision-making through ongoing open and respectful communication with local forest-based communities to foster meaningful engagement.	Engagement Plans developed for willing and interested Indigenous communities for the ongoing implementation of the 20-year forest management plan.	Maintain or increase the number of Indigenous communities on the FLM who are willing to develop or have developed an Engagement Plan for their community.	Provide opportunities for Indigenous communities to engage and provide feedback on forest management planning through ongoing Community Information Sessions, providing update letters, and ensuring on-line data information is available on the Nookapawo Forestry Management Corporation website.	An Advisory Engagement Strategy has been created to facilitate ongoing engagement throughout the 20-year implementation period of the forest management plan. All engagement will be maintained and tracked through Nookapawo Forestry Management Corporation's Forestry Management Activity Data Management System. Engagement and public participation are summarized and assessed in Canadian Standards Association (CSA) Sustainable Forest Management (SFM) standard certification annual reports.	An Advisory Engagement Strategy has been created to facilitate ongoing engagement throughout the 20-year implementation period of the forest management plan. All engagement will be maintained and tracked through Nookapawo Forestry Management Corporation's Forestry Management Activity Data Management System. Engagement and public participation are summarized and assessed in Canadian Standards Association (CSA) Sustainable Forest Management (SFM) standard certification annual reports.	An Advisory Engagement Strategy has been created to facilitate ongoing engagement throughout the 20-year implementation period of the forest management plan. All engagement will be maintained and tracked through Nookapawo Forestry Management Corporation's Forestry Management Activity Data Management System. Engagement and public participation are summarized and assessed in Canadian Standards Association (CSA) Sustainable Forest Management (SFM) standard certification annual reports.	An Advisory Engagement Strategy has been created to facilitate ongoing engagement throughout the 20-year implementation period of the forest management plan. All engagement will be maintained and tracked through Nookapawo Forestry Management Corporation's Forestry Management Activity Data Management System. Engagement and public participation are summarized and assessed in Canadian Standards Association (CSA) Sustainable Forest Management (SFM) standard certification annual reports.	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 5-year Forest Reports.	Forest Report (5-year)
34	Fair and effective decision-making	To maintain fair and effective decision-making through ongoing open and respectful communication with local forest-based communities to foster meaningful engagement.	Open and respectful communication with forest-dependent businesses, forest users, and local communities to integrate values, perspectives, and non-timber resources into forest management planning.	Maintain opportunities for all forest-dependent businesses, forest users, and local communities on the FLM to engage and provide feedback on the forest management planning process.	Provide opportunities for individuals from within local forest-based communities to engage and provide feedback on forest management planning through ongoing Community Information Sessions, providing update letters, and ensuring on-line data information is available on the Nookapawo Forestry Management Corporation website.	Community Information Sessions occur as arranged the development of 2-year Forest Management Opening Plans. All engagement will be maintained and tracked through Nookapawo Forestry Management Corporation's Forestry Management Activity Data Management System. Engagement and public participation are summarized and assessed in Canadian Standards Association (CSA) Sustainable Forest Management (SFM) standard certification annual reports.	Community Information Sessions occur as arranged the development of 2-year Forest Management Opening Plans. All engagement will be maintained and tracked through Nookapawo Forestry Management Corporation's Forestry Management Activity Data Management System. Engagement and public participation are summarized and assessed in Canadian Standards Association (CSA) Sustainable Forest Management (SFM) standard certification annual reports.	Community Information Sessions occur as arranged the development of 2-year Forest Management Opening Plans. All engagement will be maintained and tracked through Nookapawo Forestry Management Corporation's Forestry Management Activity Data Management System. Engagement and public participation are summarized and assessed in Canadian Standards Association (CSA) Sustainable Forest Management (SFM) standard certification annual reports.	Community Information Sessions occur as arranged the development of 2-year Forest Management Opening Plans. All engagement will be maintained and tracked through Nookapawo Forestry Management Corporation's Forestry Management Activity Data Management System. Engagement and public participation are summarized and assessed in Canadian Standards Association (CSA) Sustainable Forest Management (SFM) standard certification annual reports.	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 5-year Forest Reports.	Forest Report (5-year)
35	Fair and effective decision-making	To maintain fair and effective decision-making through ongoing open and respectful communication with local forest-based communities to foster meaningful engagement.	Proportion of participants from within the Sustainable Forest Management Committee (SFM) who are satisfied with the public involvement process throughout forest management plan development and ongoing implementation.	Maintain satisfaction of Sustainable Forest Management Committee (SFM) with public involvement process and implement self-evaluation survey to assess member satisfaction.	Continue to provide the opportunity for public involvement through the Sustainable Forest Management Committee (SFM) and maintain a self-evaluation survey to assess member satisfaction.	Sustainable Forest Management Committee (SFM) meetings occur quarterly. All engagement will be maintained and tracked through Nookapawo Forestry Management Corporation's Forestry Management Activity Data Management System. Engagement and public participation are summarized and assessed in Canadian Standards Association (CSA) Sustainable Forest Management (SFM) standard certification annual reports.	Sustainable Forest Management Committee (SFM) meetings occur quarterly. All engagement will be maintained and tracked through Nookapawo Forestry Management Corporation's Forestry Management Activity Data Management System. Engagement and public participation are summarized and assessed in Canadian Standards Association (CSA) Sustainable Forest Management (SFM) standard certification annual reports.	Sustainable Forest Management Committee (SFM) meetings occur quarterly. All engagement will be maintained and tracked through Nookapawo Forestry Management Corporation's Forestry Management Activity Data Management System. Engagement and public participation are summarized and assessed in Canadian Standards Association (CSA) Sustainable Forest Management (SFM) standard certification annual reports.	Sustainable Forest Management Committee (SFM) meetings occur quarterly. All engagement will be maintained and tracked through Nookapawo Forestry Management Corporation's Forestry Management Activity Data Management System. Engagement and public participation are summarized and assessed in Canadian Standards Association (CSA) Sustainable Forest Management (SFM) standard certification annual reports.	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 5-year Forest Reports.	Forest Report (5-year)
36	Fair and effective decision-making	To maintain fair and effective decision-making through ongoing open and respectful communication with local forest-based communities to foster meaningful engagement.	Compliance with Canadian Standards Association (CSA) Sustainable Forest Management (SFM) and International Organization for Standardization (ISO) Environmental Management System (EMS) standards.	Maintain certification.	Comply with certification standards.	Canadian Standards Association (CSA) Sustainable Forest Management (SFM) standard certification requires an annual reporting (CSA-specific) sustainability management indicators. The International Organization for Standardization (ISO) Environmental Management System (EMS) standard requires a number of monitoring and reporting processes to be put in place to maintain certification. Compliance for both standards is confirmed through third-party auditing.	Canadian Standards Association (CSA) Sustainable Forest Management (SFM) standard certification requires an annual reporting (CSA-specific) sustainability management indicators. The International Organization for Standardization (ISO) Environmental Management System (EMS) standard requires a number of monitoring and reporting processes to be put in place to maintain certification. Compliance for both standards is confirmed through third-party auditing.	Canadian Standards Association (CSA) Sustainable Forest Management (SFM) standard certification requires an annual reporting (CSA-specific) sustainability management indicators. The International Organization for Standardization (ISO) Environmental Management System (EMS) standard requires a number of monitoring and reporting processes to be put in place to maintain certification. Compliance for both standards is confirmed through third-party auditing.	Canadian Standards Association (CSA) Sustainable Forest Management (SFM) standard certification requires an annual reporting (CSA-specific) sustainability management indicators. The International Organization for Standardization (ISO) Environmental Management System (EMS) standard requires a number of monitoring and reporting processes to be put in place to maintain certification. Compliance for both standards is confirmed through third-party auditing.	Adhering to the Forest Management Plan Preferred Forest Management Scenario spatial harvest sequence. To be assessed in 5-year Forest Reports.	Forest Report (5-year)

Appendix O – Operational Best Management Practices

Operational best management practices (BMPs) and guidelines maintained by NFMC.

Title	Purpose
Aerial Herbicide Applications Near Water Bodies	Standards to ensure that the planning and implementation of aerial herbicide projects avoid any adverse impacts on fish habitat and water quality.
Bulldozer Work	This BMP focuses on minimizing the exposure of soil during road and landing clearing.
Debris Burning	This guideline is for the burning of debris in harvest blocks from short wood operations. Chipper debris is not to be burned in harvest blocks due to the potential for hold over fires. However, this guideline may apply to burning of chipper debris piles in stockpile sites provided there is sufficient fire break between the piles and flammable materials.
Field Camps	This BMP focuses on maintaining a clean campsite that meets applicable Provincial Regulations.
Field Marking	Standardized field marking may be used in field operations for features identified in the annual operating plans, work permits, and the forest management operating procedures.
Forest Fire	Forest fires have the potential for serious environmental, social, and economic impacts. Procedures are put in place to ensure that Company staff and contractors are prepared to prevent and respond to unplanned fire occurrences. This emergency preparedness procedure applies annually during the period of April 1 st to November 15 th , unless otherwise directed by NFMC.
Forest Operation Modification	This guideline relates spark ignition potential for various forest operations to the inherent fire hazard associated with specific site and stand conditions. Its purpose is to provide a consistent framework for modifying forest operations to reduce the risk of human-caused fire.
Forest Operations Equipment Standard	This guideline standardizes fire equipment requirements for all field operations beyond Provincial Work Permit requirements.
Fuel, Oil, and Antifreeze Spills	The normal activities of forestry operations have the potential to create adverse environmental impacts if the fuels, oils, and antifreeze used during operations are not managed in an environmentally responsible manner. Procedures detailed in this emergency preparedness procedure help to prevent adverse environmental impacts and provide guidance on how to respond safely to emergencies.
Garbage Disposal	This BMP focuses on preventing pollution in harvest blocks and related work sites.
General Safety	This BMP focuses on maintaining a safe and healthy work environment.
GPS Unit Operation	This guideline helps understand the operation of GPS units for harvesting and site preparation.
Herbicide Spill	This procedure applies to Company contractors using the herbicide glyphosate for vegetation management and addresses both spill prevention and spill mitigation.
Human Remains and Heritage Resources	This guideline assists Company staff and contractors in the event that human remains, or heritage resources are discovered in operating areas.
In-Block Road Closure	This BMP focuses on closing harvest block roads following the completion of forest management activities and temporarily closing road access where current operations are complete but where access is required in the future.

Title	Purpose
Jack Pine Salvage	This guideline outlines how to retain as much jack pine cones on-site as possible during jack pine salvage harvest.
Legislation and Regulations	Standards to ensure the fulfilment of compliance obligations relating to Company ISO Environmental Management System (EMS) certification.
Limbing	This BMP focuses on prescribing in-bush limbing or limbing at stump. Guidance includes to limb and top all trees harvested and distribute debris evenly across the harvest block. This ensures sufficient cones are left within harvest blocks to aid natural regeneration. Limbs and tops of trees help to maintain site productivity where nutrient levels may be low. Driving overtop of limbs and other debris helps to minimize ground disturbance where rutting or compaction may be a potential issue.
Location of In-Block Roads & Landings	This BMP focuses on ensuring roads and landings are in locations that optimize skidding, provide best possible ground conditions for hauling, and minimize potential environmental impacts.
Merchantable Timber in Slash Piles	This BMP focuses on maximizing the use of harvested merchantable trees within a harvest block. Merchantable wood left in slash piles as waste is subject to provincial fines.
Merchantable Trees Laying in Cutover	This BMP focuses on bringing all merchantable trees felled within a harvest block to roadside for processing. If merchantable wood is left within a block, it is considered wood waste and is subject to provincial fines.
Nesting Bird Protection	This guideline outlines best management practices for logging and silviculture operators for the protection of nesting birds, including birds that are designated as a species at risk.
Prevention of Mistletoe Infection	This BMP focuses on preventing trees infected with dwarf mistletoe from re-infecting adjacent harvest blocks and plantations.
Protection of In-Block Drainage Areas	This BMP focuses on protecting vegetation adjacent to or within small drains located in the harvest block.
Protection of Sink Holes and Caves	This BMP focuses on protecting sink holes or caves from machine activity.
Protection of Trails and Mineral Exploration Markers	This BMP focuses on the protection of in-forest trapping, hunting, mining and mineral exploration markers, snowmobiling, skiing, and other resource and resource user trails. Logging operations will ensure these pre-existing trails are not blocked with logging debris or impacted with extraordinary disturbance.
Public Engagement	Standards for both formal and informal approaches to engagement with the public to reflect community goals and values as well as address specific sites and concerns of individuals or groups.
Road & Landing Debris	This BMP focuses on managing and minimizing debris from the development and use of roads and landings.
Road Construction	Standards to manage the risk of adverse environmental impacts that the construction of primary and secondary all-weather roads can potentially have on water quality, aquatic habitat, and soil erosion.
Road Management Planning	Standardized process for obtaining approvals from the Province for planned primary road access. Ensures approval is obtained in advance of harvest access needs and capital expenditure on road construction. Ensures primary road development has minimal impact on all resource values and engagement with stakeholders and rightsholders is completed.
Selecting Leave Trees and Coarse Woody Debris	This guideline outlines best management practices for selecting leave trees and coarse woody debris for wildlife and ecosystem diversity.

Title	Purpose
Soil Disturbance	This guideline outlines how best to ensure that soil disturbance is reduced or prevented during forestry operations.
Species at Risk	The objective of this guideline is to comply with federal and provincial species at risk legislation and with company commitment to ensure that any listed species are protected during forest operations.
Standing Tree Survey	This guideline outlines the methodology for counting the residual standing trees post-harvest.
Stump Height	This BMP focuses on ensuring stump height is kept below 30 centimetres to minimize wood waste and comply with forestry regulations.
Tailgate Meeting and Inspections	This BMP focuses on ensuring contractors understand the prescribed operating conditions as required by either NFMC or in the provincial work permit for each forest management activity both before and during operations. Regular inspections by NFMC allow for timely corrections to be made to eliminate any regulatory violations or correct substandard quality control on work being done.
Trees Pushed Into Standing Timber	This BMP focuses on ensuring there is no felled wood piled outside of the edges of a harvest block and road right-of-way. Trees pushed into standing timber is a wasteful practice, a barrier to some wildlife, and can be a fire hazard. Trees felled and allowed to fall outside of a harvest block boundary or right-of-way edge present a potential for unnecessary damage occurring to trees not authorized for harvest. This practice may violate permit conditions and is a violation of the <i>Forest Act</i> (1988) regulations. Both situations are subject to fines by the province.
Truck Haul Safety	This guideline is intended for truck drivers engaged in activities for NFMC/CKP and those that work with them. It outlines practices and procedures for operating on Company roads, provincial roads, and on the millsite that promote safety and efficiency.
Understory Protection	This BMP focuses on minimizing disturbance to younger, non-merchantable, non-operable, or regenerating trees.
Utilization	This BMP focuses on maximizing the use of merchantable trees harvested within a harvest block. Areas with logging debris left as a result of poor utilization are difficult to regenerate and affect our ability to grow future forests. Poor utilization may result in provincial fines.
Water Crossing (Installation and Deactivation)	Standards for stream crossing installations and deactivation activities that have the potential to have adverse environmental impacts to water quality and aquatic habitat. The procedures apply to primary and secondary all-weather roads.
Width of In-block Roads/Landings	This BMP focuses on minimizing site disturbance and loss of productive land.
Winter Road Construction Safety	This BMP focuses on ensuring the understanding of safe work procedures when constructing winter roads over frozen water bodies and muskeg areas.
Work Permit	Standards for work permit submission. As work permits are a key document used in the mitigation approval process with the province, permit submission must contain sufficient information that will allow the government to carefully assess the request and make a competent decision.
Working Near Water Bodies	Standards for ensuring consistent planning, development, and implementation of forest management activities that provides protection for aquatic habitat and water quality.

Acronyms

Acronym	Definition
CI	Confidence Interval
FML	Forest Management Licence
GHA	Game Hunting Area
Kg	Kilogram

What is considered moose habitat within FML 2?

Moose inhabit a variety of habitats across North America and are a key species of the boreal forest. Moose require a mix of forest habitat types (e.g., mixed wood and softwood) and ages through the year for forage and cover. Moose are typically found living near water sources, such as lakes, muskeg, and streams. A mix of both young and old forests are ideal. Young forests and bodies of water provide food while mature trees can provide shelter. During the winter, deep snow can make it difficult for moose to move around, making them vulnerable to predation. Therefore, moose tend to use softwood forest (pine, spruce, balsam fir) for cover in late winter, as they provide more shelter from heavy snow compared to younger forests. During the spring and summer, moose use softwood forests for shade and wetlands and other water sources for food and managing heat stress. There is limited information about their calving sites, except they are often near water and in areas that provide protection from predators.

Moose consume at least 30 kg of browse per day to meet their nutritional needs. Moose forage on submerged aquatic plants in shallow wetlands as well as browse on shrubs and new tree growth in the summer. Food sources vary throughout the year dependent on palatability and availability, with more aquatic vegetation and new browse (e.g., leaves on deciduous trees such as aspen) consumed in the spring and summer and denser browse, such as twigs and understory shrubs such as dogwood and hazel consumed in the fall and winter when other foods are no longer available. Stands less than 20 years old provide more younger browse which can support greater densities of moose on the landscape.

In forest management planning, the forest company, or their consultants, use existing habitat models to assess habitat availability based on relevant habitat attributes (e.g., browse, cover or combination of habitat types). These models may be habitat suitability indices, or other habitat-based models.

Are there specific moose habitat management zones?

Habitat management and forest management planning go hand in hand, as forest companies can help manage the environment to provide a mix of habitat types for moose, while at the same time helping with access management to maintain and not increase hunting and predation pressures. As part of the forest management planning process, the forestry company identifies a habitat suitability model or another proxy to represent existing and future habitat for a particular species. The forestry company or

their consultant work with the Province to determine how to balance the competing habitat needs and preferences of key species, such as species at risk or species identified of high importance by a community, in forest modelling scenarios.

Are moose populations declining in FML 2?

FML 2 overlaps several game hunting areas (GHAs), making it difficult to determine the overall trend in moose population numbers across such an expansive area. Not all GHAs, across the FML, have had surveys flown to get an estimate of the population (see Table 1). Thus, where data is not available, population trends are inferred from anecdotal information provided by staff, communities, and the public. Based on anecdotal reports, some areas have seen localized declines in moose populations whereas other communities have reported an increase in moose populations in recent years. In general, we know that moose densities are naturally lower across the north than in areas to the south.

GHAs with some survey data have seen population fluctuations over time. For instance in GHA 8, aerial surveys were flown in 1999 and observed an estimate of 473 (95% Confidence Interval[CI]: 379 - 568), in 2006 an estimate of 719 (95% CI: 596 - 842), in 2012 an estimate of 317 (95% CI: 217 - 417) and in 2016 an estimate of 339 (90% CI: 287 - 391). Starting in 2015, reports from recent aerial big game surveys around the Province are posted on the Province’s [website](#). An interactive map that shows GHA boundaries can be found through the Wildlife Management Areas [website](#).

Table 1 Moose Population Estimates from Most Recent Aerial Surveys for Game Hunting Areas that Overlap Forest Management Licence Area No. 2

Game Hunting Area (GHA)	Most Recent Population Estimate	Area (km ²) of Potential Moose Habitat (excluding lakes and unsurveyed areas)	Moose Density per 100 km ²	Last Year Surveyed
2A	295	3,730	7.9	2002
4	178	2,730	6.5	2002
5	107	1,335	8.0	2015**
6	190	1,215	15.6	2010**
6A	65	960	6.8	2010**
7	206	5,310	3.9	2018
7A	666	7,135	9.3	2000
8	339	3,093	11.0	2016
9A	487	25,652	1.9	2014
10	346	9,665	3.6	2013

**Surveys had different objectives than standard moose surveys, but were flown at 100% coverage with incidental moose sightings documented

How are moose populations and hunting being managed?

Within Manitoba, moose populations are assessed and managed at a game hunting area (GHA) level. Within FML 2, moose have localized populations based on habitat availability, and thus these populations can move around the landscape as habitat changes through time. The overall objective of moose management is to ensure a sustainable moose population. Moose management is challenging, because it must consider harvest pressures, access management challenges, climate change, land use changes, disease transmission, other ungulate populations (e.g., deer, caribou), predation, and other factors.

Moose populations and population trends are largely monitored through aerial inventory surveys, which are designed to provide estimates of the moose populations within those GHAs. Where possible, age and sex of moose are recorded. Surveys are flown as regularly as possible, where monetary funds permit. These surveys are supplemented with information provided from hunter reported data (e.g., survey questionnaires), Department observations (e.g., roadkill), and anecdotal reports on trends observed from Government staff, the public, and Indigenous communities.

The Province has moose population objectives, and uses population estimates and supplemental information to influence licenced hunting opportunities and to change regulations around moose management. Regulation changes may include implementing or altering conservation closures, licenced hunting area closures, implementation of protection zones along roadways, and changing season dates, allocated licences, and/or bag limits within a particular GHA. For instance, within licenced hunting areas, there may be changes to the length of a season, bulls only, or number of animals that can be harvested.

How can the forest be managed to improve moose habitat and populations?

Moose require a mixture of habitat types across the landscape. Moose populations can benefit from forestry and fire by returning forest stands to younger age classes, which provides more favourable forage. Additionally, moose require patches of older forest stands for cover from predators, weather, and during calving. Planning human activity and forest operations to emulate natural disturbances such as wildfire will help manage the natural variation of habitat within a forest and create a dynamic mix of habitat necessary to support moose populations.

Maintaining habitat is only one factor, however. There are other pressures affecting moose such as changes in predator dynamics or increased hunting pressures as a result of increased access into areas of moose habitat that previously had no access. Managing the access into forested areas will help protect moose, caribou, and other wildlife. Roads can fragment habitat, result in increased vehicular collisions, increase hunting pressures into sensitive areas, and create travel corridors for predators such as wolves. Forestry companies that manage the net increase of roads within their FML will help protect habitat and moose populations. If access is not managed, areas with a mixture of habitat patches may become sinks to moose populations rather than sources of moose. Moose will travel to areas with a mixture of browse and cover, but if they have hunting and predation pressures then moose populations may also decline.

Why is there still a moose hunting closure and why has it been extended? Is it working?

There are several moose closures in place across the Province. Moose closures in the Duck Mountain (GHAs 18 & 18A-C) and the Porcupine Mountain (GHAs 13&13A) areas remain as Moose Conservation Closures because moose populations have not rebounded as fast as expected in the absence of moose harvesting. Results from the most recent survey (2020) suggest that the moose population is gradually increasing in the Duck Mountain area and remains stable in the Porcupine Mountain area. Populations have rebounded enough that the Province has set up an interim moose hunt for communities in both locations. Information about the interim moose hunt is available on the Government of Manitoba website (<https://www.manitoba.ca/nrnd/fish-wildlife/wildlife/index.html>) under the Attention Moose Hunters information section.

What is the natural distribution of moose populations in FML 2?

Within FML 2, moose have localized populations where there is a preferred mix of habitat. Moose are generally at naturally low densities within FML2 compared to areas further south near the Duck Mountains. Typically, moose are found at higher densities where there is a mixture of habitat types as well as where they are adjacent to waterways (e.g., lakes, rivers, wetlands). Moose are distributed throughout FML2.

How are moose populations being monitored on the landscape?

Moose populations are monitored through a variety of ways including: aerial surveys, moose hunter reporting, input from local community members, research projects, as well as traditional ecological knowledge. The Province has deployed collars in several GHAs to monitor moose habitat use areas, and how they move through forest-harvested landscapes. The Province continues to support research projects, whether by aerial surveys, camera trap, or collar projects. The Province has recently collaborated with several universities and contractors to explore new and innovative ways to estimate densities or conduct surveys by means of drones, infrared cameras, or remote sensing techniques to find more efficient and less disruptive ways to monitoring moose populations.

How do moose, caribou, and deer populations interact in the area? Are there more deer?

Moose, caribou, and deer have different habitat preferences for forest type, cover, and food. However, there is some habitat overlap between these three species. Due to habitat selection, habitat utilization, and other ecological factors deer interactions are typically low with caribou and moose within FML 2. Winters with warmer temperatures and lower snow depths can result in deer expanding their range north into areas that were previously dominated by moose populations. Deer are known to carry parasites, such as the brainworm and liver flukes, which can be lethal to moose. For example, in the southeast part of Manitoba deer have replaced moose over time. Therefore, as climate change continues, this trend may continue in more northern areas of the province. Over time, there has been

an increase in white-tailed deer moving north, and this trend may increase with climate change. Caribou inhabit areas that are typically not desirable for predators and other prey species (i.e., moose). Caribou are adapted to live in mature coniferous forests, peatlands, and areas with deep persistent snow packs. These habitats sustain their needs, but not those of other prey species such as moose.

Are moose in agricultural areas now?

Moose have always inhabited agricultural areas to some extent, provided there is cover and food resources for them to utilize. However, moose densities tend to be lower in agricultural areas compared to the Porcupine Forest and Duck Mountain areas since moose prefer mixed wood forest types over agricultural lands. Within the prairies, moose are more vulnerable to predation and hunters since there is not as much forest cover for protection as well as access to their preferred food type.

Has the distribution of moose changed historically over time?

Moose distributions may change across the landscape based on the location of preferred habitat, which means that moose distributions and densities may fluctuate over time as habitat availability changes because of fire, forestry, and other human activities. There is no information to suggest that the distribution of moose has changed significantly across the FML 2 area. In addition to habitat alteration, other impacts that could affect the distribution of moose population could be either predation from wolves, or land use changes that have resulted in too much fragmentation and a loss of food and/or cover, or a loss of habitat. Moose distributions have changed some in the southeast region of Manitoba (e.g., the Whiteshell area), largely because of habitat overlap with white-tailed deer, which are known to carry brainworm parasites. The white-tailed deer range is expanding in a northern direction, which may result in the distributions of moose changing due to the impact of brainworm on moose populations. Moose distributions may also change in the future as a result of climate change, as climate change may affect vegetation distributions, altering forage, water and cover availability.

What is the average range size?

Moose home ranges vary by ecoregion, as ranges are dependent on availability of resources such as food and cover. Lynch and Morgantini (1984) analyzed 277 home ranges of moose in northcentral Alberta. The home ranges for bulls and cows averaged 51.6 km² and 46.8 km² respectively during winter, 33.2 km² and 25.6 km² respectively during spring, 22.1 km² and 22.7 km² respectively during summer, and 26.1 km² and 15.4 km² respectively during fall. Both sexes were found to have a significantly larger home ranges in winter when compared to the other seasons. Moose tend to move around more in the winter as they search for food, but will move around less if they have access to an abundance of forage, which is often the case in the summer. Some moose collar data collected in Manitoba is consistent with moose home ranges increasing and decreasing as forage becomes more or less available through the seasons. The results of this study are consistent with the large home ranges reported in the boreal plains ecoregion in northcentral Alberta and in the boreal forests in northwestern Ontario (Lynch and Morgantini 1984). Most of FML 2 falls within the boreal plain ecoregion of Manitoba. Larger home ranges not only result in an animal potentially expending more energy to search for necessary resources, but can also make an animal more vulnerable to potential recreational and industry activities. Further, Lynch and Morgantini (1984) found that the average home range size of two-year-old males was



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significantly different than two-year-old females during fall, largely as a result of males dispersing further away from where they were born.

Questions regarding the Government of Manitoba website:

Public engagement noted on GOM website in regards to moose management, can this be done again with rights holders and stakeholders in FML 2?

The engagement project focusing on moose management that was carried out using the EngageMB platform, was open to the general public throughout the province of Manitoba. Individuals were invited to participate in a short online survey to better help the Wildlife Branch understand the public's knowledge of different threats to moose. The results of the engagement were compiled and released in a What We Heard Report that is posted to the moose engagement page.

Wildlife staff use many forms of engagement to hear people's thoughts regarding moose management. Representatives of the Wildlife Branch participate on Resource Management Boards throughout the province. Additionally, Government is actively trying to move forward with shared management in some areas of the province. As part of the 20 year plan development, Wildlife staff are willing to provide information regarding moose management and engage with communities as necessary.

Were communities of FML 2 included in 2020 and 2021?

The EngageMB Moose Project was open to all residents of Manitoba for commenting, and provided a link to the document "Hard to be a moose in a changing world", which was shared as part of the engagement with some communities. Some communities from FML 2 were part the consultation and engagement processes for the development of the 20-year forest management plan for FML 3. The engagement was generally based around shared management with a focus on moose conservation closure areas and identifying or sharing information about threats to moose populations.

Can some of the findings and comments from this be used to provide information and fact sheets to FML 2 rights holders and stakeholders?

Documents such as the What We heard Report from the moose engagement project found on the website can be handed out at FML2 meetings, and have been shared at some past FML 2 meetings. The What We Heard Report was generated for the Province. Information is also available on the website under EngageMB Moose Project, which is found here: <https://engagemb.ca/moose-in-manitoba>.

References

Lynch, G.M., & Morgantini, L.E. 1984. Sex and age differential in seasonal home range size of moose in northcentral Alberta, 1971-1979. *Alces*, 20: 61-78.

Report on Testing and Developing Bird Models for FML 2 Forest Management Plan

Report for NISO on testing the existing Ontario Boreal bird models and developing new Manitoba bird models for FML 2.

Dec 6th, 2024

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Background

- Older Manitoba HSI bird models considered of insufficient quality
- Currently no data collection in progress, so was recommended to use Ontario Boreal Bird Models. These are a class of models called resource selection probability functions (RSPFs) and have been validated and perform well in Ontario boreal forest context.
- Models produce a probability of use by each of the 12 species, which varies from 0.0 to 1.0. This probability of use is then categorized into predicted occupied and predicted unoccupied classes based on a threshold value that optimizes the balance of false positive and false negative predictions.
- The Ontario bird models were built using a hierarchical data structure from LSL based on hexagons. It was desirable to recode these models into Patchworks data structure so dynamic output could be created by Patchworks on the fly
- Once models were encoded and output created, it was necessary to test the performance of the models by testing whether predicted occupied sites were indeed occupied, and likewise for predicted unoccupied sites.

- Because the thresholds for the occupancy classification were based on Ontario data, it was suggested to rederive thresholds using Manitoba Bird Atlas data, and then test performance of the new species-specific occupancy maps.

Methods for Testing the Ontario Bird models, applied to FML2

- Model testing data was obtained from the last Manitoba Bird Atlas point counts (2010-2014). The data was queried to filter and provide useful data for performance assessment. Filtering stages included:
 - For the 12 modelled species (ALFL, AMRE, BAWW, BBWA, BHVI, BLBW, BRRCR, COYE, CSWA, DEJU, GCKI, HETH), select data from extents of FML 2
 - Remove any records where disturbance occurred after the bird observations were made. This was to avoid false associations (e.g., bird was observed in mature forest, but the current inventory labels that location as clear-cut)
- After initial filtering, species level processing was conducted to create species-specific model training and testing data. Training data was used to estimate new threshold, or cut-point values, while “out-of-sample” testing data was used to estimate model performance.
 - Each point location can be monitored multiple times, so select the date associated with an occurrence for that species, otherwise label site as available, but unoccupied.
 - A training data set was created by using the R program GRTS (Generalized Random Tessellation Stratified), which aids creation of a random, spatial dispersed sample set. The initial data set included sites where status was either “used”, i.e., where the animal was recorded as being present at the site, or “available”, where that species was never recorded as being present at the site. Used was coded as 1, available as 0. The training spatial sample was created for a subset of the full data set, and an option specified to treat site status as a survey stratum. This ensures that the site status (0/1) balance remains in place after the sub-sampling.
 - Focus of this analysis was on testing performance of the existing occupancy models, so a 25% training sample of bird data was selected to derive the new thresholds, and the remaining 75% set aside for testing performance of the models.
 - Model maps that predict probability of use were exported from Patchworks, and these raster grids were then imported into R.
 - The training data was overlaid onto the probability maps, and the values captured at each point.
 - A procedure in R using the package PresenceAbsence was then used to create a confusion matrix to estimate sensitivity and specificity (see description in Appendix 1), and to then identify threshold values based on balancing false-positive and false-negative errors.
 - The existing probability of use map was classified as a predicted occupancy map (0/1) using these newly derived species-specific thresholds, and the testing data from the Manitoba Bird Atlas overlaid. Occupancy values were captured at each overlaid point.

- Performance of the Ontario Bird Models in Manitoba was evaluated by calculating model classification performance (sensitivity, specificity, and balanced error) of the occupancy maps, i.e., how accurately did the model correctly predict (classify) both presence and absence of the species across testing sites.

Performance Results for Ontario Models:

- Ontario models performed poorly for all species, with sensitivity and specificity values approaching 0.5. Acceptable models should have values > 0.6, and good models with values > 0.7
- Some suggestions as to why the Ontario boreal bird models did not perform well within FML 2 include differences in how forest types are defined in the FRI between Manitoba and Ontario, differences in habitat selection by birds in FML 2, absence of important habitat types used by FML 2 birds in the Ontario bird models, and differences in how spatial data was processed in Patchworks versus LSL.
- At this point the models' performance was discussed with NISO, with the option presented to derive new models using Manitoba Bird Atlas data and Patchworks habitat layer output, but to assess models among a broader group of 30 species. The next section of the report presents methods and results for deriving these new models.

Methods for developing and testing new Manitoba Bird Models.

- Habitat surfaces for variables used in the Ontario models were exported from Patchworks as rasters, and then imported into R. Layers were "seral_0", "locage_0", "loccc_0", "locht_0", "lopcpthwd_0", "lopcptyng_0", "landcwed_0", "landpctmat_0", representing seral stage, tree height, percent hardwood volume, percent young forest, percent mature forest, and contrast-weighted edge density between young and old forest, for a combination of local and landscape scales. The "_0" suffix indicated that these variables were for time period 0. The same variables were also available for periods 1-4, so could therefore be used to predict habitat use across time (the 4 simulation periods), and space (the entire FML 2 landscape).
- Quadratic forms of these variables were created and included as candidate variables (e.g., height and height²).
- A new training data set was derived from the Manitoba Bird Atlas data as described in the section above, except that now training data comprised 75% of the data, and remaining 25% used for testing. This is because developing a new model requires as much data as possible, while still retaining sufficient data for testing.
- Stepwise logistic regression, using change in the information criterion AIC, was used to derive new models. This model selection approach assesses models, not individual model coefficients. Like the Ontario model, these models are also termed Resource Selection Probability Functions (RSPFs). Models predict a logit value, which is then transformed using an exponential function into a probability of use. Model coefficients are provided in Appendix 2 (Table A2-1).

- Once a new model was created, new threshold values were derived using methods described above to transform the continuous probability of use predictions into predicted occupancy Appendix 2 (Table A2-2).
- Predictions were then applied to the entire FML 2 landscape, the test values overlaid, and raster values extracted for each test data point.
- Model performance was then evaluated using the test data (as described above), and ROC curves produced (Appendix 3).
- RSPF values and predicted percent area occupied was calculated for all species, across all time periods.
- PAO was calculated as sum of cells =1/ sum of cells = 1 or 0. Cells with invalid or missing data were omitted from the calculation.

Model Performance and Selected Birds

Model performance improved across the board relative to the Ontario models, but nonetheless model performance was variable. I expanded the list of species to consider for models to 30, and among the species evaluated, 11 species were selected (Table 1). Models performed well in terms of sensitivity, specificity, and overall accuracy for these 11 species (Table 2). ROC curves are found in Appendix 3.

Table 1. Selected birds (focal species).

AOU Code	Common Name	Latin Name
ALFL	Alder Flycatcher	<i>Empidonax alnorum</i>
AMRE	American Redstart	<i>Setophaga ruticilla</i>
BAWW	Black-and-white Warbler	<i>Mniotilta varia</i>
BLBW	Blackburnian Warbler	<i>Setophaga fusca</i>
HETH	Hermit Thrush	<i>Catharus guttatus</i>
LEFL	Least Flycatcher	<i>Empidonax minimus</i>
MOWA	Mourning Warbler	<i>Geothlypis philadelphia</i>
OVEN	Ovenbird	<i>Seiurus aurocapilla</i>
PIWO	Pileated Woodpecker	<i>Dryocopus pileatus</i>
REVI	Red-eyed Vireo	<i>Vireo olivaceus</i>
WIWR	Winter Wren	<i>Troglodytes hiemalis</i>

Table 2. Model performance of the new Manitoba Bird Models

Performance metric	Value	Species
ALFL	Sensitivity	0.420
ALFL	Specificity	0.758
ALFL	Balanced Accuracy	0.589
AMRE	Sensitivity	0.670
AMRE	Specificity	0.857
AMRE	Balanced Accuracy	0.764
BAWW	Sensitivity	0.520
BAWW	Specificity	0.676
BAWW	Balanced Accuracy	0.598

BLBW	Sensitivity	0.703
BLBW	Specificity	0.632
BLBW	Balanced Accuracy	0.667
HETH	Sensitivity	0.760
HETH	Specificity	0.446
HETH	Balanced Accuracy	0.603
LEFL	Sensitivity	0.629
LEFL	Specificity	0.789
LEFL	Balanced Accuracy	0.709
MOWA	Sensitivity	0.823
MOWA	Specificity	0.560
MOWA	Balanced Accuracy	0.692
OVEN	Sensitivity	0.653
OVEN	Specificity	0.742
OVEN	Balanced Accuracy	0.698
PIWO	Sensitivity	0.622
PIWO	Specificity	0.696
PIWO	Balanced Accuracy	0.659
REVI	Sensitivity	0.786
REVI	Specificity	0.485
REVI	Balanced Accuracy	0.635
WIWR	Sensitivity	0.906
WIWR	Specificity	0.250
WIWR	Balanced Accuracy	0.578

Based on a summary of bird information (Keith Hobson, per. comm), these birds represent a broad array of habitat requirements, with some requiring coniferous forest, deciduous forest, or either, and with age requirements old, young, or either age (Table 3). All birds are considered common to abundant in Manitoba, and all are prevalent within Boreal Softwood Shield and northern extent of the Boreal Taiga Plains, although some species are at the northern edge of their distribution (Manitoba Bird Atlas). In terms of canopy closure, they also represent a range of requirements of either closed, open, or wetland (Table 4). Thus overall, these 11 species can be viewed as focal species indicating the range of variation expected under natural forest conditions in the Churchill River Upland, Hayes River Upland, Mid-Boreal Lowland, and Interlake Plain ecoregions, all which fall within FML 2.

Table 3. Tertiary habitat and age requirements.

Tertiary Habitat	Avg Forest Age	Species List
Coniferous	Either	Winter Wren
Deciduous	Old	Red-eyed Vireo
Either	Either	American Redstart
Either	Old	Blackburnian Warbler, Ovenbird, Least Flycatcher, Hermit Thrush, Black-and-white Warbler
Either	Young	Mourning Warbler, Alder Flycatcher

Table 4. Secondary habitat requirements

Secondary Habitat	Species Count	Species List
Closed Forest	3	Winter Wren, Blackburnian Warbler, Ovenbird
Open Forest	6	American Redstart, Least Flycatcher, Red-eyed Vireo, Hermit Thrush, Black-and-white Warbler, Mourning Warbler
Wetland	1	Alder Flycatcher

Percent Area Occupied

The percentage of all pixels classified as occupied (PAO) was plotted over time and between scenarios to assess Patchworks outcomes with respect to bird habitat for the 11 focal species (Figure 1). The average PAO across time periods 1-4 was calculated to determine differences between the null and preferred scenarios (Table 5). For some species the trends were similar between scenarios, but for ALFL and WIWR, occupancy was lower under the preferred scenario, whereas for BLBW, HETH, MOWA, and PIWO occupancy was higher under the preferred scenario.

Table 5. Average Percent Area Occupied (PAO) for periods 1 to 4.

Species	Null	Preferred
ALFL	74.53	67.99
AMRE	22.68	27.83
BAWW	40.75	40.78
BLBW	18.80	23.15
HETH	50.96	57.07
LEFL	28.37	27.65
MOWA	10.56	12.79
OVEN	39.50	41.81
PIWO	40.60	43.02
REVI	26.83	26.67
WIWR	33.21	<u>27.60</u>

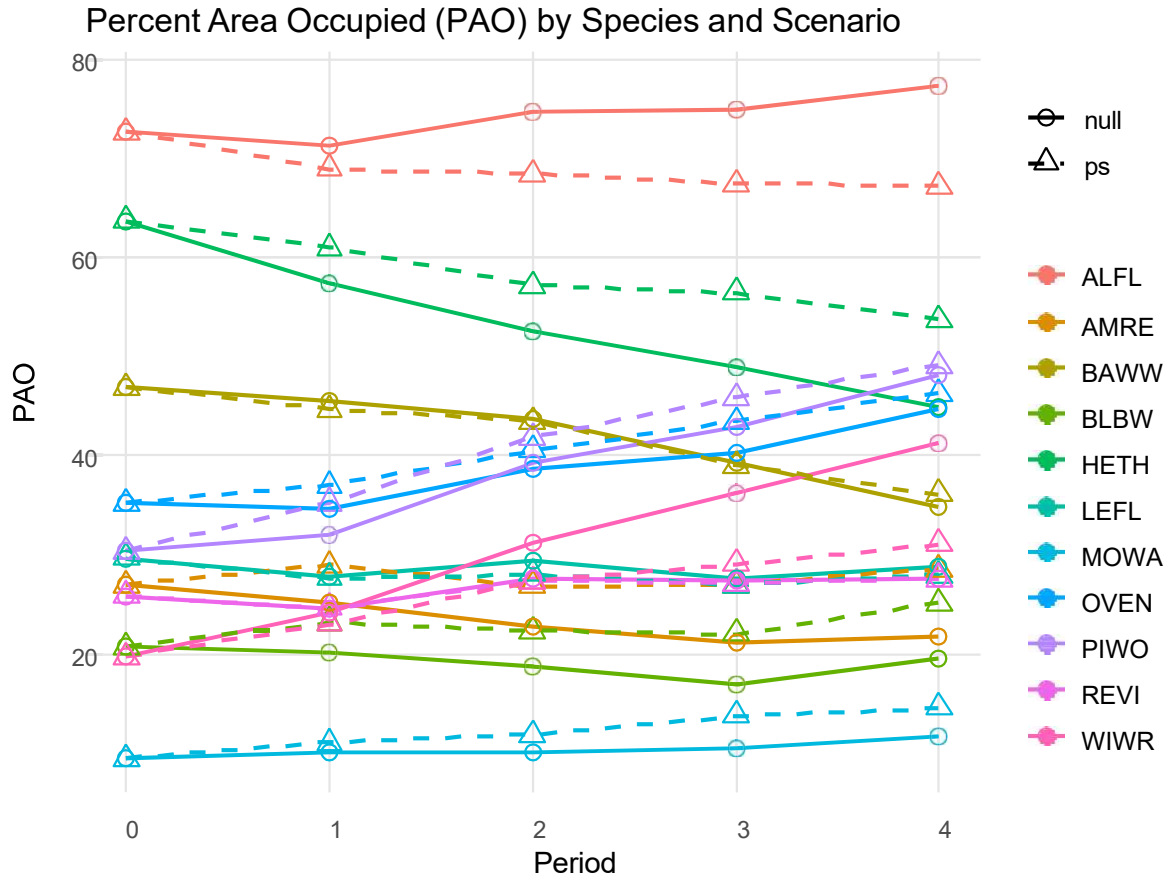


Figure 1. Percent area occupied (PAO) by 11 species for the null and preferred forest management scenarios. For the null scenario, no harvest was simulated, and existing harvest was allowed to age.

Appendix 1. Definition of Performance Metrics

Example Confusion Matrix and Calculation:

	Predicted Positive	Predicted Negative
Actual Positive	TP (True Positive)	FN (False Negative)
Actual Negative	FP (False Positive)	TN (True Negative)

1. Sensitivity (True Positive Rate, Recall):

- **Definition:** Sensitivity measures the proportion of actual positives that are correctly identified by the model.
- **Formula:**

$$\text{Sensitivity} = \frac{\text{True Positives (TP)}}{\text{True Positives (TP)} + \text{False Negatives (FN)}}$$

- **Interpretation:**
 - A model with high sensitivity has a low rate of false negatives, meaning it rarely misses positive cases.
 - It answers the question: *"How well does the model detect positive cases?"*

2. Specificity (True Negative Rate):

- **Definition:** Specificity measures the proportion of actual negatives that are correctly identified by the model.
- **Formula:**

$$\text{Specificity} = \frac{\text{True Negatives (TN)}}{\text{True Negatives (TN)} + \text{False Positives (FP)}}$$

- **Interpretation:**
 - A model with high specificity has a low rate of false positives, meaning it rarely incorrectly classifies negatives as positives.
 - It answers the question: *"How well does the model identify negative cases?"*

Appendix 2. Model Results

Table A2_1. Model Coefficients, by species. Models predict logit values.

Variable	Model coefficients	Species
(Intercept)	-1.04460	ALFL
locage_0	-0.02662	ALFL
landpctmat_0	1.25126	ALFL
locage_0_2	0.00014	ALFL
locht_0_2	-0.00191	ALFL
locpctyng_0_2	-1.47053	ALFL
(Intercept)	-3.91118	AMRE
locage_0	-0.00925	AMRE
loccc_0	-0.01768	AMRE
locht_0	0.24670	AMRE
landpctmat_0	3.37826	AMRE
locht_0_2	-0.00846	AMRE
locpcthwd_0_2	3.58291	AMRE
landpctmat_0_2	-3.87641	AMRE
(Intercept)	-5.08071	BAWW
locage_0	-0.02431	BAWW
loccc_0	0.11358	BAWW
locht_0	0.37271	BAWW
locpcthwd_0	1.30805	BAWW
landpctmat_0	-1.21542	BAWW
loccc_0_2	-0.00162	BAWW
locht_0_2	-0.00947	BAWW
landcwed_0_2	-0.36049	BAWW
(Intercept)	-5.55476	BLBW
locht_0	0.15524	BLBW
locpctyng_0	-9.85026	BLBW
landcwed_0	3.04745	BLBW
landpctmat_0	8.36636	BLBW
locage_0_2	-0.00011	BLBW
loccc_0_2	-0.00061	BLBW
locpctyng_0_2	9.66632	BLBW
landcwed_0_2	-1.21030	BLBW
landpctmat_0_2	-9.80076	BLBW
(Intercept)	-0.33470	HETH
locage_0	-0.00933	HETH
landcwed_0	0.23605	HETH
landpctmat_0	-1.81052	HETH
locpctyng_0_2	-0.80093	HETH

landpctmat_0_2	1.85400	HETH
(Intercept)	-3.36025	LEFL
locage_0	-0.00646	LEFL
locpcthwd_0	4.55713	LEFL
landcwed_0	1.27494	LEFL
locpcthwd_0_2	-3.21014	LEFL
landcwed_0_2	-0.64067	LEFL
landpctmat_0_2	0.85257	LEFL
(Intercept)	-7.22024	MOWA
locage_0	0.07257	MOWA
locpcthwd_0	3.45021	MOWA
locpctyng_0	2.70377	MOWA
locage_0_2	-0.00047	MOWA
(Intercept)	-2.43986	OVEN
locage_0	-0.02991	OVEN
locht_0	0.06485	OVEN
locpcthwd_0	5.29153	OVEN
landcwed_0	0.52370	OVEN
landpctmat_0	0.49822	OVEN
locage_0_2	0.00013	OVEN
locpcthwd_0_2	-4.32540	OVEN
(Intercept)	-2.83583	PIWO
locage_0	-0.06361	PIWO
locht_0	0.09188	PIWO
locpcthwd_0	4.69005	PIWO
locpctyng_0	2.76092	PIWO
landcwed_0	0.49959	PIWO
locage_0_2	0.00037	PIWO
locpcthwd_0_2	-5.63057	PIWO
locpctyng_0_2	-3.30752	PIWO
(Intercept)	-1.82444	REVI
locage_0	-0.03892	REVI
locht_0	0.21939	REVI
locpcthwd_0	5.18551	REVI
locage_0_2	0.00019	REVI
loccc_0_2	-0.00014	REVI
locht_0_2	-0.00745	REVI
locpcthwd_0_2	-4.20425	REVI
(Intercept)	-1.49619	WIWR
locage_0	-0.03106	WIWR
landcwed_0	1.53352	WIWR
landpctmat_0	-2.56059	WIWR
locage_0_2	0.00018	WIWR

locpctyng_0_2	-1.04736	WIWR
landcwed_0_2	-0.63305	WIWR
landpctmat_0_2	3.33552	WIWR

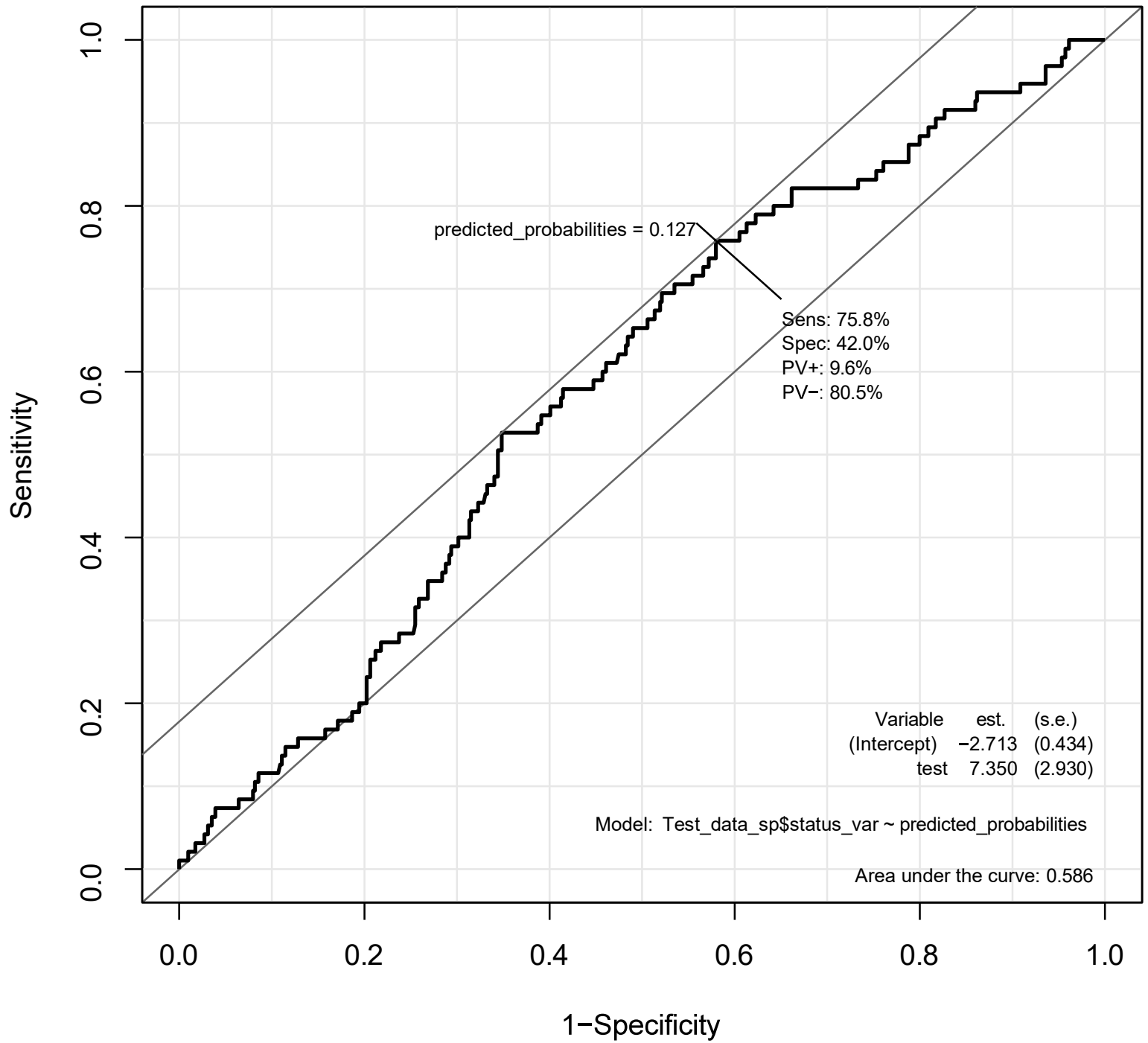
"locage_0", "loccc_0", "locht_0", "locpcthwd_0", "locpctyng_0", "landcwed_0", "landpctmat_0", represent age, crown closure, height, percent hardwood, percent young, contrast weighted edge and percent mature and old at time 0. Variables with _0_2 suffix indicated the variable value was squared.

Table A2_2. Thresholds (CP) for classifying probability of use into predicted occupancy.

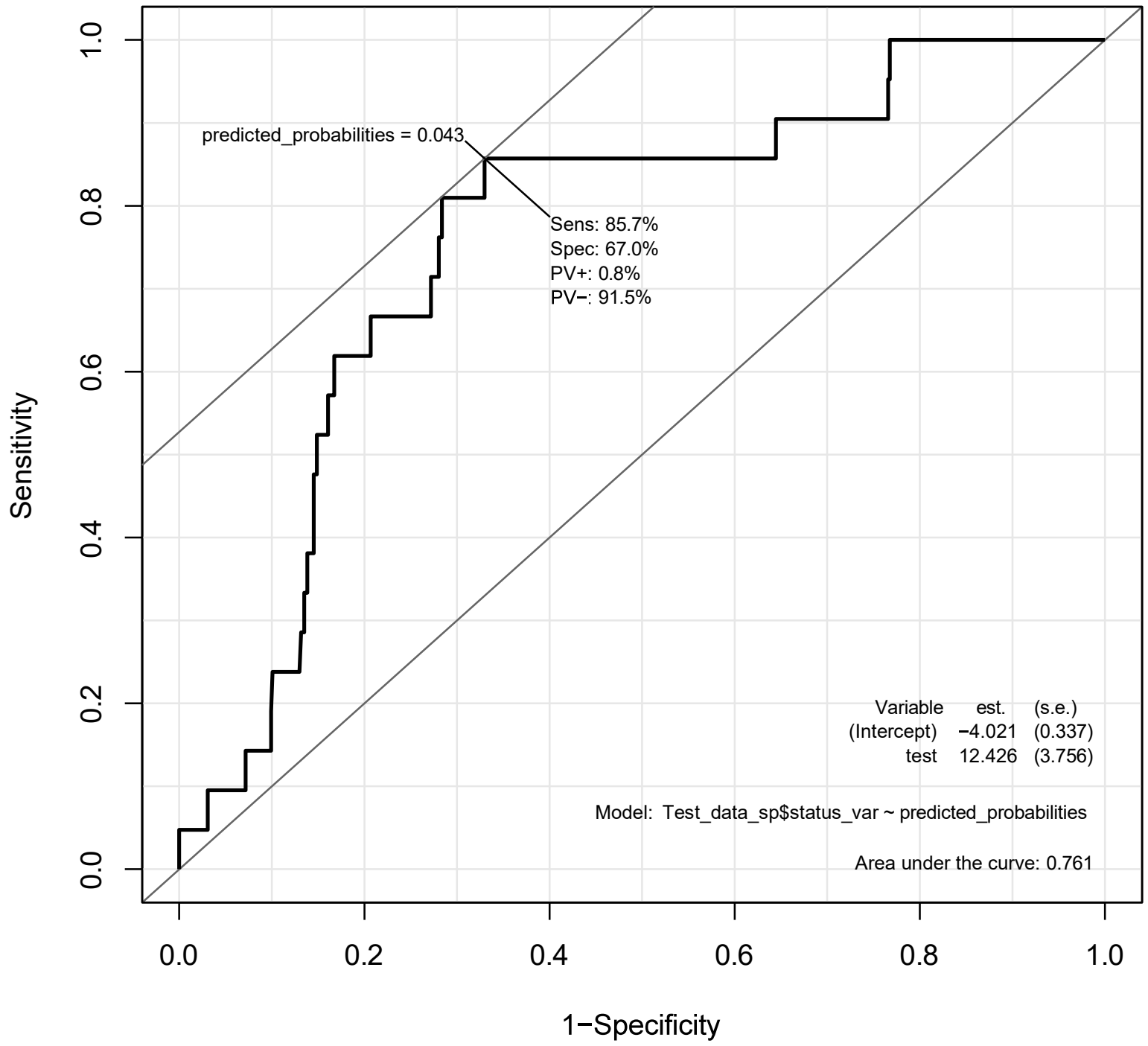
CP	Species
0.1269	ALFL
0.0433	AMRE
0.0437	BAWW
0.0336	BLBW
0.2411	HETH
0.0775	LEFL
0.0395	MOWA
0.1374	OVEN
0.0391	PIWO
0.1972	REVI
0.1191	WIWR

Appendix 3. ROC Curves

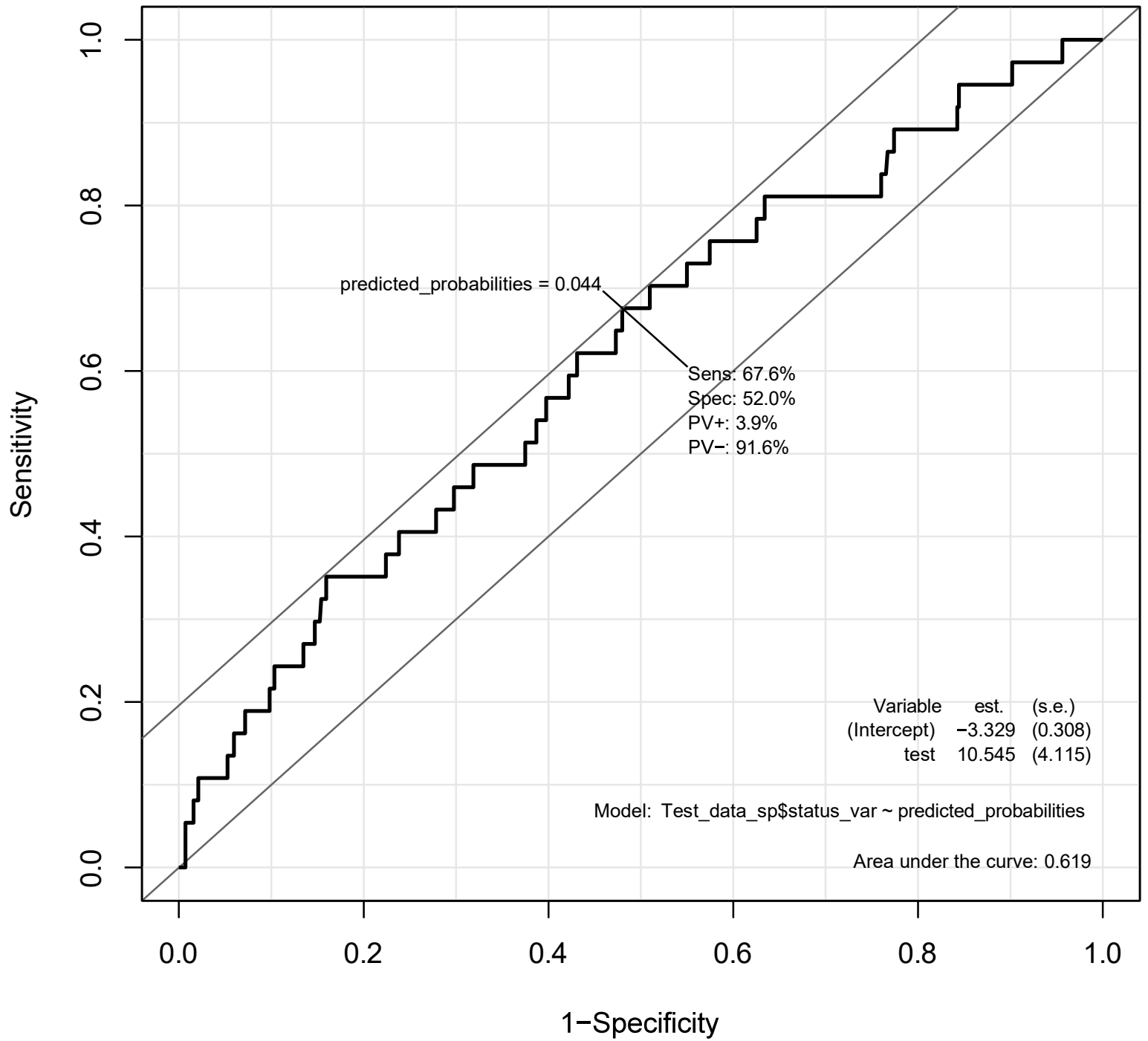
ALFL



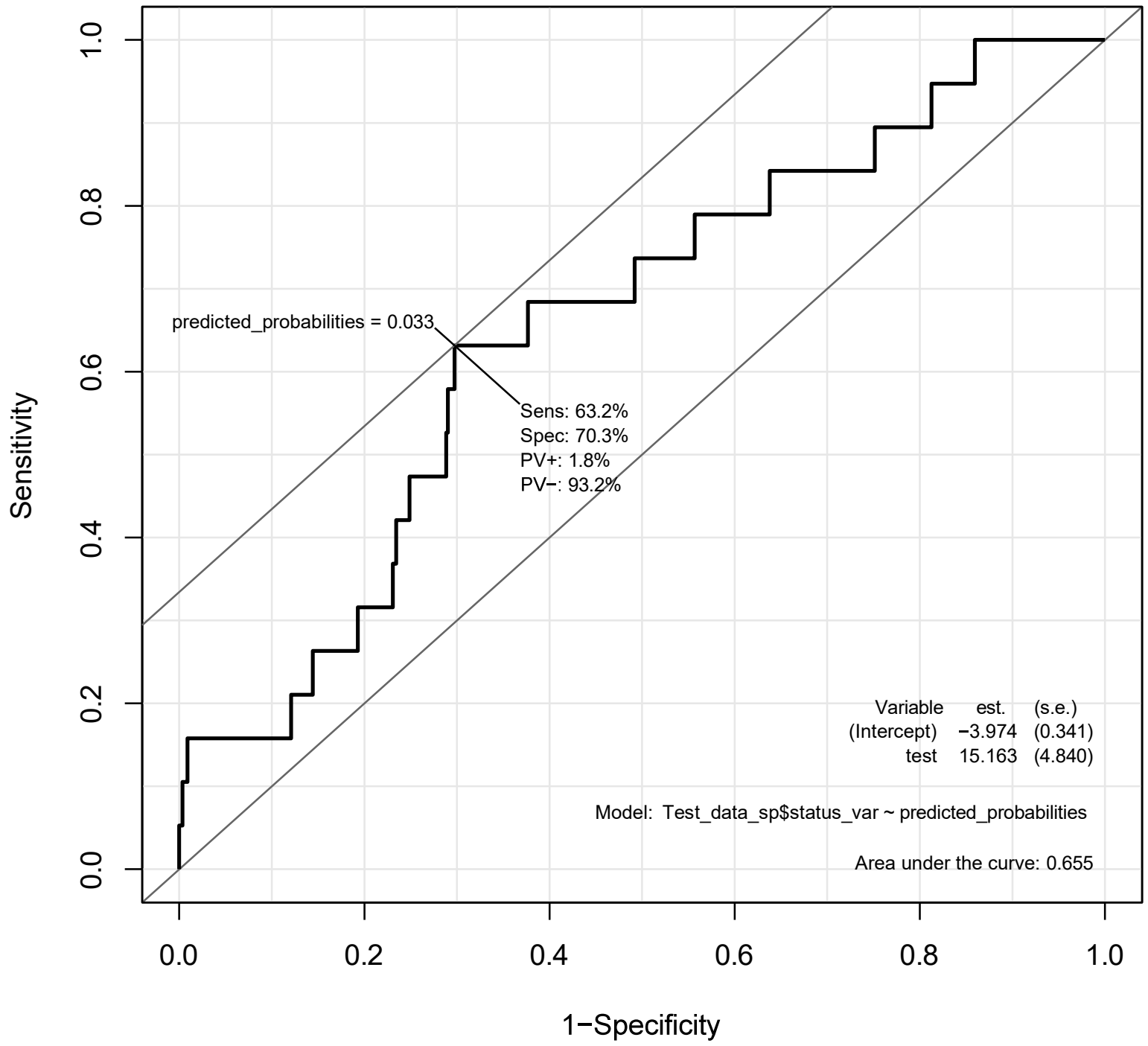
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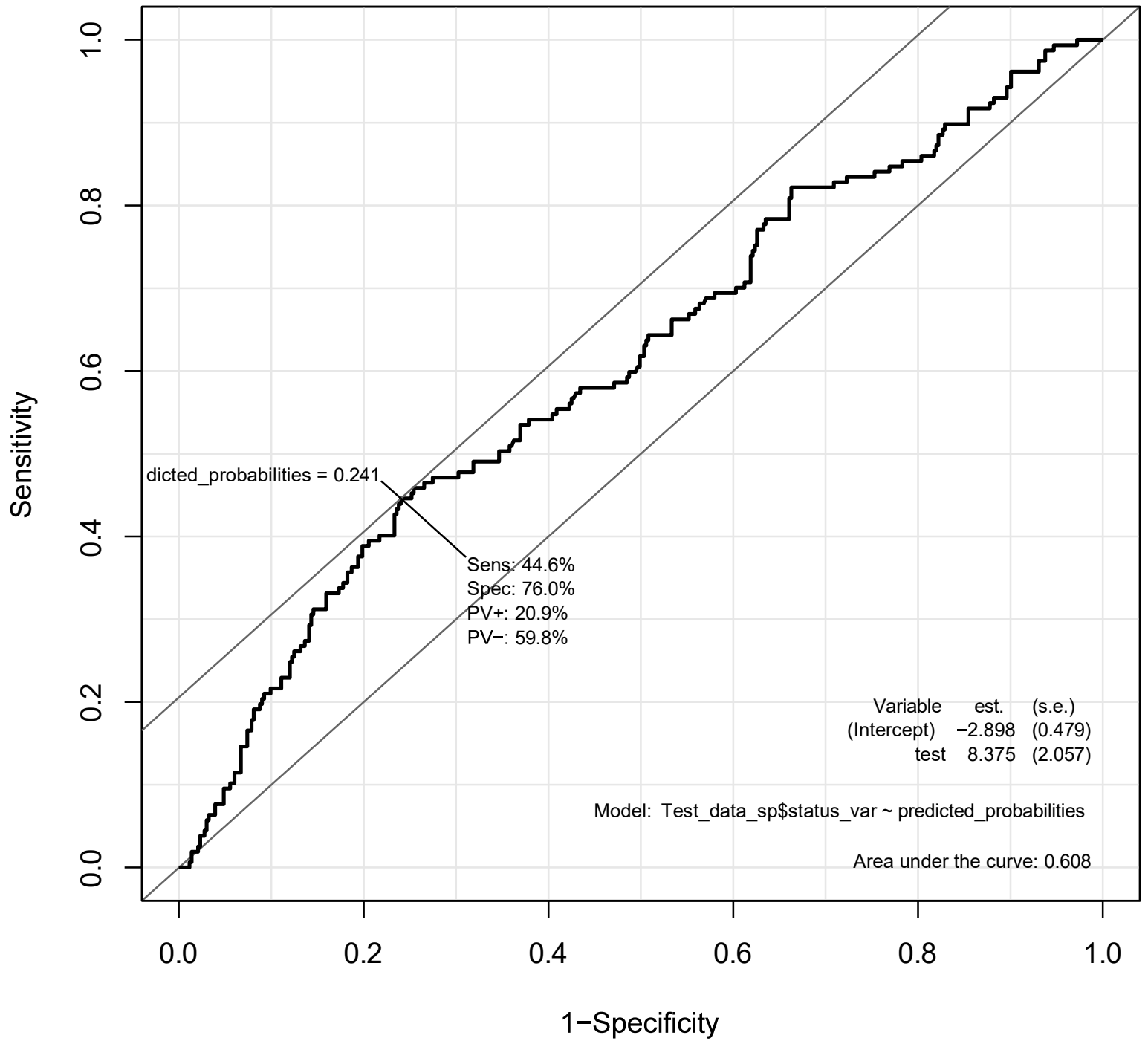
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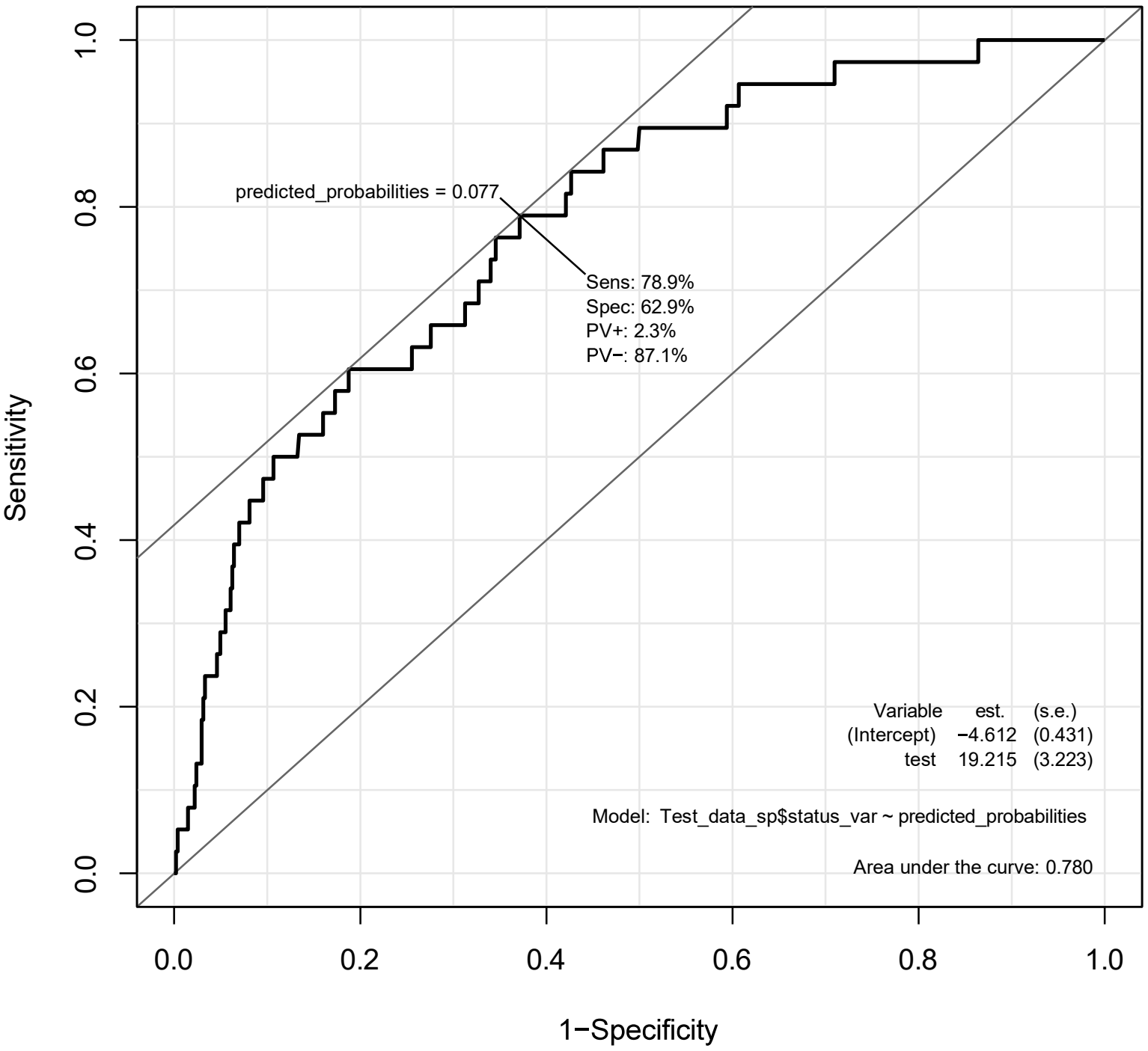
BLBW



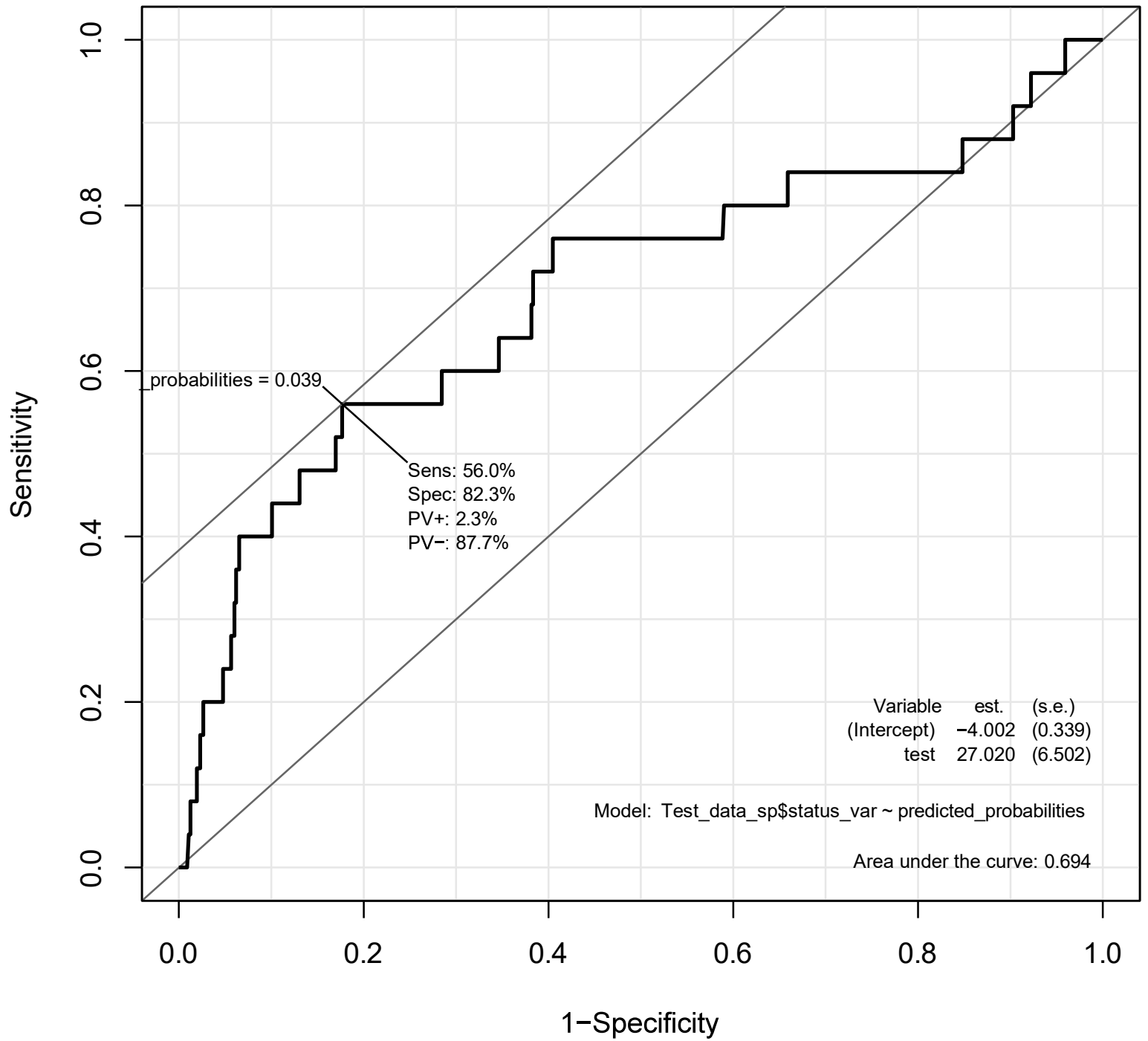
HETH



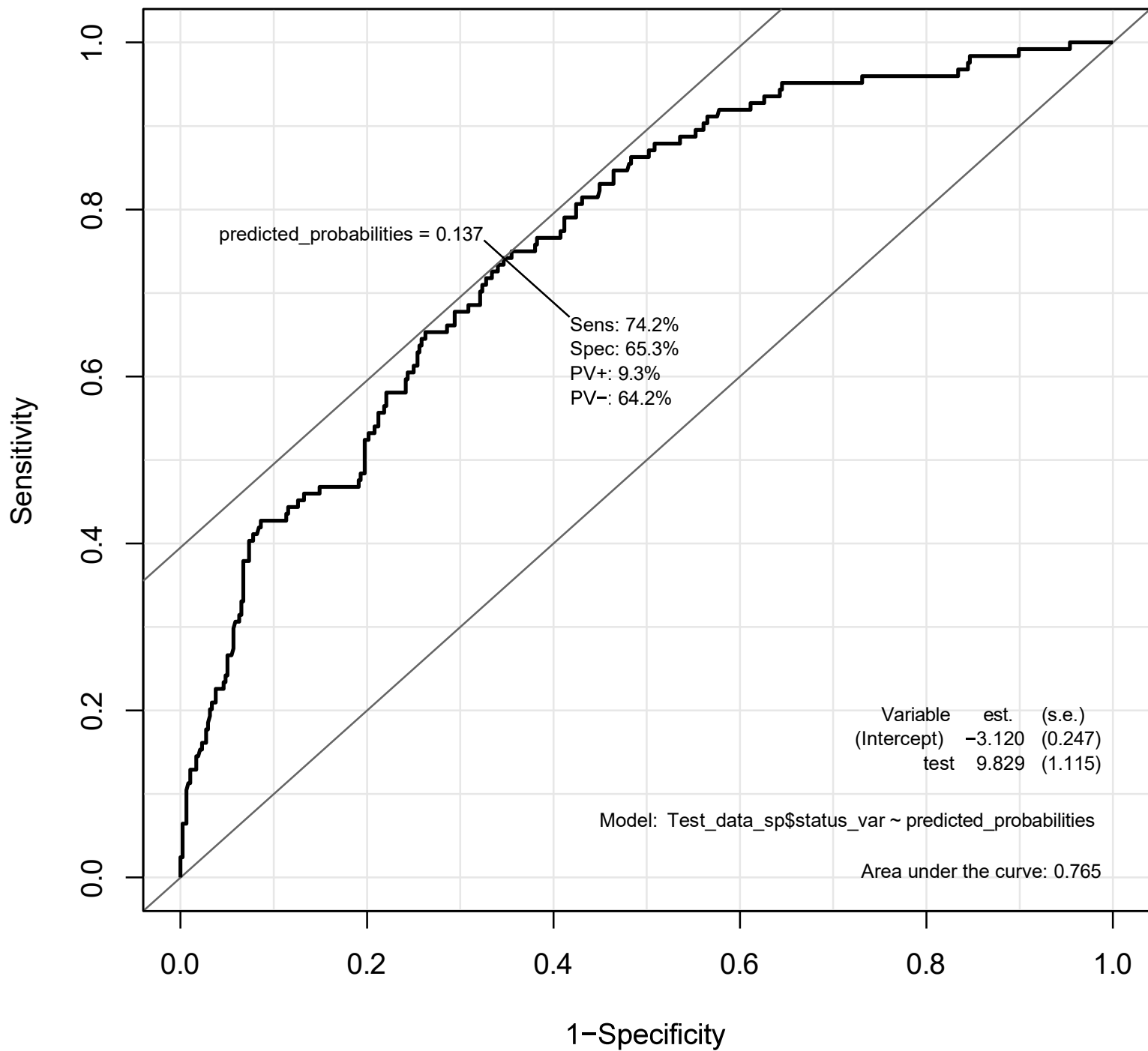
LEFL



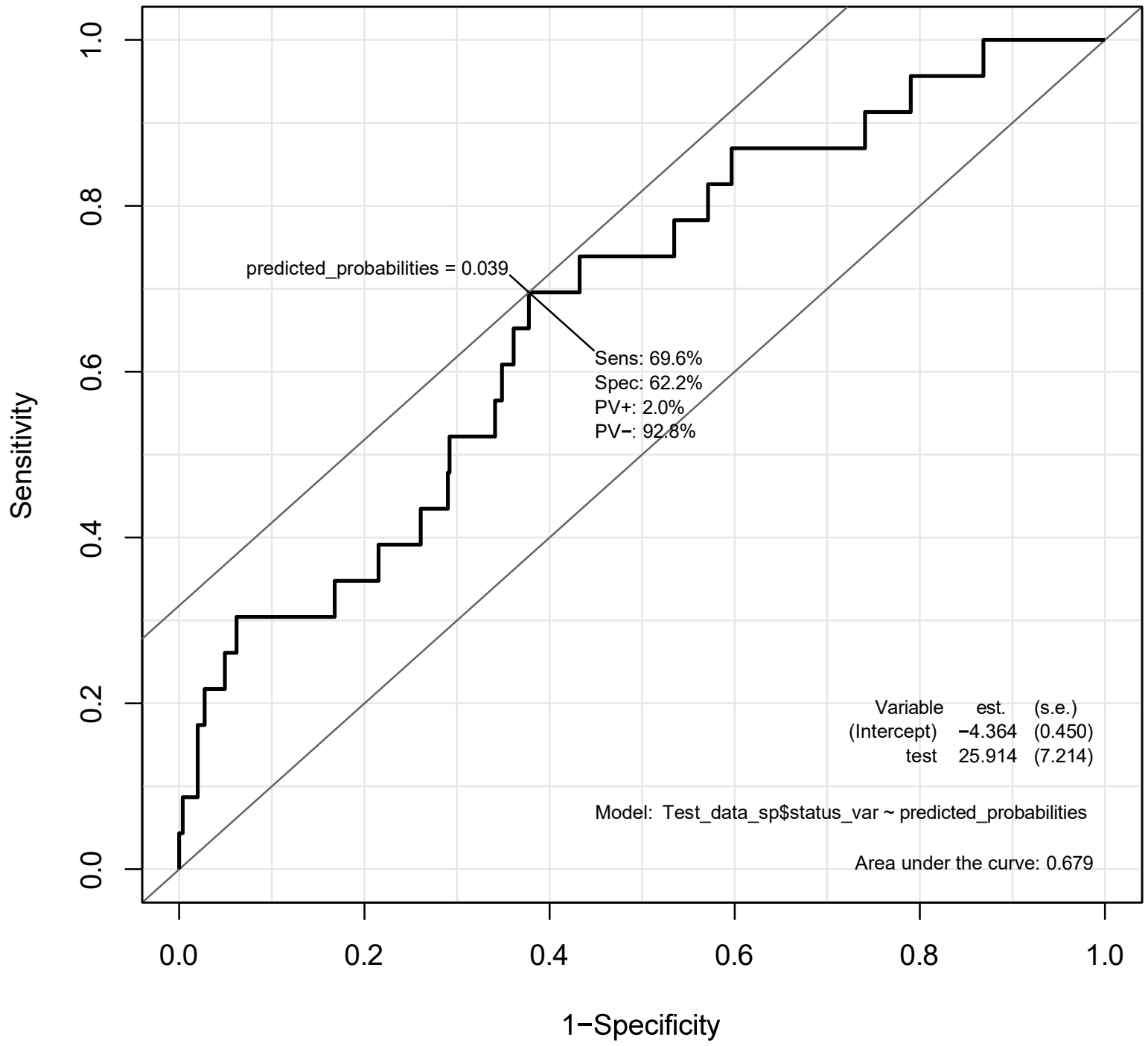
MOWA



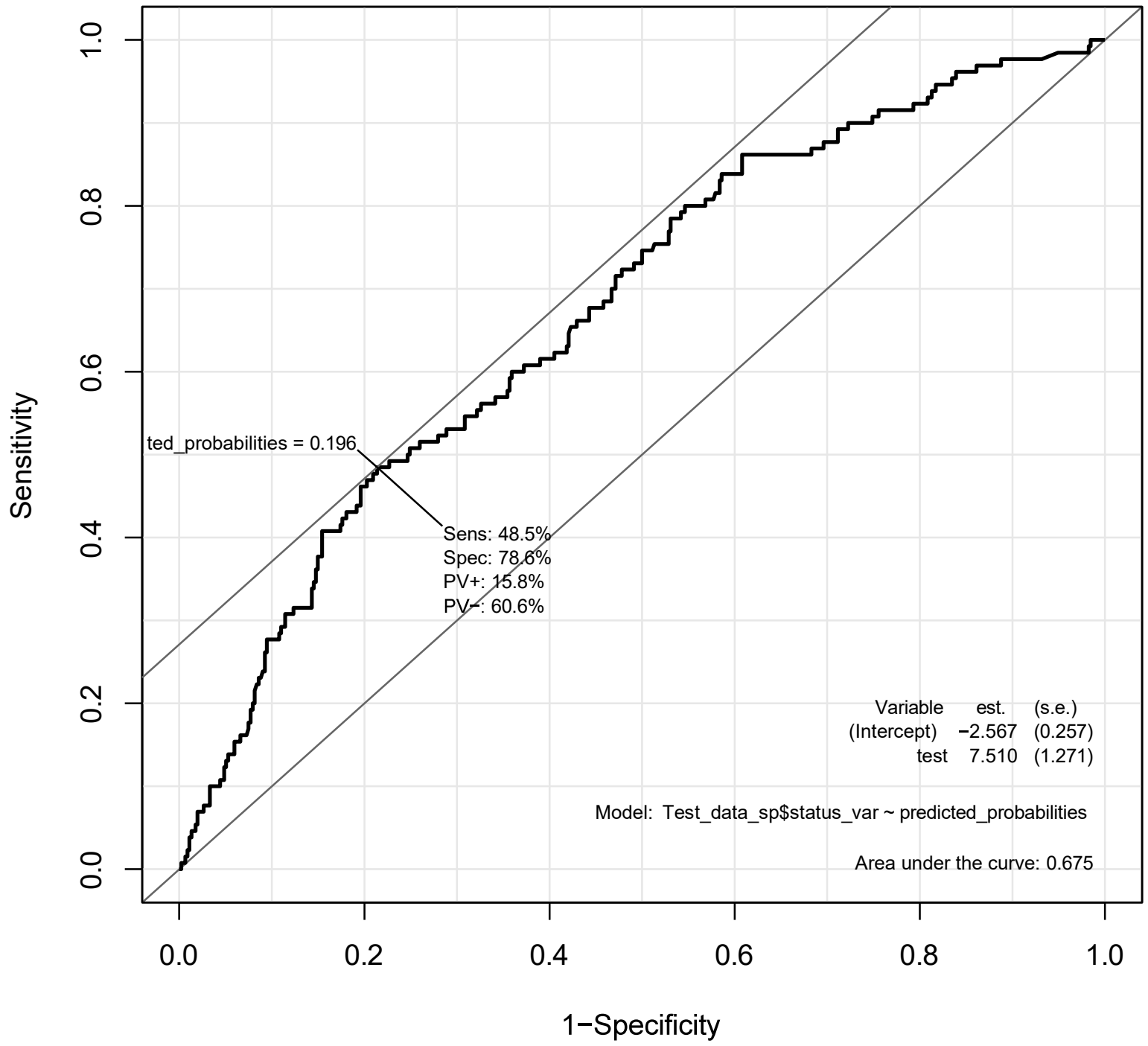
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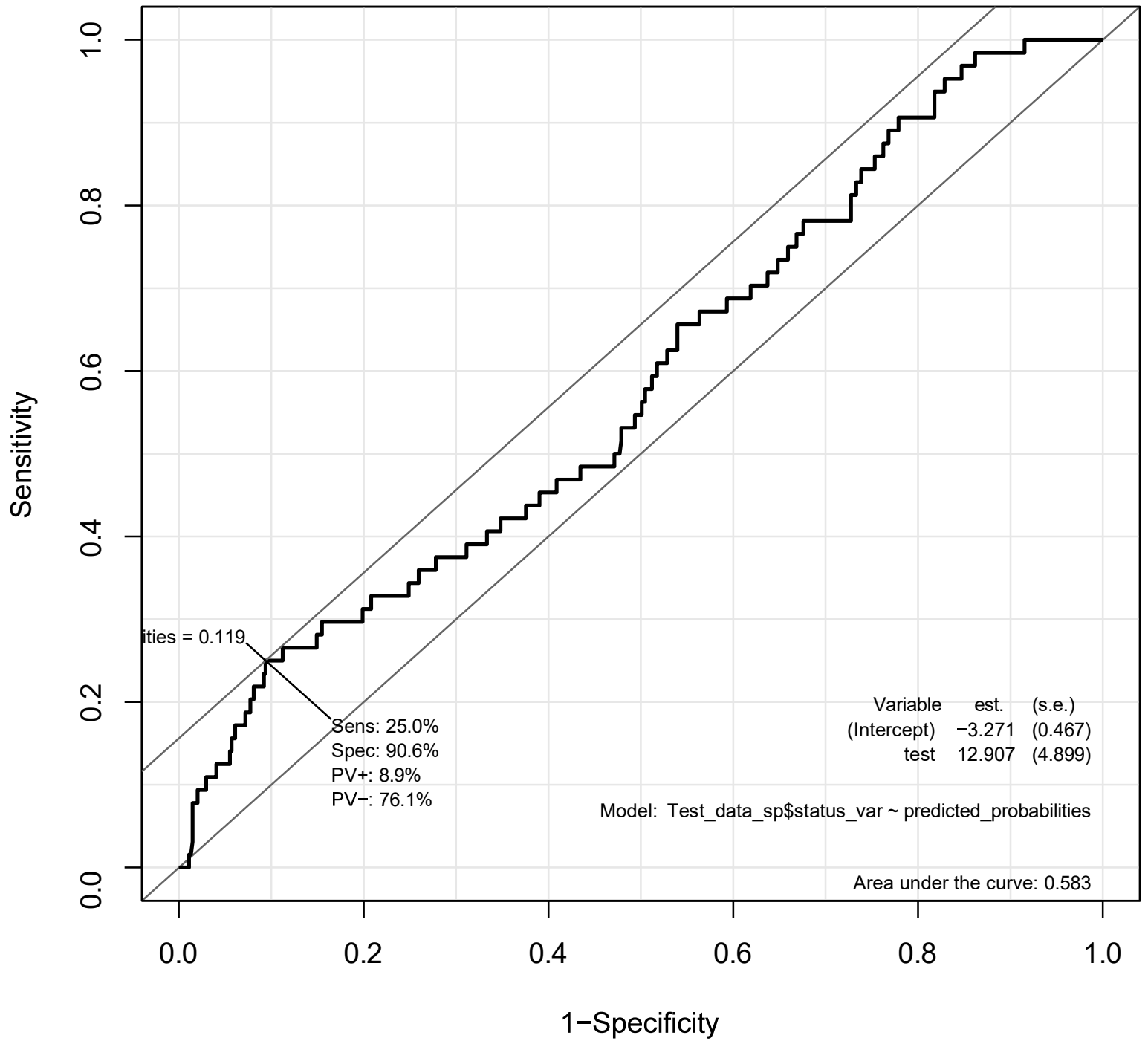
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REVI

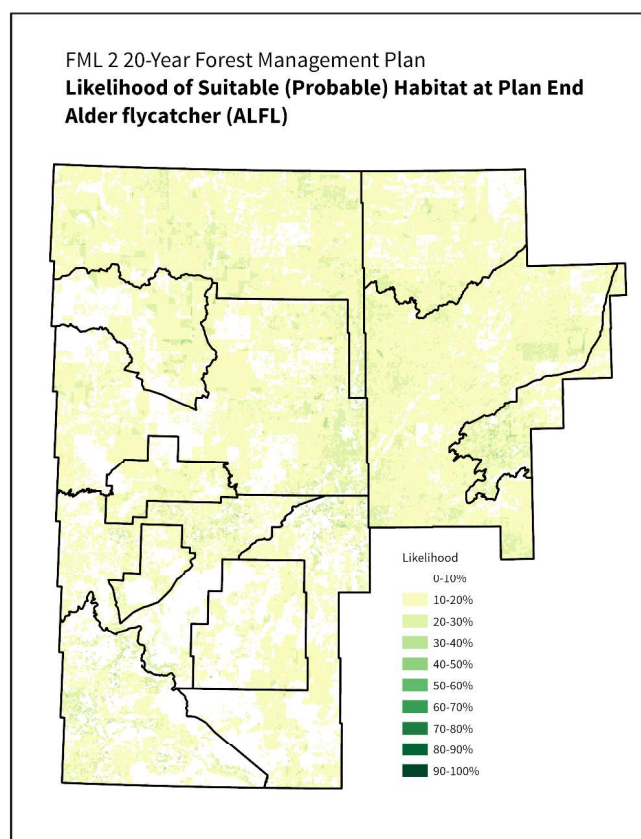
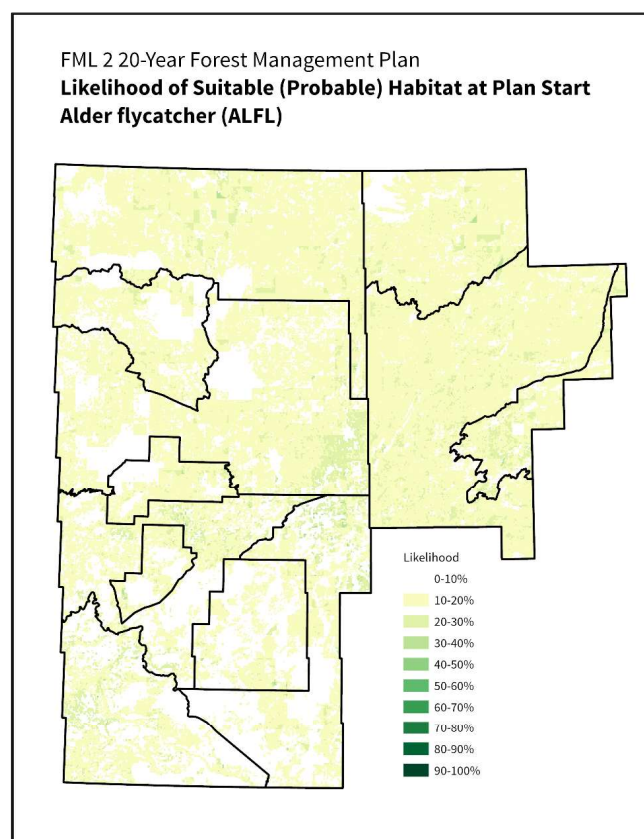


WIWR

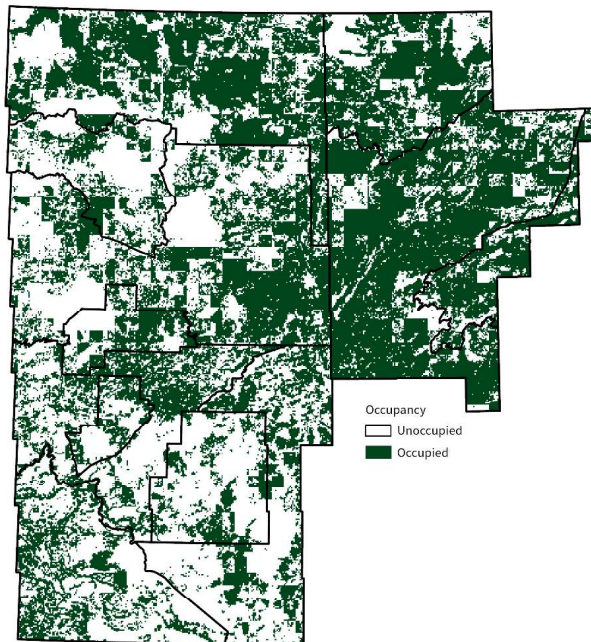


Appendix R – Boreal Songbird Model Map Results

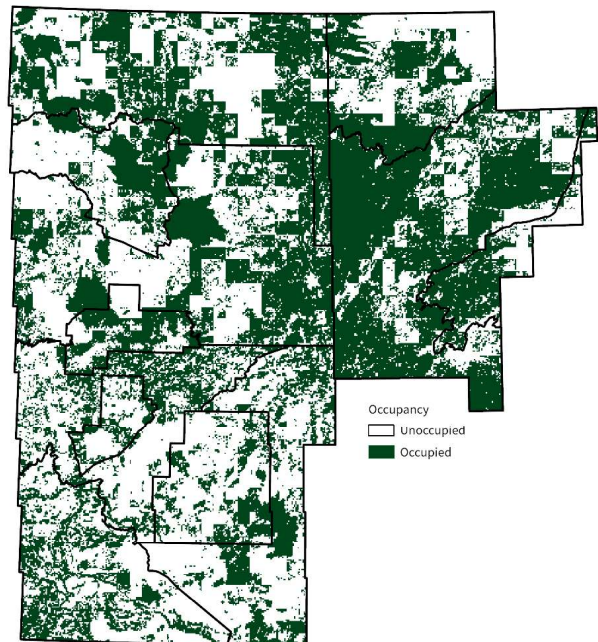
For more information on how to interpret these results, see *Modelling and Wildlife Habitat and Habita Elements* subsection 11.4 *Boreal Songbird Habitat Elements*.



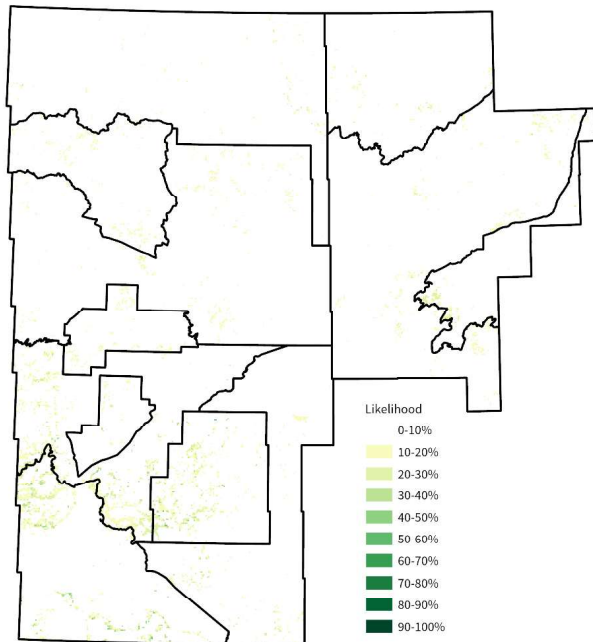
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Likelihood of Occupied Habitat at Plan Start
Alder flycatcher (ALFL)



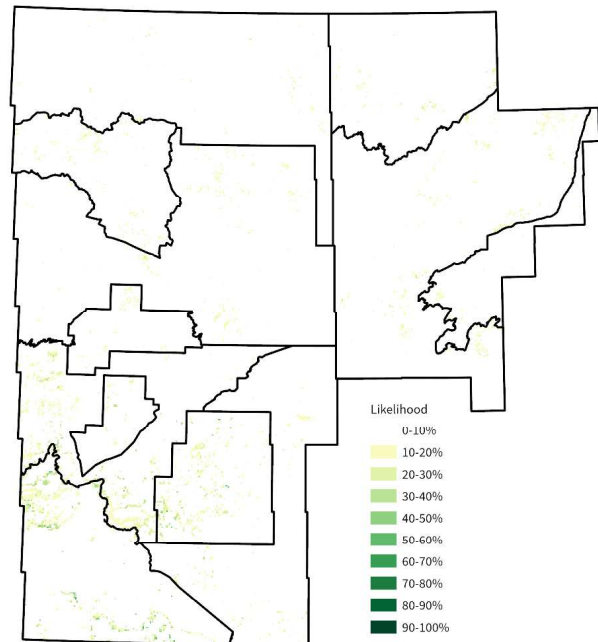
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Alder flycatcher (ALFL)



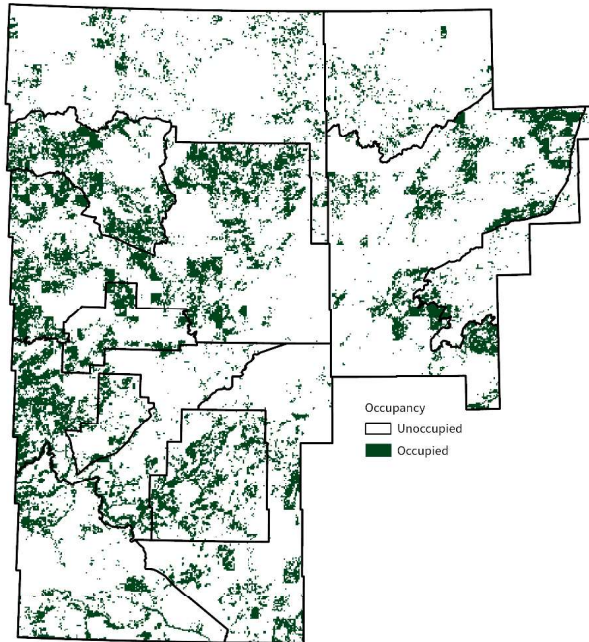
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Likelihood of Suitable (Probable) Habitat at Plan Start
American redstart (AMRE)



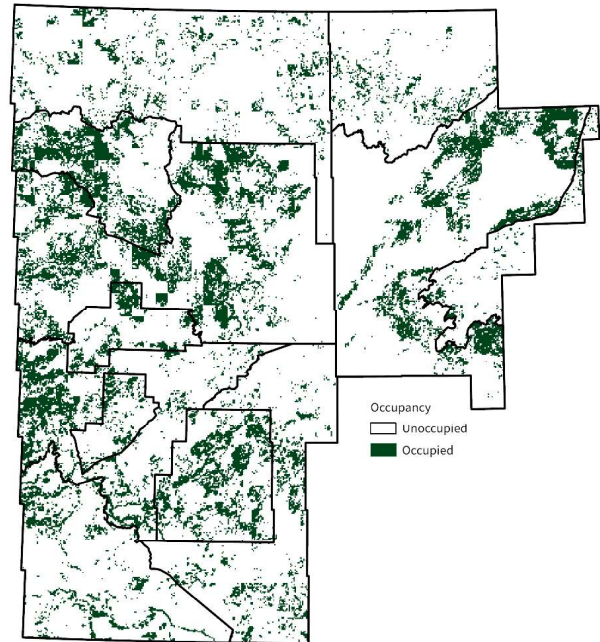
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Likelihood of Suitable (Probable) Habitat at Plan End
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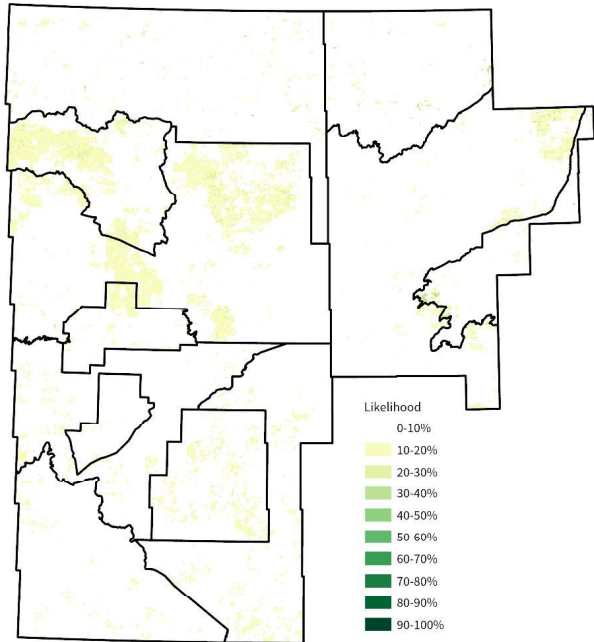
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Likelihood of Occupied Habitat at Plan Start
American redstart (AMRE)



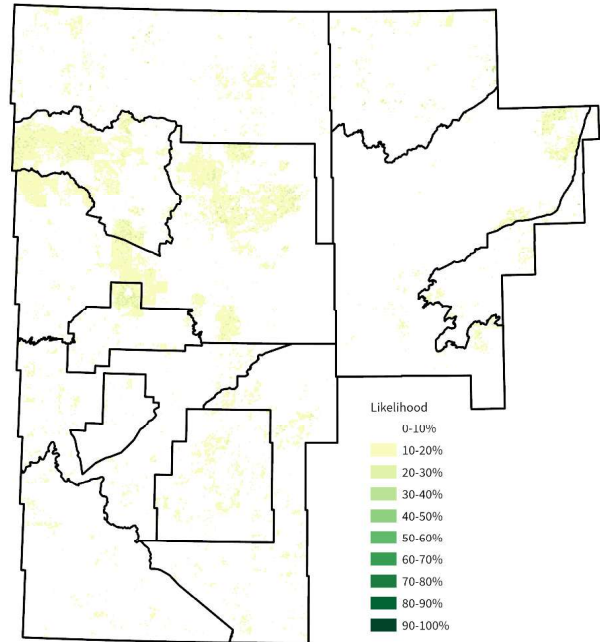
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American redstart (AMRE)



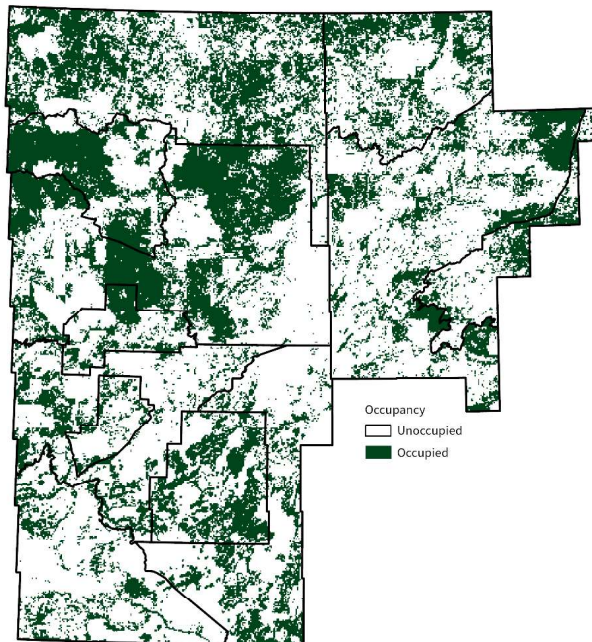
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Likelihood of Suitable (Probable) Habitat at Plan Start
Black-and-white warbler (BAWW)



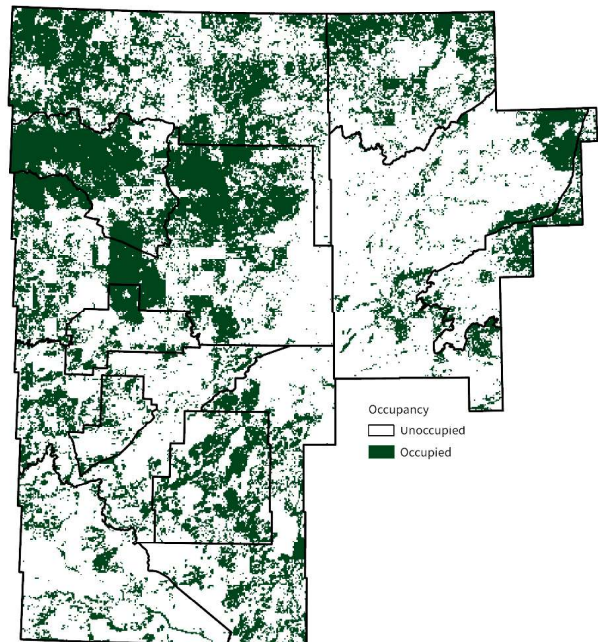
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Likelihood of Suitable (Probable) Habitat at Plan End
Black-and-white warbler (BAWW)

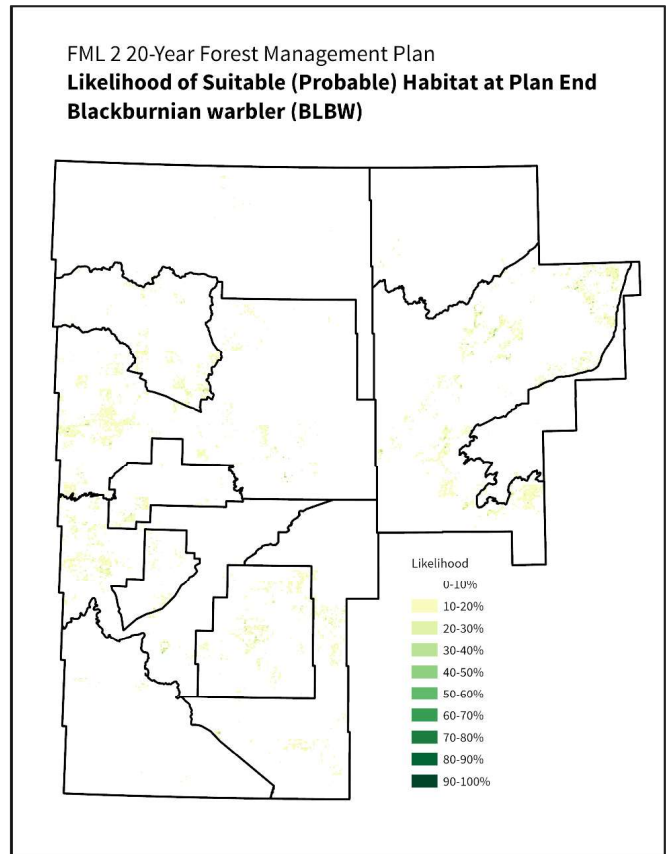
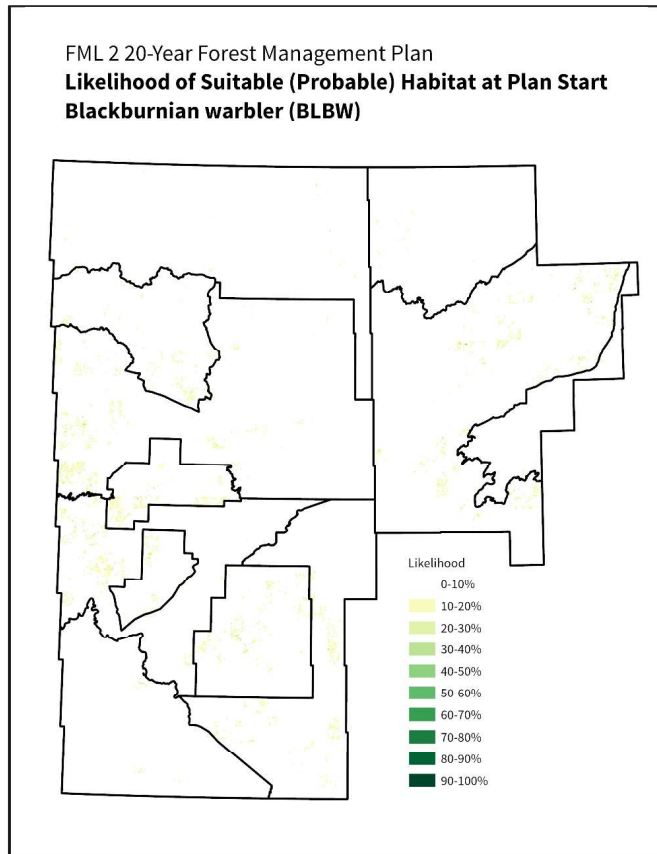


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Likelihood of Occupied Habitat at Plan Start
Black-and-white warbler (BAWW)

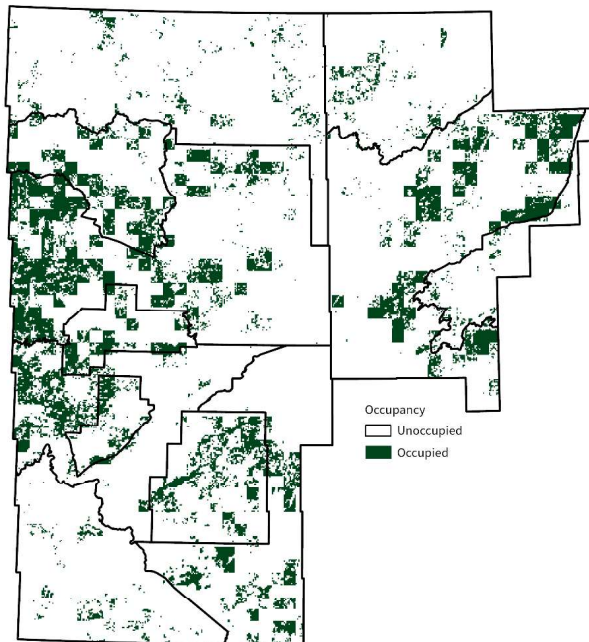


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Likelihood of Occupied Habitat at Plan End
Black-and-white warbler (BAWW)

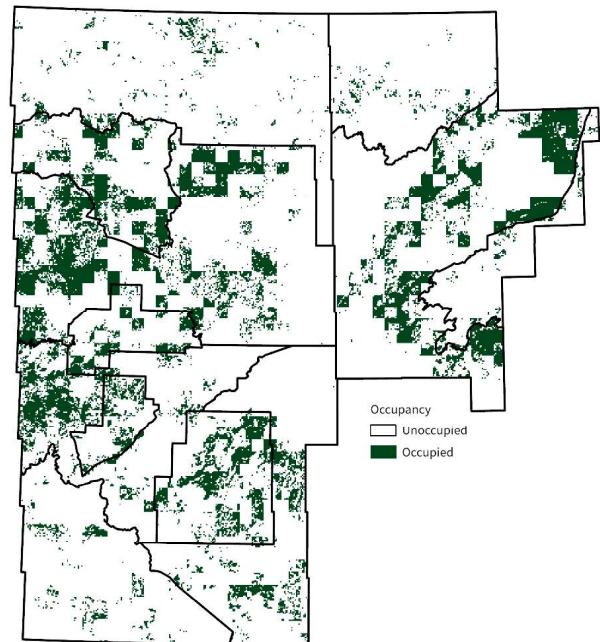




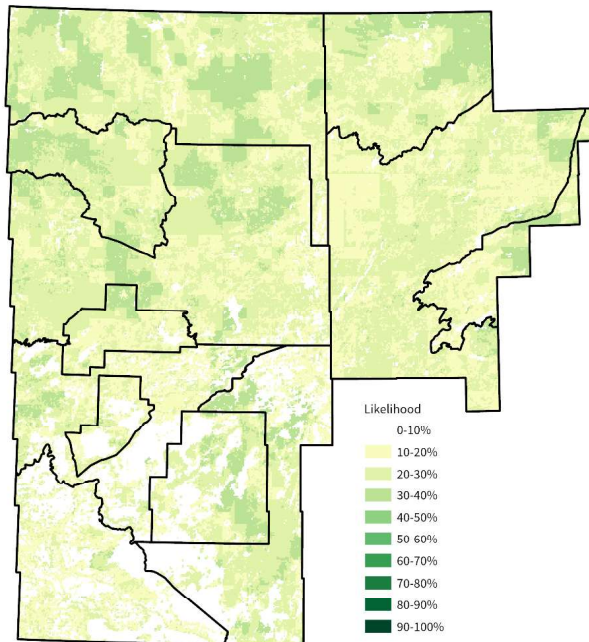
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Likelihood of Occupied Habitat at Plan Start
Blackburnian warbler (BLBW)



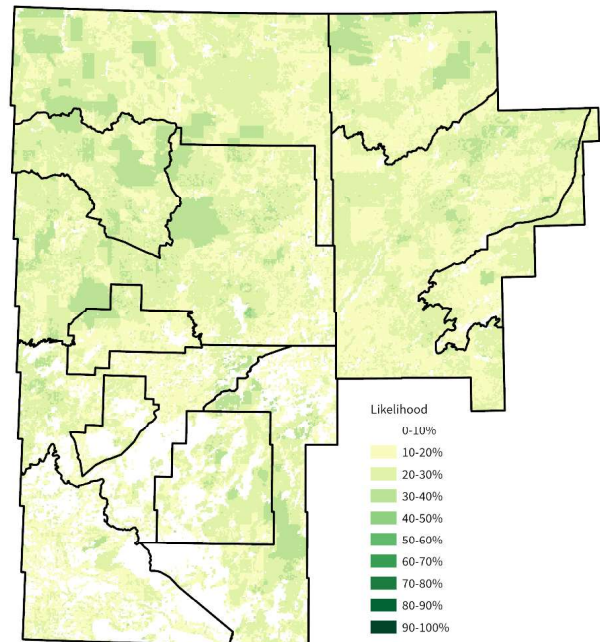
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Likelihood of Occupied Habitat at Plan End
Blackburnian warbler (BLBW)



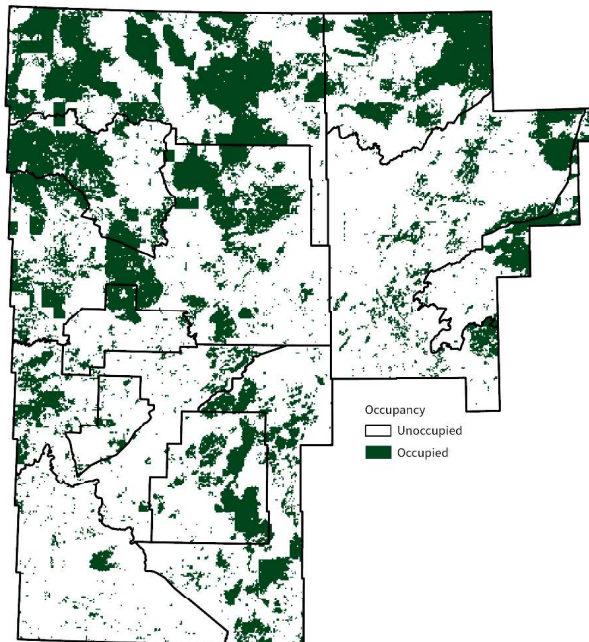
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Likelihood of Suitable (Probable) Habitat at Plan Start
Hermit thrush (HETH)



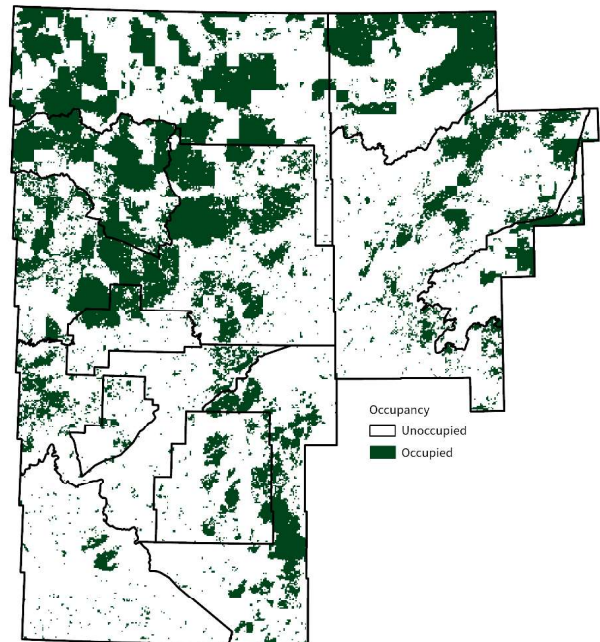
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Likelihood of Suitable (Probable) Habitat at Plan End
Hermit thrush (HETH)



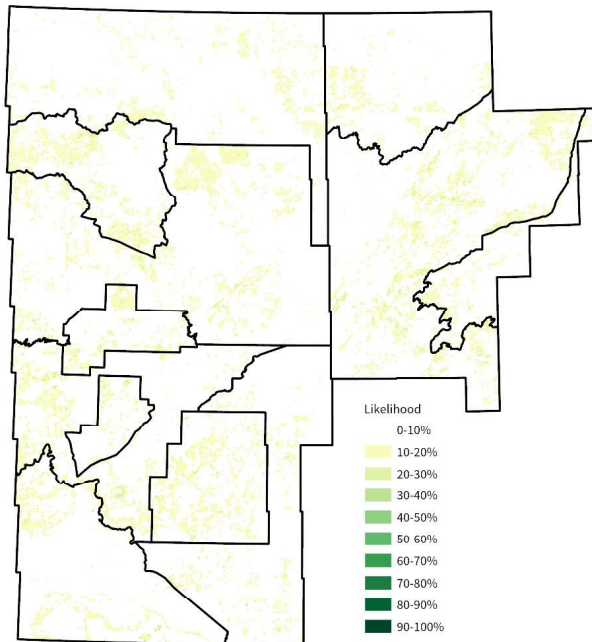
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Likelihood of Occupied Habitat at Plan Start
Hermit thrush (HETH)



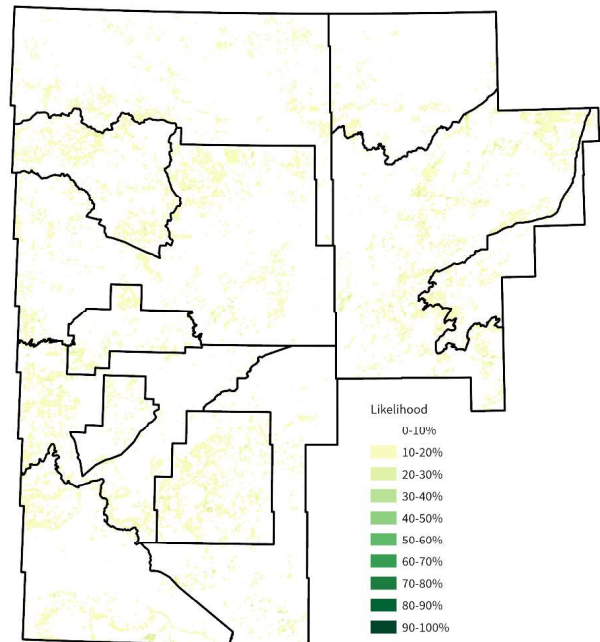
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Likelihood of Occupied Habitat at Plan End
Hermit thrush (HETH)



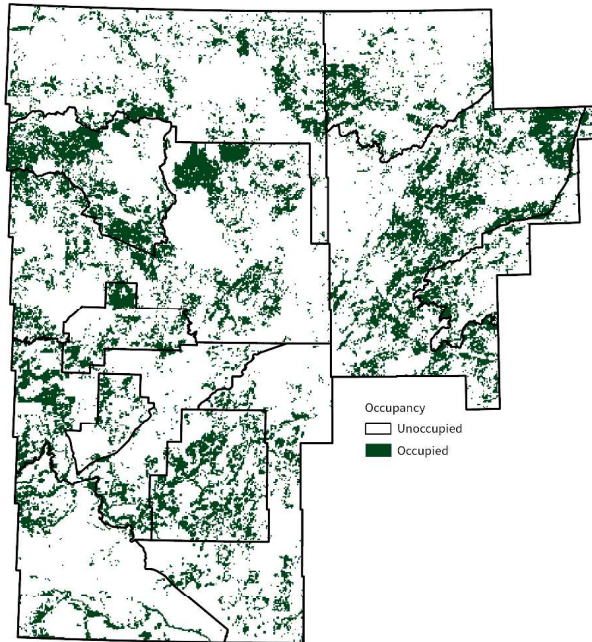
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Likelihood of Suitable (Probable) Habitat at Plan Start
Least flycatcher (LEFL)



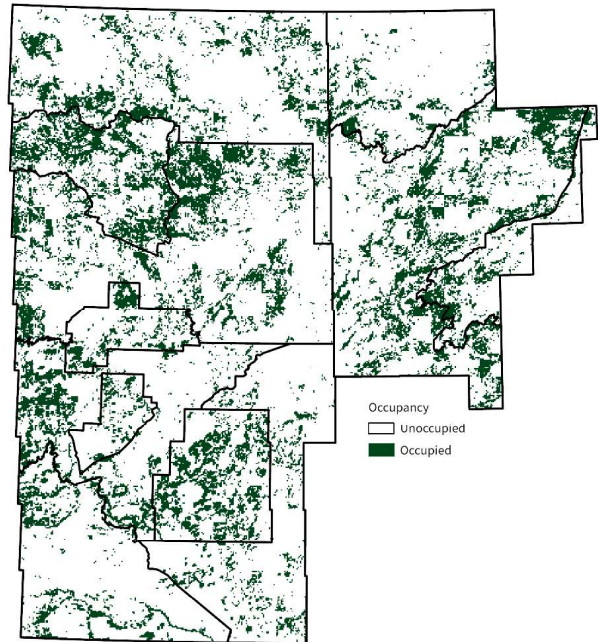
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Likelihood of Suitable (Probable) Habitat at Plan End
Least flycatcher (LEFL)

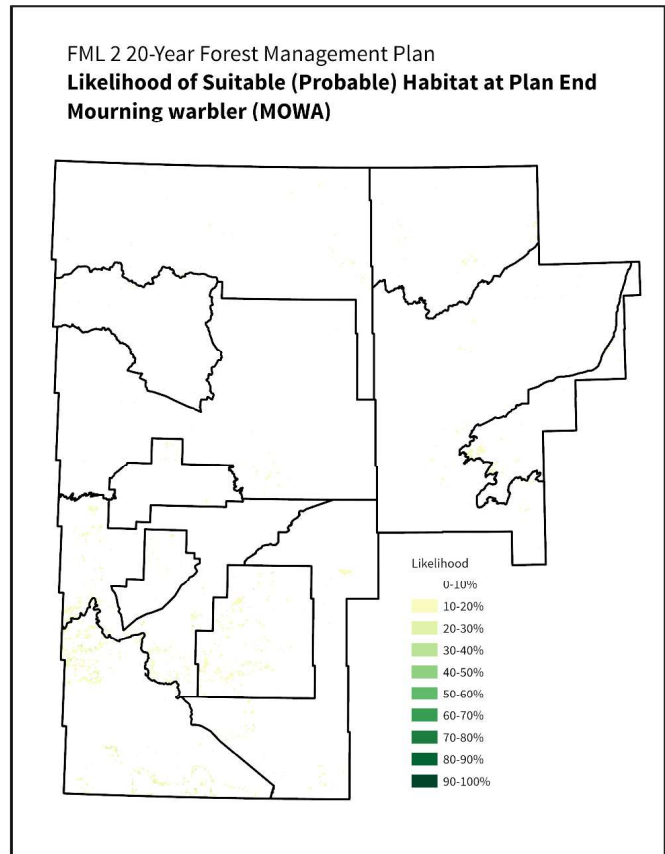
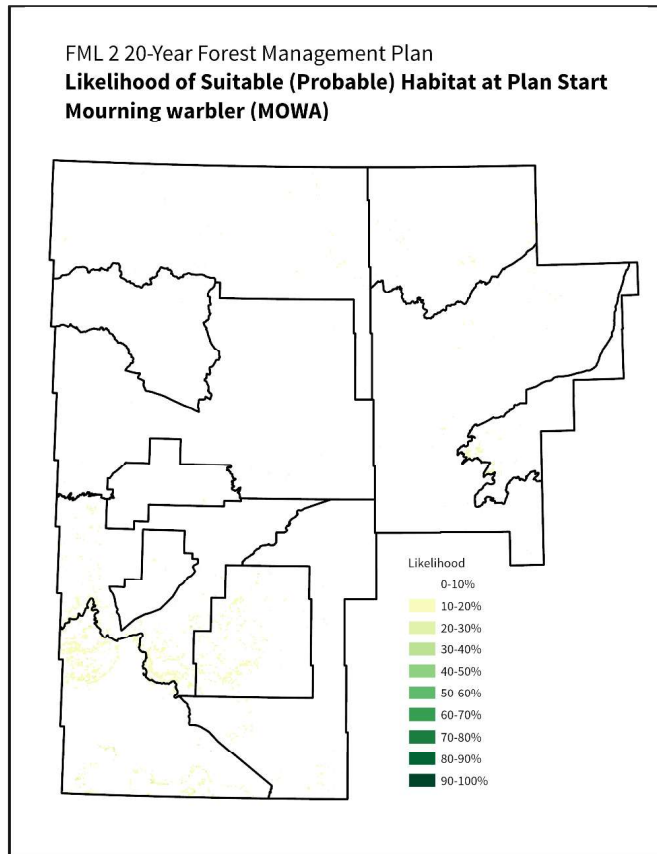


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Likelihood of Occupied Habitat at Plan Start
Least flycatcher (LEFL)

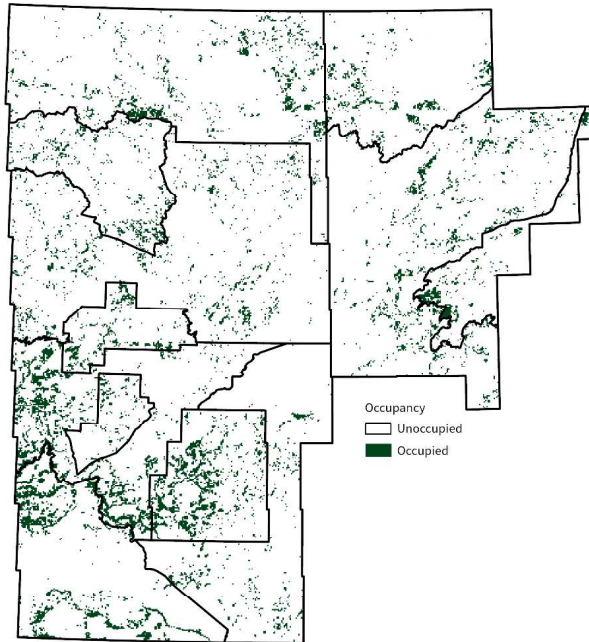


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Likelihood of Occupied Habitat at Plan End
Least flycatcher (LEFL)

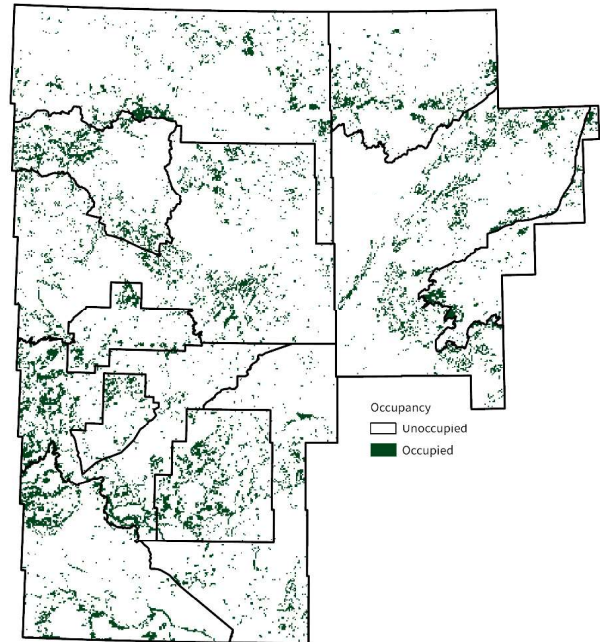




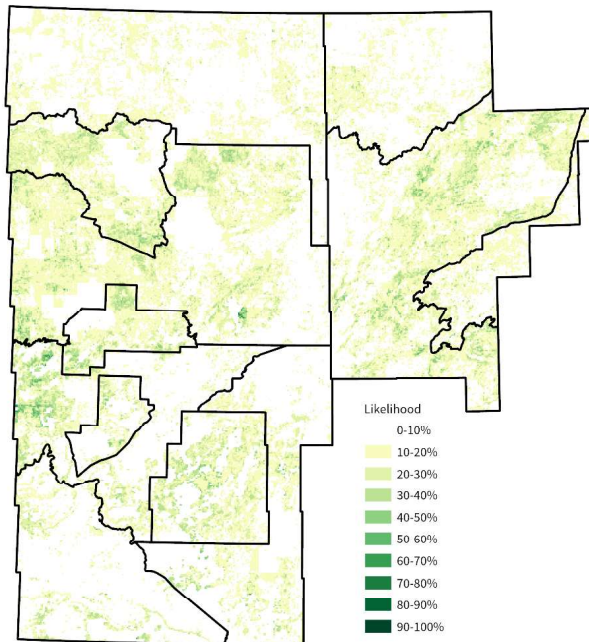
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Likelihood of Occupied Habitat at Plan Start
Mourning warbler (MOWA)



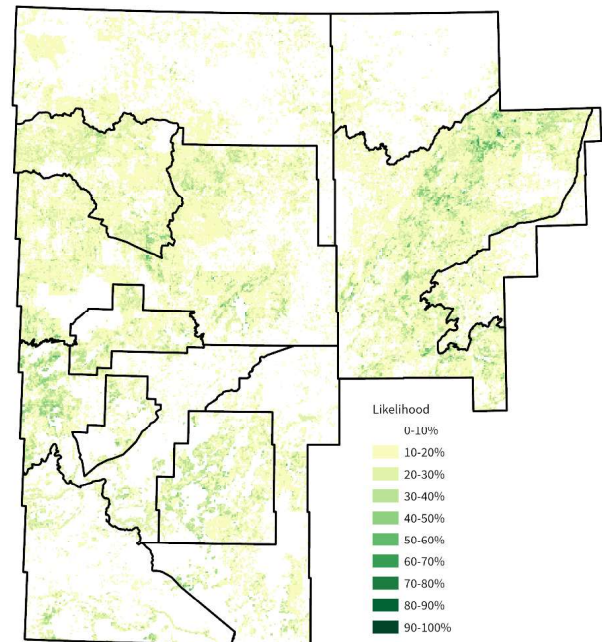
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Likelihood of Occupied Habitat at Plan End
Mourning warbler (MOWA)



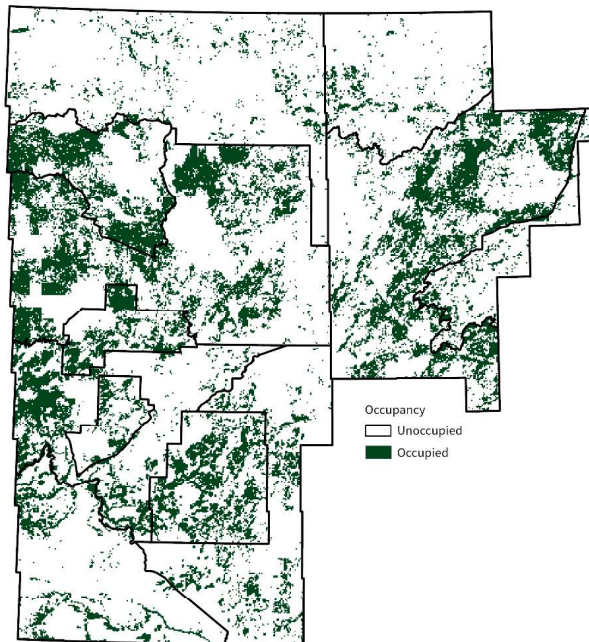
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Likelihood of Suitable (Probable) Habitat at Plan Start
Ovenbird (OVEN)



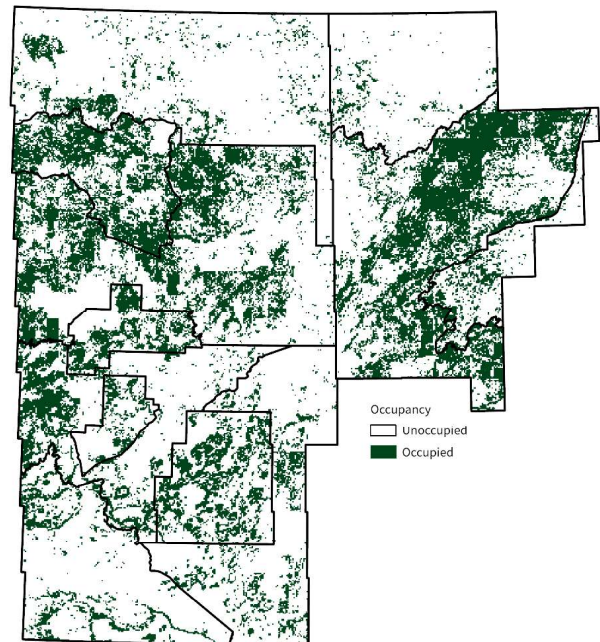
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Likelihood of Suitable (Probable) Habitat at Plan End
Ovenbird (OVEN)

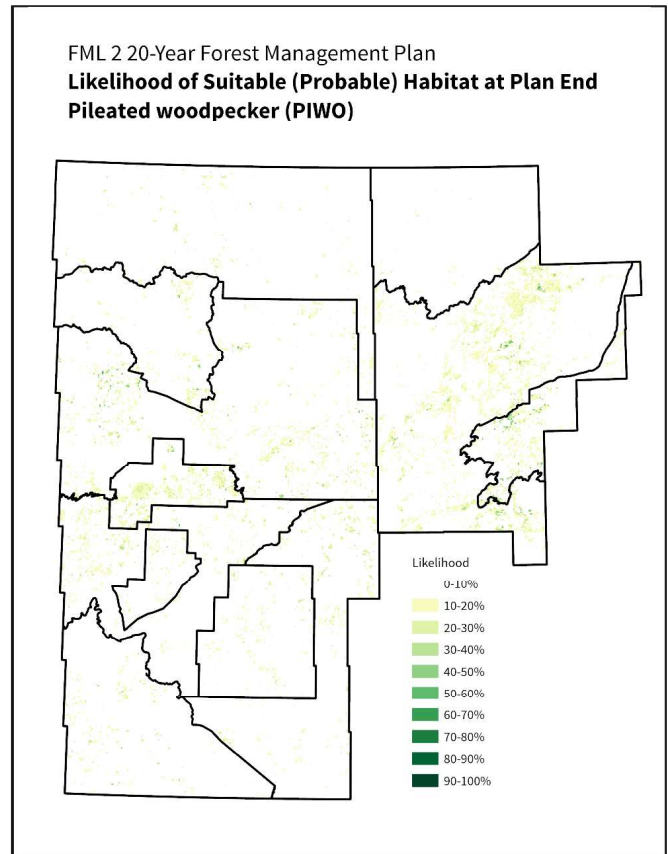
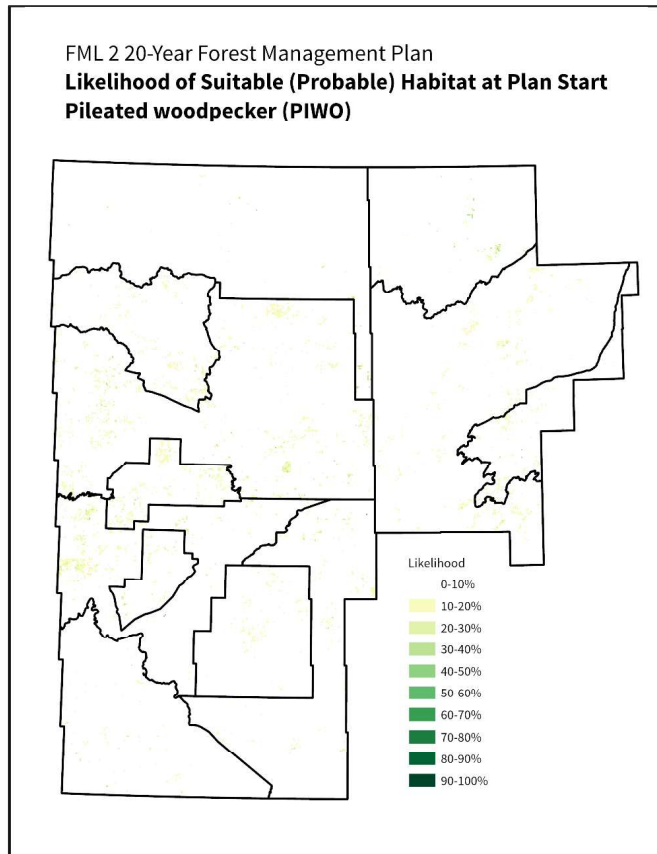


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Likelihood of Occupied Habitat at Plan Start
Ovenbird (OVEN)

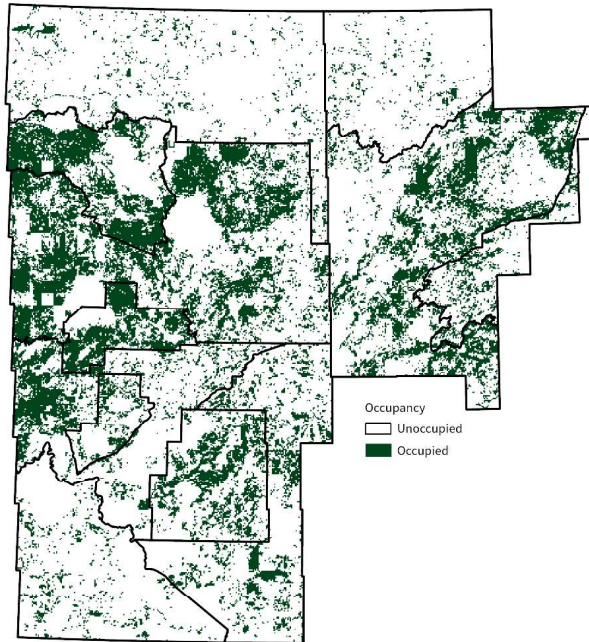


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Likelihood of Occupied Habitat at Plan End
Ovenbird (OVEN)

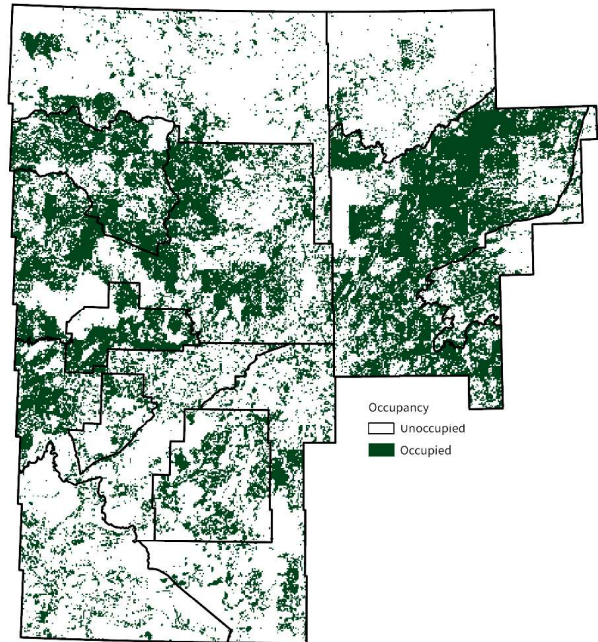




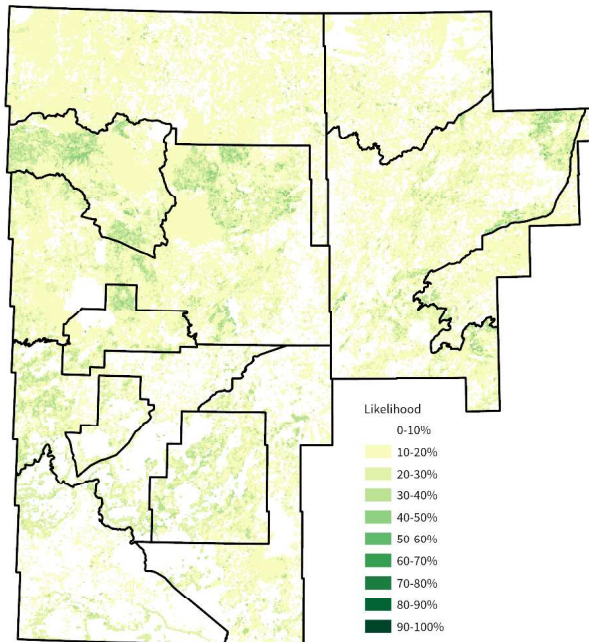
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Likelihood of Occupied Habitat at Plan Start
Pileated woodpecker (PIWO)



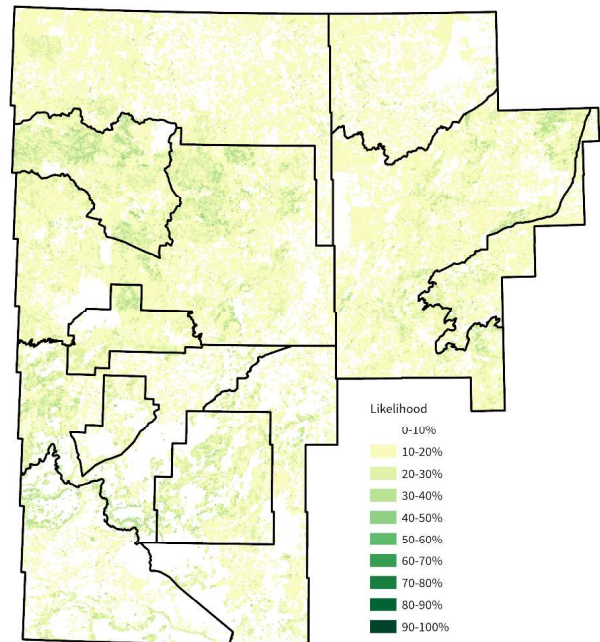
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Likelihood of Occupied Habitat at Plan End
Pileated woodpecker (PIWO)



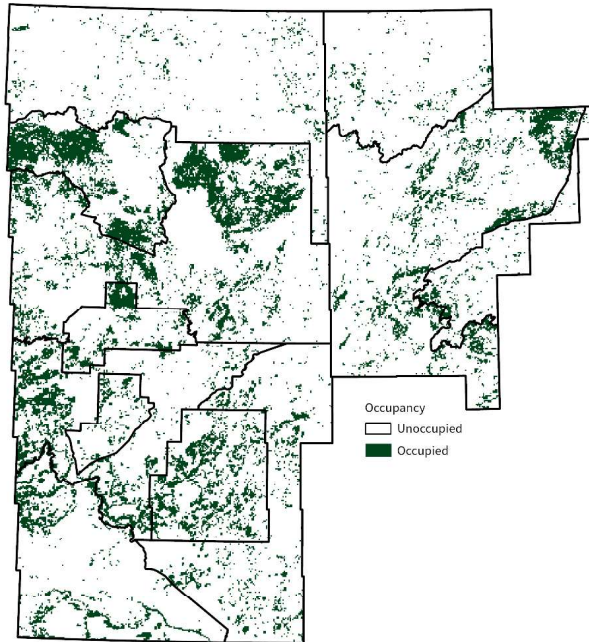
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Likelihood of Suitable (Probable) Habitat at Plan Start
Red-eyed vireo (REVI)



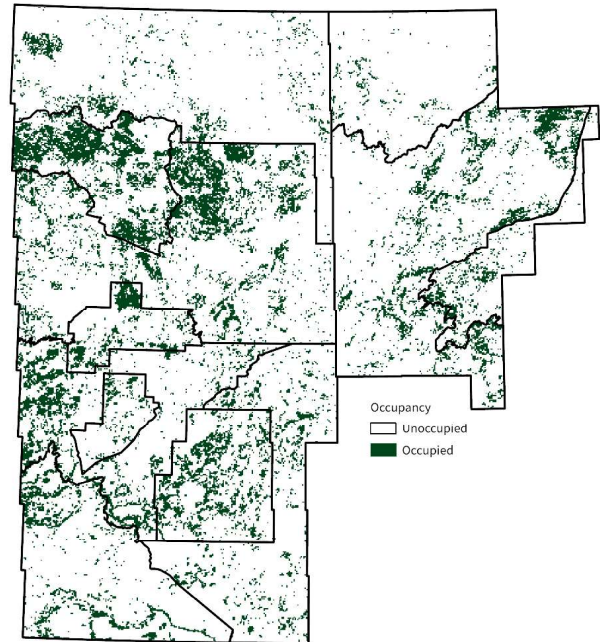
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Likelihood of Suitable (Probable) Habitat at Plan End
Red-eyed vireo (REVI)



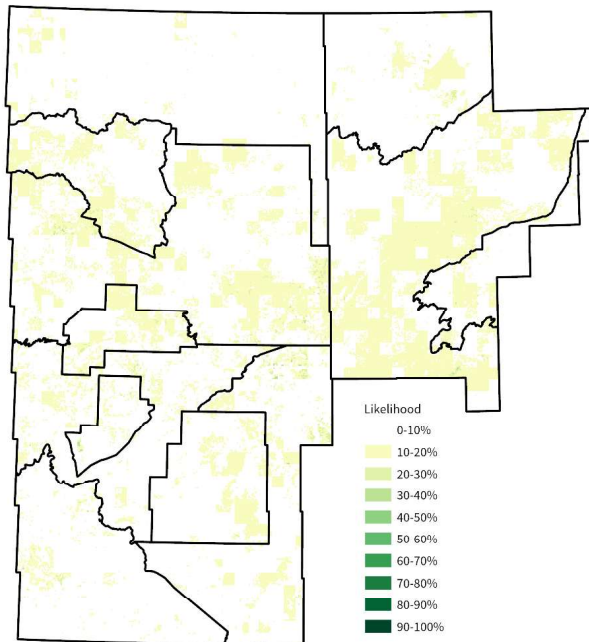
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Likelihood of Occupied Habitat at Plan Start
Red-eyed vireo (REVI)



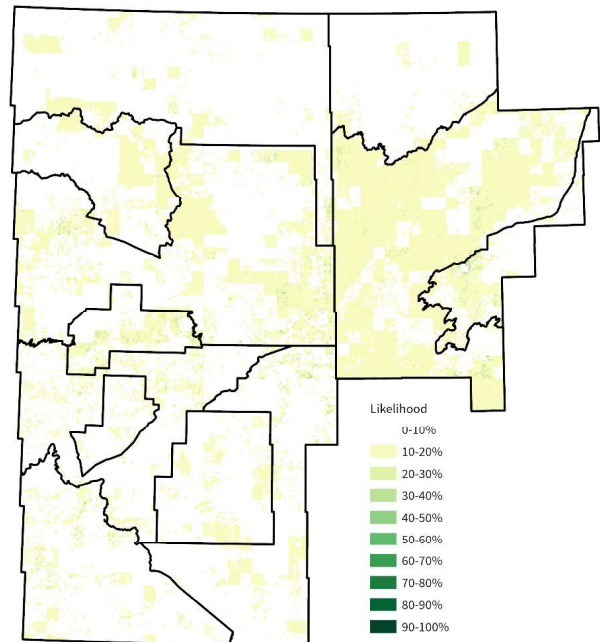
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Likelihood of Occupied Habitat at Plan End
Red-eyed vireo (REVI)



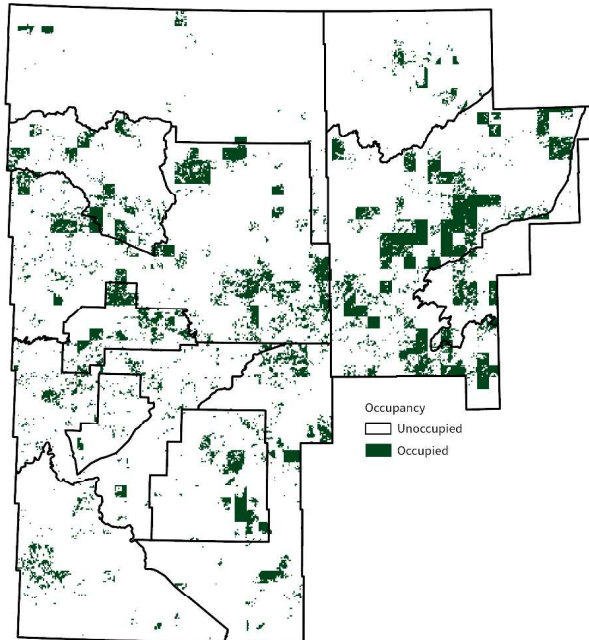
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Likelihood of Suitable (Probable) Habitat at Plan Start
Winter wren (WIWR)



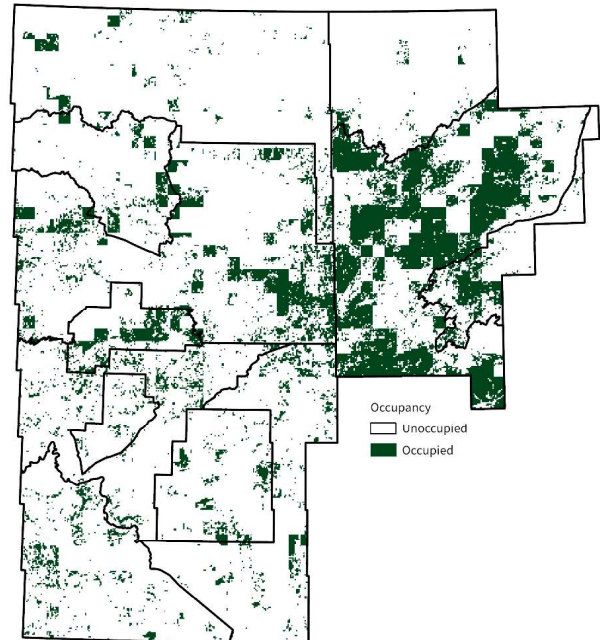
FML 2 20-Year Forest Management Plan
Likelihood of Suitable (Probable) Habitat at Plan End
Winter wren (WIWR)



FML 2 20-Year Forest Management Plan
Likelihood of Occupied Habitat at Plan Start
Winter wren (WIWR)



FML 2 20-Year Forest Management Plan
Likelihood of Occupied Habitat at Plan End
Winter wren (WIWR)



November 8, 2021

RE: Technical Memo – Manitoba Government – Woodland Caribou Habitat State Analyses

1.0 Introduction

Manitoba Department of Agriculture and Resource Development (Manitoba) has committed to developing woodland caribou management unit range plans (MU range plans) as part of Manitoba's caribou recovery planning framework. The MU range plans are intended to describe how both federal and provincial boreal caribou recovery strategies will be applied, outlining measures to manage boreal caribou populations, protect caribou critical habitat and provide for the dynamic habitat requirements of woodland caribou across their range. In Manitoba, there are 9 woodland caribou management units encompassing 15 caribou ranges.

To progress on caribou MU range planning an assessment of habitat state (disturbance and caribou preference) was undertaken using best available habitat data (provided by Manitoba), including application of a habitat suitability model for caribou range.

2.0 Habitat State Analyses

Wood acquired and reviewed available habitat datasets and land disturbance datasets for boreal caribou data obtained from Manitoba. All habitat spatial analyses were undertaken at the local population range scale but can be rolled up to the MU scale for MUs where >1 local population range are encompassed. The habitat state analysis task involved:

- 1) an update of the 2015 ECCC disturbance layer using local and more recent Manitoba geodata and
- 2) Caribou habitat modeling of woodland caribou ranges with respect to habitat supply (caribou habitat preference) and habitat suitability.

2.1 Disturbance Geobase

A geospatial disturbance assessment was undertaken for each Caribou Management Unit (n = 9) and each Caribou Range (n = 15) to produce maps depiction human and natural (fire) disturbance amounts, types and overlap, and for calculation of total disturbance consistent with the Environment Canada and Climate Change (ECCC) method (Environment Canada 2011, CBFA 2016). To accomplish this, the current Environment and Climate Change Canada (ECCC) disturbance coverage (based on 2015 Landsat satellite imagery (GOC 2019) was updated using provincial spatial files of disturbance provided by Manitoba. The ECCC disturbance coverage uses a 30 x 30m pixel LandSat imagery with 50m RMS positional accuracy to identify human or natural disturbance at 1:50,000 scale. A minimum mapping unit of 2 ha (or 100m



diameter circle for well sites) is applied to polygona disturbance, and a separation distance of 100m is used for linear features. The resulting updated disturbance layer is summarized in Table 1.

Table 1: Summary of natural and anthropogenic disturbance in Manitoba woodland caribou ranges and management units.

Scale	Range/MU Total Area (ha)	Disturbance Area (ha)				Overlap (%)
		Fire (<40yrs old - no buffer)	Human (with 500m buffer)	Total (Pooled)	Overlap	
Woodland Caribou Range (based on MCP boundary)						
Atiko	848192.4	152684.3	73176.23	210739.1	15121.4	7.2
Berens	38975.6	557051.4	162325.99	680401.8	38975.6	5.7
Bloodvein	165484.7	3548.2	24681.17	27044.2	1185.2	4.4
Charron Lake	2010396.9	388500.2	39222.30	419894.1	7828.4	1.9
Harding	1680614.8	474565.8	285073.16	739571.8	20067.2	2.7
Interlake	701895.0	21965.1	152232.26	168563.2	5634.2	3.3
Kississing	260342.3	47007.2	59011.72	102346.1	3672.8	3.6
Naosap-Reed	1224183.9	227050.7	531901.68	685679.5	73272.8	10.7
Norway House	2622514.0	807871.5	161953.66	939862.4	29962.7	3.2
Owl-Flintstone	140380.6	24853.3	45886.69	64282.8	6457.2	10.0
The Bog	873091.2	30122.8	201782.62	225316.4	6589.0	2.9
Wabowden	1012900.3	115743.1	317820.19	382400.4	51162.9	13.4
Wapisiu-Winnapedi	1259003.0	177900.4	175630.28	349943.4	3587.3	1.0
Wheadon	923151.7	223771.8	98362.35	311773.3	10360.9	3.3
William Lake	373325.7	53774.8	88468.08	111039.9	31203.0	28.1
Woodland Caribou Management Unit (based on MU boundary)						
Atikaki-Berens	2158474.1	583730.6	257183.37	791758.0	49156.0	6.2
Interlake	915978.1	36122.9	235942.52	261559.2	10506.2	4.0
Kamuchawe	2220342.0	767299.0	241655.65	930257.6	78697.1	8.5
Molson	6139593.4	1624862.3	375426.92	1931759.6	68529.6	3.5
Naosap	1781600.9	391952.4	687709.61	988166.3	91495.7	9.3
Owl-Flintstone	435985.5	129165.8	210854.88	289487.0	50533.7	17.5
Partridge-Crop	4305592.0	1217601.1	603352.34	1741679.4	79274.0	4.6
The Bog	641583.5	37443.8	218151.11	244496.8	11098.0	4.5
Wabowden	1767858.7	216708.6	565387.87	684905.8	97190.6	14.2



2.2 Landcover Geobase – Caribou Habitat Preference Model

Available forest land cover geobases (including provincial forest vegetation inventory datasets; FRI) provided by Manitoba, supplemented with the CanVec wetlands geobase and the NRCan Canadian peatlands geobase. All landcover geobases were then merged into a comprehensive Manitoba landcover. The landcover was then reclassified into 28 caribou habitat classes with associated preference ratings ranging from most avoided (-3) to most preferred (+3) (Table 2), based on Arsenault 2014 and Arsenault et al. 2014 with respect to vegetative characteristics (i.e., conifer dominance, shrub dominance, lichen abundance) and functional suitability as caribou habitat (i.e., predator detection/risk, forage). (ECCC 2019, EC 2011, Arsenault 2014, Arsenault et al. 2014, Racey & Arsenault 2007).

Table 2: Woodland caribou land cover type preference.

Land Cover Type		Caribou Preference	HSI Rating
Upland	Pine	3	1.0
	Coniferous	2	0.8
	Mixedwood (coniferous dominant)	1	0.6
	Mixedwood (deciduous dominant)	-1	0.2
	Deciduous	-1	0.0
	Sand Dune	0	0.0
	Bedrock / Rubble	1	0.6
	Upland Shrub	-1	0.2
	Native grassland	-1	0.0
Lowland	Treed Bog	3	1.0
	Shrubby Bog	2	0.8
	Graminoid Bog	1	0.6
	Treed Fen (rich, poor)	2	0.8
	Shrubby Fen	1	0.6
	Graminoid Fen	0	0.4
	Treed (Conifer) Swamp	2	0.8
	Mixedwood Swamp	0	0.4
	Hardwood (Birch) Swamp	0	0.0
	Shrub Swamp / Riparian Shrub	-1	0.2
	Meadow Marsh / Riparian Meadow	0	0.0
	Mudflats / Gravel Bar / Rocky Shore	0	0.0
	Emergent Marsh	0	0.0
	Aquatic Bed	0	0.0
Open Water	0	0.0	
Disturbed	Burn (<40yr)	-2	---
	Clearcut / Clearing (<40yrs)	-3	---
	Permanent Polygonal Disturbance (agriculture, settlements, infrastructure)	-3	---
	Linear Disturbance	-3	---



2.2.1 Model Cross-validation

Habitat modelling must include aspects of cross-validation to test predictive accuracy (EC 2011, Predictive ability of the caribou habitat preference model is important because of the spatial application in conservation and management. The resulting preference model was cross-validated against a reference caribou range (Pasquia-Bog; see Arsenault 2014, Arsenault et al. 2014) and associated caribou location data, with a coarse scale national RSF model of caribou habitat preference for Boreal Plain and Boreal Shield Ecozones (see Appendix 7.3 in EC 2011), and with a land cover classification figure of The Bog developed independently by Manitoba. There was high concordance among landcover/habitat modelling methods, therefore the caribou habitat preference model (Table 2) was applied to the Manitoba caribou range extent for habitat suitability modelling.

2.3 Caribou Habitat Suitability Modelling

The main driver of a species distribution are the abiotic factors (i.e., chemical and physical elements of the environment that affect organisms and ecosystem functions) characterizing its fundamental niche (potential habitat), interacting with biotic factors (i.e., demography, species interactions, competition, predation, community dynamics, etc.), and the accessibility of habitat (i.e., resources use, seasonal selection and movement dynamics). The combination of fundamental niche with biotic factors defines the realized niche (realized habitat) which represents a positive population growth rate and biological fitness is increased (EC 2011). Habitat suitability drives the probability of presence of a species at equilibrium within its realized niche. The biophysical attributes of the realized niche characterize habitat suitability in space and time. Biophysical attributes are identified in Canada as a component of critical habitat for caribou and are identified in the federal boreal caribou recovery strategy (EC 2012, ECCC2 020). The biophysical attributes important to caribou drives habitat preference (Table 2).

Caribou habitat preference is affected by disturbance type (natural and anthropogenic) and disturbance age. Therefore, the caribou habitat preference model ratings (Table 2) were modified by the disturbance and age variables to develop predictive geobase of habitat suitability of caribou range in Manitoba. The resulting habitat suitability model then underwent a calibration step to verify that the variables applied to the habitat preference model were appropriately weighted.

2.3.1 Model Calibration

2.3.1.1 Age Variable

Calibration of stand age involved assignment and adjustment of HSI ratings to age classes by land cover type for productive forest cover types as follows:



Variable	Rationale	Variable Range	HSI Rating
Stand Age (yrs)	Terrestrial lichens are most abundant in older stands from 50 to 120 yr (Brown and Hobson, 1998). In old growth upland forests ≥ 120 yrs, lichen abundance decreases and have limited food potential for caribou. Treed peatlands (>50 yrs of age) and upland conifer dominant stands (>60 yrs of age with >20% lichen cover) are optimal (Bradshaw et al, 1995, Stewart-Smith et al. 1997, Briand et al. 2009, Courbin et al. 2009, Arlt & Manseau 2011, Arsenault & Manseau 2011).	<10	0.0
		10-19	0.2
		20-29	0.4
		30-39	0.6
		40-49	0.8
		50-59	0.9
		60-100	1.0
		>100	0.8

Non-productive covertypes in the landcover geobase did not have an age assignment and therefore were assigned an HSI value of 1.0 so that their respective habitat preference rating would remain unaffected.

2.3.1.2 Disturbance Variable

Calibration of the disturbance buffer on caribou habitat followed the federal guidance for natural and anthropogenic disturbance types. Natural disturbance (wildfire) was considered disturbed if <40 years old, with no disturbance buffer applied. A 500m was applied to anthropogenic disturbance as follows:

Variable	Rationale	Variable Range	HSI Rating
Disturbance (Local Scale - within 500 m)	Disturbance to the landscape is likely to influence caribou habitat use based on the level of associated human activity. Zones of influence vary by disturbance type, intensity, magnitude and duration: <ul style="list-style-type: none"> • High level / long-term disturbances (e.g., active roads, forest cut blocks, permanent project facilities) may result in avoidance distances of 500m (Dyer et al. 2001, Oberg 2001, Smith et al. 2000). • Medium level disturbances (e.g., active oil and gas well sites, pipeline construction) can result in typical displacement distances of 250m (Dyer 1999, Dyer et al. 2001, Jalkotzy et al. 1997). • Low level disturbances (e.g., seismic lines, pipeline corridors, abandoned well pads, borrow pits) will likely result in typical avoidance distances of 100m (Dyer et al. 2001, Jalkotzy et al. 1997, Oberg 2001, James & Stuart-Smith 2000). 	High	0.1
		Medium	0.5
		Low	0.9

2.3.1.3 Overall HSI Model

The overall annual HSI for the caribou habitat landscape was calculated in Arc GIS raster format for each polygon using the HSI ratings for Caribou Land Cover Preference (Table 2), Stand Age (per section 2.3.1.1) and disturbance (see section 2.3.1.2) as follows:

$$\text{Annual HSI} = \text{Caribou Land Cover Preference} \times \text{Stand Age} \times \text{Disturbance}$$



A Habitat suitability model was then generated as a raster based geobase layer upon which caribou ranges or MU could be overlaid.

3.0 Metadata Documentation

The following documents primary dataset use and manipulation for the disturbance model update and for HSI modelling undertaken by CanNorth under the supervision of Al Arsenault.

3.1 Scales of Analysis

Two types of analysis units were used to display and subset the results of the landscape disturbance geobase and Caribou habitat models.

- 1) **Woodland Caribou Management Units** were used to create updates to the federal caribou data sets. The management units were obtained from Environment and Climate Change Canada.
- 2) **Woodland Caribou Local Population Ranges** were the analysis unit used by the Province of Manitoba for caribou habitat management and planning. Population Range boundaries were provided by Manitoba Agriculture and Resource Development - Wildlife and Fisheries Branch.

3.2 Primary Datasets

- 1) **Historic Anthropogenic Disturbance Through 2015** -Historic anthropogenic disturbance includes documented disturbance as of 2015. The data sets originated with Environment and Climate Change Canada. The geodatabase naming convention suggests that 30 metre resolution raster imagery is the source data. The data sets were provided by Manitoba Agriculture and Resource Development - Wildlife and Fisheries Branch.
- 2) **Updated Anthropogenic Disturbance 2016-2020** - Updated anthropogenic disturbance data is a compilation of several data sources provided by Manitoba Agriculture and Resource Development - Wildlife and Fisheries Branch. Sources included linear features (example: transportation routes), areal features (example: urbanized areas), and point features (example: remote cottages). A 500m disturbance buffer was applied to all anthropogenic disturbances added to the model.
- 3) **Fire Disturbance** - Manitoba Agriculture and Resource Development - Wildlife and Fisheries Branch provided the province's comprehensive wildfire spatial database for 1928 to 2019. This data set was supplemented with an additional file that covered the 2020 wildfire season. No disturbance buffer was applied and fires <40 years old were considered disturbed habitat.
- 4) **Forest Inventory Data** - Manitoba Agriculture and Resource Development - Wildlife and Fisheries Branch provide a comprehensive provincial forestry subset that included data from the province's Forest Resources Inventory and Forest Land Inventory (FLI). Included with this data set was the Forestry Inventory Manual 1.3 (and its previous versions) and the FLI User Guide (April 27, 2004), which are essential to working with the data set.



- 5) **Caribou Habitat Preference and Suitability Index Schema** - The habitat suitability index schema was based on previous work completed by project manager A. A. Arsenault titled "Woodland Caribou (*Rangifer tarandus caribou*) – Habitat Suitability Index Model" which originated from Arsenault 2014 and Arsenault et al. 2014. The document was updated April 1, 2021, for use in this specific project.
- 6) **Ancillary Data** - Ancillary data was acquired from public data sources with open license agreements or sources included with Esri software maintenance end user license agreements. Its primary purpose was to provide base map context and cartographic content for displaying and evaluating the modeled disturbance and habitat results.
- 7) **ESRI Topographic** - The Esri Topographic data set is a base map service option within the ArcMap software platform. The map content is served via Esri's ArcGIS Online service with credits to multiple partners. For more information refer to http://goto.arcgisonline.com/maps/World_Topo_Map.
- 8) **Natural Resources Canada CanVec** - The CanVec data from Natural Resources Canada forms the vector spatial data basis for Canada's National Topographic System. Data can be obtained through the Ministry's web-based data portal (<https://open.canada.ca/data/en/dataset/8ba2aa2a-7bb9-4448-b4d7-f164409fe056>) and is used under Canada's Open Government License (<https://open.canada.ca/en/open-government-licence-canada>)

3.3 Data Processing and Summarizing

- 1) **Woodland Caribou Management Units and Local Population Ranges** - Management Unit and Local Population Range boundaries were used to clip the modeled disturbance and habitat data down to their specific areal space. A script was used to cycle through the boundary records and clip results were written to a geodatabase.
- 2) **Historic Anthropogenic Disturbance Through 2015** - This data was deemed to be current and assumed that no areas had rehabilitated the required forty years needed for caribou lichen food sources to become re-established. The data set was incorporated as-is into the anthropogenic disturbance and total disturbance models.
- 3) **Updated Anthropogenic Disturbance 2016-2020** - Updated anthropogenic disturbance data sources were queried to include only types that impacted woodland caribou. Feature subsets were combined and buffered 500m. Overlapping buffers were merged. The result was a summarized set of features that represented anthropogenic disturbance with a 500m effect buffer. As a summary, the data set is limited in that specific types of anthropogenic disturbance cannot be differentiated. The summary data was incorporated into the anthropogenic and total disturbance models.
- 4) **Fire Disturbance** - Fire disturbance records were queried and compiled for the 1928-2019 and 2020 data sets to create a subset that spanned forty years 1981-2020 inclusive. Fire disturbances do not receive a 500m buffer. The combined fire disturbances were summarized into the fire



disturbance and total disturbance models. As a summary, the data set is limited in that specific wildfire events cannot be differentiated. Dates populated in the database represent the year of the most recent wildfire event at that location. Fires ≥ 40 years old (originating in 1980 or earlier) were treated as undisturbed.

5) Forest Inventory Data - The forest inventory model was a very large and comprehensive snapshot of the state of the forests in the study area. It included legacy data as well as current data related to Manitoba's forest and forest management practices. From this vast data set, forest cover type and stand age needed to be determined and categorized. Cover types needed to be determined from the multiple classification systems compiled into the data set. Determined cover types were then categorized into the Habitat Suitability Index schema (-3 Anthropogenic Disturbance, -2 Natural (Fire) Disturbance, -1 Deciduous Dominant, 0 No Preference, 1 Upland Conifer, 2 Conifer Dominant Bogs/Fens, and 2 Lichen-rich Peatlands). Age data was determined for features with suitability ratings of 0 to 3. The ages were placed in factor bins (<10 years = factor 0, 10 to 19 years = factor 0.1, 20 to 39 years = 0.2, 30 to 39 years = 0.4, 40 to 49 years = 0.6, 50 to 59 years = 0.8, 60 to 100 years = 1, and >100 years = 0.8). The suitability index for the 0 to 3 categories were multiplied by the bin factor and rounded to the nearest whole number to produce the final suitability index assignment. The categorized and factored forestry data form the caribou habitat suitability index model.

6) Year-based Analysis - Year-based data populated in the forestry data set was available to a discrete number of records. Records without this information received assumed years or were flagged as not applicable based on ancillary data and land cover type (for example, deciduous cover types, which are indexed at -1, are not applicable caribou habitat, so the stand age is not a factor). The populated data included both fire and harvest events current to 2020. Therefore, yearly wildfire data from the disturbance model was not incorporated directly into the habitat suitability model. Instead, the populated and assumed forest stand age data was used to make age-based modifications to suitability ratings.

The fire disturbance model is incorporated into the analysis as an overlay on top of the caribou habitat suitability index model. Fire is a time sensitive habitat suitability factor, where any forest stand in a regeneration cycle of <40 yrs old is considered unsuitable for caribou use. However, fire disturbance does not discriminate impact based on land cover or habitat index. Fire disturbed areas are presented with a "-2" suitability rating when overlaid with the calculated forestry model's suitability ratings.

7) Overlay Visual Analysis and Presentation - Three primary models were overlaid with ancillary data to visually analyze and present the model results. The three models may be further processed into a summarized suitability model. The models were kept separate at the time of this report for analysis and presentation purposes. Value was identified in being able to observe the stage of habitat recovery under fire disturbances. Further value was identified in being able to analyse and visualize habitat that is undisturbed by anthropogenic activity but considered unsuitable for caribou due to proximity human activity. These areas could be considered for preservation and rehabilitation.



The primary model is the caribou habitat suitability index model. It presents habitat suitability indices -1, 0, 1, 2, and 3. The fire disturbance model was placed next, delineating unsuitable habitat indexed to -2. The anthropogenic disturbance model was placed on top, delineating human disturbance with a 500m buffer. It was indexed as -3. The layer is displayed with an open hatch so that the impacted habitat can be observed, as well as areas where anthropogenic and fire disturbances are coincident.

3.4 Delivered Data Structure

3.4.1 Disturbance Deliverables Folder

The Disturbance Deliverables folder contains four subfolders [].

- [3773_Disturbance_Analysis.gdb] is a file geodatabase. It contains the final disturbance data sets.
- [data_Geodatabases] is a file folder. It contains file geodatabases that were used as source input data.
- [data_Shapefiles] is a file folder. It contains shapefiles that were used as source input data.
- [Excel Summary Tables] is a file folder. It contains summary tables prepared from the disturbance model results.

[3773 Disturbance Analysis.gdb]

The geodatabase contains eight feature data sets {}. Feature data sets prefixed “analysis” contain feature classes that include: the output analysis data sets, Management Unit subsets of the results, and Range subsets of the results. Feature data sets prefixed “input” include inputs from source files and outputs from source data processing that were used as inputs to the analyses.

Four areal analyses were performed with the “input” feature data sets: total disturbance, anthropogenic disturbance, fire disturbance, and overlapping disturbance where anthropogenic and fire disturbance are coincident. Each of the “analysis” feature data sets include outputs from the analyses and a separate feature class of the results clipped to each Management Unit and Range.

The contents of the “input” feature data sets is as follows:

- {input_Anthropogenic_Buffered_500m} contains updated anthropogenic disturbances with 500 metre setbacks. The feature data set also includes copies of the buffered source files (inputs) and the compiled disturbance footprint (output).
- {input_Combined_Disturbance_Inputs} contains copies of the full anthropogenic disturbance footprint and the cumulative fire disturbance footprint.
- {input_ECCC_Combined_2015_Anthro_Disturbance} contains historic, buffered, anthropogenic disturbances through 2015, per Environment and Climate Change Canada. The feature class is the result of compiling the disturbances from each individual Management Unit in the source data.



- {input_Fire_Unbuffered_Disturbance} contains the input wildfire data, a combined output that retains the fire's year, and a summarized data set of the 1981 to 2020 impact footprint that retains the year of the most recent fire event.

3.4.2 Final Caribou Habitat Model

The Final Caribou Habitat folder contains one geodatabase: [MB_Caribou_Habitat_Suitability_Model.gdb]. The geodatabase holds two feature classes and one feature data set.

The feature class "Boreal_Caribou_2020" is the final caribou habitat index model based on the forest inventory data set from Manitoba Agriculture and Resource Development - Wildlife and Fisheries Branch.

Feature class "DD_index_ranges_and_Mus" is a merge of the management unit and range boundaries. The file is used to automate data clip functions and control the map extent in the ArcMap software platform.

The feature data set {Habitat_Preference_by_Range_or_MU} contains a separate subset of the habitat suitability model ("Boreal_Caribou_2020") for each management unit and range. Thematic mapping is performed on the field [Calc_HSI].

The following list of fields in "Boreal_Caribou_2020" are from the forest inventory source data. They were used to determine a land cover category, index category, and age bin.

- AGE_2020
- COVER_TYPE
- LANDCOVER1
- LANDCOVER2
- FIRE_YR
- HARVEST_YR
- LAST_EVENT_2020
- LAST_EVENT_YR_2020
- PRODUCTIVITY
- COVERTYPE

The following list of fields in "Boreal_Caribou_2020" were created by CanNorth for constructing, troubleshooting, and quality checking the data.

- CN_AGE (The age determined for a forest stand. A value of 9999 indicates the age in undetermined and/or irrelevant to the forest stand's suitability index).
- Age Rate (The age factor multiplied to the suitability rating, where applicable. See "Factor Age" field).



- Habitat Preference (The habitat suitability rating before being modified for age).
- Calc_HSI (The final habitat suitability rating, modified for age, and as presented in the cartographic products).
- Factor_Age (Determines if the age factor should be applied to the habitat index. If “Yes” the factor was multiplied to the Habitat Preference and rounded to the nearest whole number. The result was updated to Calc_HSI).
- Habitat Source (Indicates the primary forest inventory field used to determine the land cover).
- Source_Vals_L2_L1_P_CT (The field name describes the field priority in determining land cover: LANDCOVER2, LANDCOVER1, PRODUCTIVITY AND COVER_TYPE. The field contains concatenated values from those fields).
- PRODUCTIVITY_As_Num (A conversion of the string type PRODUCTIVITY field to a short integer type field to facilitate a table join with an Excel file with code definitions).

4.0 Summary

All tasks associated with population state analyses were completed to the extent possible, but data limitations hindered development of reliable population trend models for some of the local caribou population ranges. The briefing presented here, along with the habitat suitability model geobase establishes a spatial framework from which a caribou habitat monitoring program can be developed to track habitat change over time in support of ongoing local population recovery planning.



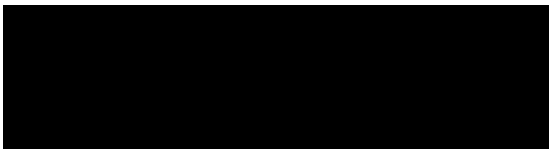
5.0 Closing

We trust that this memo provides the detail you require for woodland caribou range planning. Please do not hesitate to contact the undersigned if you require additional information or analysis.

Yours truly,

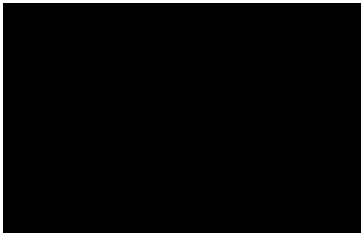
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20-Year Forest Management Plan for Forest Management Licence #2

TERMS OF REFERENCE

(Manitoba 20-Year Forest Management Plan Guideline – Section 3.0)

Proponent: Nisokapawino Forestry Management Corporation (NFMC)
And
Canadian Kraft Paper Industries Ltd. (CKP)

Term of FMP: January 1, 2027 – December 31, 2046

CURRENT STATUS

The current Forest Management Licence Agreement (FMLA) for FML 2 had an expiry date of December 31, 2024. A 2-year extension to the FMLA was applied for by NFMC and approved by the Manitoba government prior to December 31, 2024, extending the expiry date to December 31, 2026.

The current Environment Act Licence (EAL) No. 2302 ER had an expiry date of December 31, 2024. The EAL was extended to December 31, 2026.

The current Forest Management Licence Agreement (FMLA) for Forest Management Licence (FML) #2 is held jointly by Canadian Kraft Paper Industries Ltd (CKP) and Nisokapawino Forestry Management Corporation (NFMC).

NFMC performs the forestry management services associated with the operation of FML 2 and will be the lead proponent for the new 20-Year Forest Management Plan for FML 2. NFMC is equally owned by Canadian Kraft Paper Industries Ltd. and Nekoté Limited Partnership. Canadian Kraft Paper owns and operates a kraft pulp and paper mill operation in The Pas, MB and the Nekoté LP is owned and represents the interests of 7 First Nations upon whose traditional lands the FML 2 is located. NFMC works to ensure the objectives of both Partners are being met with respect to forest management decisions, local opportunities for employment, education, and training, and access to fibre. Other tenures that are volume based exist within FML 2 and are referred to as Quota holders. NFMC provides planning services for their tenure at the direction of the FML Agreement and the Manitoba Government.

GENERAL INFORMATION

Development of the Forest Management Plan (FMP) will follow the framework of the Manitoba's 2021 Twenty Year Forest Management Plan Guideline. As such, the first step in the FMP is to define the Terms of Reference as per the Guideline. The primary representative in the FMP process for NFMC is the General Manager, and the primary representative for Manitoba Natural Resources and Northern Development (NRND) is the Director of Forestry and Peatlands. The 20 Year FMP development will follow a collaborative, integrated development process. A planning team composed of Manitoba Government representatives, Nisokapawino Forestry Management Corporation Representatives (including Nekoté Community Representatives), and Canadian Kraft Paper Representatives are

responsible for the development of these Terms of Reference, and the creation of the FMP. Scientists and/or consultants will form a part of this team as invited.

Section 3.0 of Manitoba’s Twenty Year Forest Management Plan Guideline outlines the requirements to be included in the Terms of Reference (ToR) used to develop this document. Beyond the scope of the ToR, the proponent will develop the FMP in full accordance with the guideline. This includes the development of Values, Objectives, Indicators and Targets (VOIT’s) as based on the Canadian Council of Forest Ministers criteria and indicators. This will include the development of indicators to address socio-economic conditions, environmental protection, and other identified values that cannot be modelled as it relates to the FMP.

PRE-PLANNING REQUIREMENTS: TERMS OF REFERENCE

The Terms of Reference for the FML 2 2027 FMP (reported here) provides the overall guidance for the planning process by identifying and defining:

- Known issues/risks/knowledge gaps within the FML
- Planning team members and their roles and responsibilities
- Communication strategies for Planning Team members
- Engagement plans with First Nation communities, and stakeholders
- Modelling methods and modelling input data
- Indicator species and wildlife habitat assessment methods
- Scope of FMP assessments for climate change and cumulative effects; and,
- Process and timelines

The Terms of Reference is a living document. It is used by both the Manitoba Government (the Regulator) and NFMC and CKP (The Proponents) as a planning aid. This is a public document that provides the roles and responsibilities of Planning Team members, information requirements for the plan development, as well as internal and external communication plans. During the development of the FMP changes to what would be included in the FMP or how components of the FMP would be developed were discussed and agreed to by the Proponent and Regulator. Updates to the Terms of Reference have been made as part of those discussions and revisions are captured in the table below.

Revision	Date	Description
1.0	December 2019	Initial draft Terms of Reference
2.0	December 2020	Additional information added around inventory and model. Indicator species reviewed and updated. Communication plan expanded to include internal and public plans. Issues and milestone schedule updated. Reviewed by FMP Planning Team and Sub-Committees.
3.0	February 2022	Additional information added to address changes to the 20-Year Forest Management Plan Guideline from MB NRND in December 2021. Includes scoping information for Climate Change and Cumulative Effects assessments. Revisions to timelines.
4.0	May 2022	Updated to address comments received from TAC and public from registry posting of the ToR version 3.0.

Revision	Date	Description
5.0	December 2024	Updated to include changes to the duration of the FMP upon receiving approval of 2-year extension to the FMLA (updated to state 2027 FMP with associated duration and milestones). Updated to include Wildlife Habitat Elements and Habitat Assessment models that were updated and available for use with regional data. Updates to the habitat elements were a result of adjusting approach after receiving feedback during engagement with rightsholders and stakeholders.

Table 1. FML 2 FMP Planning Team members (as of Revision 5.0, December 2024).

Organization	Name	Title	Role
NFMC	Andrew Forward	General Manager	Plan Author, Chair
Manitoba NRIF	Brad Epp	Director of Forestry and Peatlands Branch	Member
Canadian Kraft Paper Ltd		Woodlands Manager	Member
Nekoté LP		Nekoté Liaison	Member
Chemawawin Cree Nation		Representative	Member (Nekoté)
Mathias Colomb Cree Nation		Councilor	Member (Nekoté)
Misipawistik Cree Nation		Councilor	Member (Nekoté)
Mosakihiken Cree Nation		Representative	Member (Nekoté)
Opaskwayak Cree Nation		Representative	Member (Nekoté)
Sapotaweyak Cree Nation		Councilor	Member (Nekoté)
Wuskwi Sipihk First Nation		Representative	Member (Nekoté)
NFMC		Silviculture Forester	Member
NFMC		Forest Technician	Member
Manitoba NRIF	Jane Epp	Planning and Practices Forester	FMP Coordinator
Manitoba NRIF	Evan Finkler	Indigenous Relations Forester	FMP Consultation Lead
Manitoba NRIF	Sima Feuer	Manager, Planning and Development	Member
Manitoba NRIF	Jianwei Liu	Wood Supply Forester	Member
Manitoba NRIF	James Boyd	Manager, Inventory and Analysis	Member
Manitoba NRIF	Joel Kayer	Northwest Regional Forester	Member
Manitoba NRIF	Graydon McKee	Habitat Mitigation Biologist	Member
Manitoba NRIF	Lindsey Bylo	Lead Wildlife Biologist – NW Region	Member
Manitoba NRIF	Maria Arlt	Director of Wildlife	Member
Manitoba ECC	Bryce Wood	Environmental Officer	Member
Manitoba ECC	Jenny Harms	Protected Areas Specialist	Member

Important milestones and timelines for the development of the FMP are included at the end of this document. The Planning Team has the responsibility to continually review the schedule of milestones and agree on necessary adjustments accordingly. Manitoba's NRND has provided the FMP Submission Date, Review process, and approval date within Table 2.

The remaining requirements of the Terms of Reference have been organized into the following sections:

1. Topics of potential impact or influence on the FMLA
2. Land base and Modeling Information for FMP development

3. Wildlife habitat and Indicator Species
4. FMP Assessments for Cumulative Effects and Climate Change Adaptation
5. Communication Plan
6. Process and Timelines

Table 2. Manitoba NRIF Review and Approval Schedule of completed FMP.

Key Manitoba NRIF Review and Approval Milestones	Estimated Dates
FMP Draft Submission	June 2025
Public and government review	June 2025 - September 2025
Manitoba Consultation of Completed FMP Submission	October 2025 – June 2026
Final FMP Approval	July 2026 – December 2026

TOPICS OF POTENTIAL IMPACT OR INFLUENCE ON THE FML

The topics in this section are elements that could be considered as inputs to the FMP but are yet to be developed. They may be broad or complex in nature and not easily incorporated into an FMP, but are important both socially and environmentally within the FML and may need to be spoken to during the development of the FMP.

Woodland Caribou Recovery Strategies and Action Plans

Boreal woodland caribou are listed as “threatened” under both the federal Species at Risk Act and Manitoba’s Endangered Species and Ecosystems Act. The Province of Manitoba continues to develop Woodland Caribou Recovery Strategies and Action Plans. In the event these Strategies and Plans are not available to contribute to the Forest Management Plan, the regulator and the proponent will determine a mutually agreeable process for integration into the FMP at some future point.

Ecosystem-Based Management

Ecosystem-based management (EBM) is an approach to management that is guided by natural patterns and processes. The goal is to reduce the differences between natural and managed landscapes in order to keep habitat conditions within a natural range of variation. In Manitoba’s boreal forest, wildfire is a dominant natural disturbance agent. The size and pattern of wildfire disturbance is variable and some large disturbance events are very likely. As a result, the transition to EBM will result in more spatially concentrated harvest relative to historical practice. A shift towards larger harvest blocks may impact other resource users and stakeholders and may cause public concern if the background and objectives of EBM are not clearly communicated. Although other jurisdictions across Canada have adopted EBM into forest management planning as a best practice, this policy direction is currently not available in Manitoba. Manitoba may explore EBM policy direction during the development of this FMP. This new direction could have an influence on the FMP.

Maintenance of moose habitat

Moose are a culturally and socially important species in the forest management licence area and forestry activities affect their habitat. Due to a variety of factors, moose have experienced a population decline in several regions in Manitoba which has led to conservation closures for moose hunting in areas of the province, although not within FML #2. While habitat is not likely the driving factor affecting moose population declines in the Province, habitat availability and potential impacts related to forestry activities such as increased pressure on populations through predation or hunting should be considered.

Forest health

Forest insect and disease are important natural disturbance agents in Manitoba's boreal forest. In the past, both jack pine and spruce budworm outbreaks have occurred within the FML at variable intensities and extents. Currently, there is an outbreak of jack pine budworm occurring within the FML. Such outbreaks can threaten the sustainability of the forest industry and the communities that depend on them. The Province and CKPI must continue to collaborate on the management of insect and disease outbreaks.

LAND BASE BACKGROUND INFORMATION FOR FMP

The following section provides information on FML 2 land base, required inventory updates and agreed upon processes and summarizes the status of each FMU within the FML for use in the FMP.

Boundaries and Land base Extent of FML 2

Figure 1 outlines the area of Forest Management License 2 (FML 2) in northwestern Manitoba. The license area covers over 8.77 million ha north and west of Lake Winnipeg, and encompasses the major population centres of The Pas, Flin Flon and Thompson, in addition to numerous additional smaller indigenous and non-indigenous communities.

FML 2 contains portions of three Forest Sections (see Figure 2), the Saskatchewan River, Highrock and the Nelson River Forest sections. Each forest section is comprised of several Forest Management Units (FMU), each of which functions as an independent sustained yield unit for the purpose of timber harvesting and annual allowable cut determinations (see Figure 3).

- FMUs of the Saskatchewan River Forest Section which form part of FML 2 - 50, 53, 58 and 59
- FMUs of the Highrock Forest Section which form part of FML 2 - 67, 68 and 69
- FMUs of the Nelson River Forest Section which form part of FML 2 – 801, 802, 803 (Formerly FMUs 83, 84, 85, 87, and 89)

Portions of the Nelson River Forest Section have been recently completed with a new photo-interpreted Forest Lands Inventory (FLI). Manitoba, in response to a request from industry, has determined that it would be more efficient to align FMUs in Nelson River to the inventories being completed, and to better align with the realities of the challenging geography and distances in Nelson River. For the 2027 FMP, Nelson River Forest Section will be arranged into three FMUs (see Figure 3). FMU 801 corresponds to the recently completed FLI, and is on the accessible western side of the Nelson River. FMU 800 is currently inaccessible on the eastern side of the Nelson River and FMU 802 is on the top of FMU 801 in the Nelson River Forest Section. Both FMU 800 and 802 will use Forest Resource Inventory (FRI).

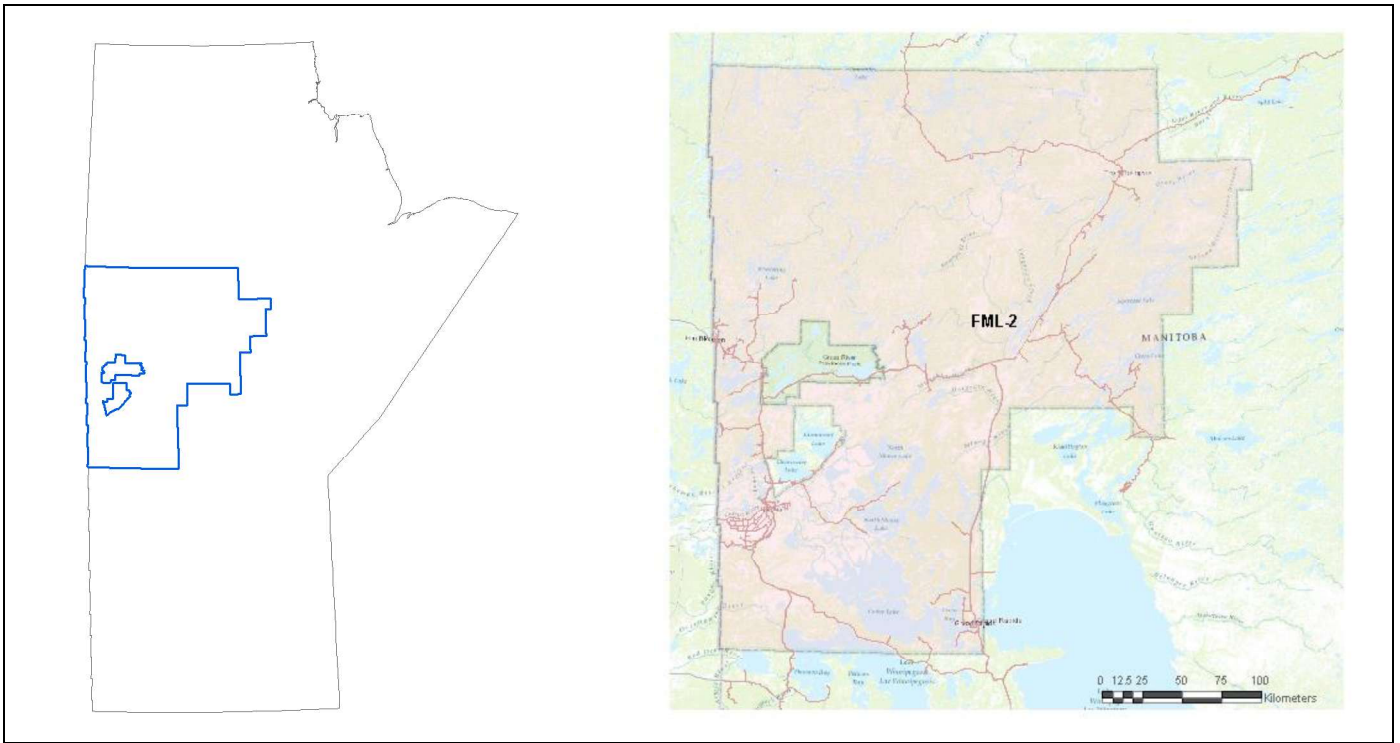


Figure 1 Forest Management Licence 2 in northwestern Manitoba

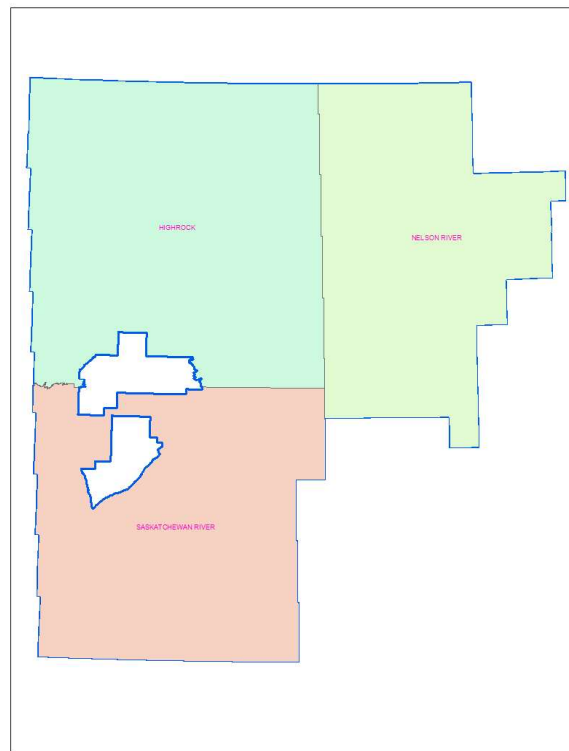


Figure 2 Forest Sections of Forest Management Licence 2 in northwestern Manitoba. FML 2 encompasses portions of the Saskatchewan River and Nelson River Forest Sections and all of the Highrock Forest Section

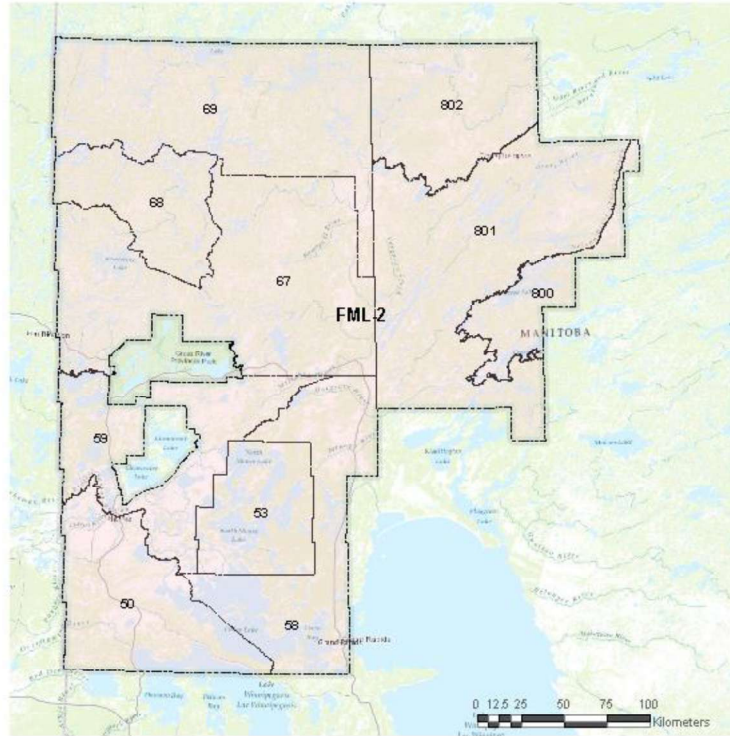


Figure 3 New Forest Management Units for use in the 2027 FML 2 Forest Management Plan. The Nelson River Forest Section has been delineated so that FMU 801 corresponds to the area of completed FLI, and FMUs 802 and 800 correspond to the FRI.

Forest Inventory in Provincial Parks and Protected and Conserved Areas

The 2027 FML 2 Forest Management Plan will consider broad objectives for ecosystems, wildlife, habitat, and timber supply over the vast land base of the FML in northwestern Manitoba. The forest inventory is the key input into the FMP that will allow the Planning Team to evaluate and measure the values on the land base to meet all of the plan objectives. Provincial parks and protected and conserved areas are a critical element in evaluating the quantity, quality and connectivity of habitats across the entire FML. The inclusion of parks and protected areas in the assessment of habitats within the FML does not influence the management and development decisions of Parks Branch.

Including forest inventories from provincial parks, and protected and conserved areas in the forest inventory planning for FML 2 may help the team to develop and meet the broad strategic ecological objectives of the entire forest. Species that have a large home range, such as woodland caribou, will make use of habitat across very large areas and cross many borders. The FMP Planning Team will request inputs from the land managers for these areas and seek their advice on incorporating available forest inventories into the FMP process.

In the case of Grass River Provincial Park and Clearwater Lake Provincial Park, these areas are physically outside the FML; however Parks Branch will be contacted to explore opportunities for including the forest inventories within the parks in the planning inventory to assist the Planning Team in evaluating plan objectives for wildlife and habitat only. Harvest operations will not be a consideration within the provincial park areas in this Forest Management Plan (FMP), nor will any decisions in the FML impact the ability for unprotected provincial parks to be developed in accordance with their respective park management plans and/or land use categories.

Re-Inventory

Portions of FML 2 currently have very old forest inventories that require a re-inventory that meets new forest inventory standards. The previous FRI standard, in use until 2000, provided limited timber attributes and did not include key attributes like canopy heights or age, key elements in the determination of volume.

Areas of Special Interest

There are several large areas of special interest (ASIs) in the High Rock and Nelson River Forest sections (FMUs 69, 800, 801, and 802) which may have implications on the management of FML 2.

Areas of special interest are designed based on enduring features found within an ecoregion that still need to be captured in Manitoba's network of protected and conserved areas to adequately represent the ecological biodiversity found in the province. These study areas are not formally protected, and may be considered as candidate protected areas in the future through the Protected Areas Initiative.

The FMP Planning Team will request a status update for ASIs within the High Rock and Nelson River Forest Sections from Manitoba Environment, Climate and Parks. The inclusion of this information within the planning inventory will provide a complete overview of the land base for wildlife and habitat connectivity assessment, and provide guidance in developing management objectives for the FML that align with the intent and objectives of the ASIs.

Relevant Landbase Management Plans

Government Management Plans:

The FMP Planning Team will use existing land-base management plans for Crown land designations and other planning areas within the FML and for Grass River and Clearwater Lake Provincial Parks in FMUs 57 and 60 as guidance when developing management objectives for FML 2 that align with the intent and objectives of these areas. The Planning Team will clarify language in the Grass River and Clearwater Lake Provincial Park Management Plans with the Provincial Park Planner.

- All provincial park management plans
<https://www.gov.mb.ca/sd/parks/park-facilities-and-services/park-system-plan/>
- Carrot-Saskatchewan River Integrated Watershed Management Plan
http://www.manitoba.ca/water/watershed/iwmp/carrot_saskatchewan/index.html

Other User Management Plans

The proponent will engage with Communities within FML 2 to review available plans or plans in development to seek guidance in developing management objectives and VOITs for the FMP. The following examples provide a potential list of available information.

- Community land use plans
- Tradition Use plans
- Traditional Knowledge Practices/Guidelines
- Spatial information of travel corridors, traditional use areas, sites currently being gathered for community plan development

Inventory Update Process for Planning

Manitoba NRND will update all inventories in the FML to an effective date of December 31, 2020, to capture all recent disturbances and silvicultural treatment data. The final Landbase will be provided to the proponent for use

in the FMP. All analyses by the Province of Manitoba and NFMC would utilize the same spatial landbase data for modelling.

The process will involve an amalgamation of the two inventory types (FRI and FLI) for the FML. Ages, disturbances and past silviculture, where available, will be used to update the planning inventory. Forest inventory information within provincial parks will be included in the planning inventory in order to facilitate habitat and wildlife assessments for the entire landbase.

While high resolution (30 cm) imagery has been acquired for most of the Saskatchewan River Forest Section, the development of a new Forest inventory for that section will not be completed in time to be included in the development of this FMP.

Detailed information about each FMU, the current status and updates required is contained in Table 3.

Additional Spatial Information for FMP Modeling and Analysis

a. Roads

Roads are important as land base netdowns (for buffers) and as a modelling tool to model timber access, economics and even habitat indicators. NFMC will provide forest level roads for FMP modelling, and to Manitoba as well to ensure continuity in the development of the modelling landbase.

b. Streams/Rivers

Streams and rivers provide critical habitat and buffers around these features are necessary for protection of these features. The best available information will be used to identify water features; either from within the forest inventory or other sources of GIS data, such as the National Hydrographic Network will also be investigated for use as a spatial netdown of riparian reserves.

Note: additional spatial information will be incorporated when available (see section Other User Management Plans)

Table 3 Summary of Inventory and Land Base Elements by FMU

Forest Section		High Rock Forest Section			Nelson River Forest Section			Saskatchewan River Forest Section				Grass River Provincial Park (PP)	Clearwater Lake PP, Cormorant Provincial Forest
Category	Description	FMU69	FMU68	FMU67	FMU802	FMU801	FMU800	FMU59	FMU58	FMU53	FMU50	FMU60	FMU57
Inventory	Inventory Standard	FRI	FLI	FLI	FRI	FLI	FRI	FRI	FRI	FRI	FRI	FLI	FRI
	Inventory Current update (for depletions and silviculture data)	2020	2020	2020	2020	2020	2020	2020	2020	2020	2020	2020	2020
Status of Base Case	Yield Curves	STRATA	STRATA	STRATA	STRATA	STRATA	STRATA	STRATA	STRATA	STRATA	STRATA	NA	NA
	Model Inputs	Silviculture Transitions, Management Options, Species Succession			Silviculture Transitions, Management Options, Species Succession	Silviculture Transitions, Management Options, Species Succession	Silviculture Transitions, Management Options, Species Succession					NA	NA
	Forest Estate Model	Woodstock	Woodstock	Woodstock	Woodstock	Woodstock	Woodstock	Woodstock	Woodstock	Woodstock	Woodstock	Woodstock	NA
AAC	Year	2020	2014	2014	2020	2020	2020	2014	2014	2014	2014	NA	NA
FMP Modeling	FMP Landbase (includes disturbances and forecasted depletions to the end of plan current plan)	2024	2024	2024	2024	2024	2024	2024	2024	2024	2024	2024	2024
	Ownership/Status	Current	Current (TLE lands within this area – no inventory provided)	Current	Current	Current	Current	Current	Current	Current	Current	Current	Current
	Provincial Land Designations (provincial parks, ecological reserves, wildlife management areas, community pastures, etc)	Current	Current	Current	Current	Current	Current	Current	Current	Current	Current	Current	Current
	Areas of Special Interest	Current	Current	Current	Current	Current	Current	Current	Current	Current	Current	Current	Current
	Yield Curves	STRATA	STRATA	STRATA	STRATA	STRATA	STRATA	STRATA	STRATA	STRATA	STRATA	STRATA	STRATA
Forest Estate Model	Patchworks	Patchworks	Patchworks	Patchworks	Patchworks	Patchworks	Patchworks	Patchworks	Patchworks	Patchworks	Patchworks	Patchworks	Patchworks

FMP MODELLING

Wood supply modelling uses computer simulation tools to forecast future forest conditions as a result of management strategies and constraints being considered. The use of wood supply models helps to explore and understand impacts and trade-offs of management decisions within a large geographical area over long time horizons. The information derived from modelling provides decision support to the FMP Planning Team as they develop and select the Preferred Management Scenario.

Manitoba NRND will complete the required Base Case modelling for FMUs (FMU69; FMU800; FMU801; FMU802) that do not currently have an updated Base Case. The Base Case modelling is important to provide a benchmark understanding of the wood supply within the FML and the interactions of various model inputs and generally sets the upper limits of annual harvest. The Base Case does not usually account for operational constraints and requirements like roads, haul distances and seasonal harvest block layout. The harvest levels derived from Manitoba NRND will inform the development of the FMP model and management objectives. Manitoba NRND will provide the results of the Base Case to the proponent as well as any relevant inputs as this information becomes available.

NFMC has chosen to use the Patchworks forest estate model for FMP scenario planning. The Patchworks model is a spatially explicit planning tool that maintains forest area information and relationships to the managed land base throughout the strategic planning exercise. This will provide a more realistic forecast of management alternatives that will consider spatial factors such as accessibility, roads, harvest blocks as well as landscape level habitat relationships for species with large home ranges like Woodland Caribou. Considering location of management activities within the FML at the strategic level will provide better connectivity to operations and implementation of the plan. This landscape level strategic approach will consider objectives at the FML level, as well as at the FMU level where required.

Due to the use of different models and management objectives being considered between the Base Case and FMP Modeling, the Planning Team anticipates some differences in results.

Model Input - Yield Curves

STRATA based yield curves exist and will be provided by NRND Forestry and Peatlands for the FMUs. Strata based yields have been used in all existing Base Cases (Sask River and FMU 67 and 68). For the FMP model, NFMC will use the latest information available where the required input information exists. Utilization standards also have an impact on the determination of sustainable harvest levels.

Model Input - Post-Harvest Transitions

Manitoba NRND and NFMC will work closely together to create post-harvest transitions from collected silviculture data, for use in Base Case and FMP models (developed by Forest Section). Post-harvest transitions are an important model input that provide a future forest condition based on the management activity scheduled. Historical records, current practices and local operational knowledge will be used by the Land-base and Modeling Sub-Committee.

Modeling Scenarios – Scenario Planning

Working towards a scenario that will consider numerous management objectives – both ecological and economic – and that reflect objectives expressed by communities. The following scenarios will be developed and influenced by Indigenous communities and stakeholders input to be included in the Preferred Management Approach Selection Process along with the Base Case.

- Baseline Scenario

- Current policy and management objectives
- Sustainable wood supply – for FML and FMUs
- Accessibility and arrangement of harvest blocks
- Transportation considerations and economics
- Habitat Scenario
 - Baseline scenario objectives
 - Explore management alternatives to enhance the amount and arrangement of habitat for selected indicator species within the FML over time.

Spatial Harvest Schedule and the Base Case

The Manitoba government Base Case spatial component is not intended to generate an operational spatial harvest schedule and this will come from the Preferred Forest Management Scenario (PFMS) after analysis and engagement with rightsholders and stakeholders. The FMP model, developed in Patchworks as a fully spatial model, will allow the team to explore and visualize the FMP objectives in very interactive ways. The FMP model may consider objectives that are not present in the base case such as roads, economics, caribou strategy, moose strategy, current conditions of ecological features. All of these have the potential to deviate from the Base Case results and will be fully discussed and developed as a team to ensure the objectives of the FMP are met.

PRELIMINARY IDENTIFICATION OF REGIONALLY IMPORTANT SPECIES

Revision 5.0: At the time the original Terms of Reference was developed, a selection of indicator species was chosen based on available HSI models. Based on feedback heard during engagement and discussions with the Planning Team, it was decided that the HSI models historically available and initially selected for use (caribou, hairy woodpecker, marten, great grey owl, moose, common yellowthroat, red-breasted nuthatch, ruffed grouse, and black-and-white warbler) were potentially not representative of conditions in FML 2.

The Planning Team concluded that based on this feedback, a new approach was necessary. The boreal songbird section has been added to this Terms of Reference to document the framework and direction taken to consider, include, and apply boreal songbird models in the forest management plan development process in place of the previously identified HSI models for indicator species. When considered alongside boreal woodland caribou habitat elements at the landscape scale, moose habitat elements at the more local scale, and songbird habitat elements to capture a diverse range of habitat needs, the Planning Team agreed to update the following section to represent regionally important and focal species on the FML.

Indicator species are defined as an animal or plant species that can be used to infer conditions in a particular habitat. In terms of the development of the FMP for FML 2, the preliminary indicator species identified in the plan were selected due to the variety of habitat types and forest conditions utilized, as well as habitat suitability models that were available for use in a forest modelling context. During the initial development stages of the FMP, it was determined that many of the available Habitat Suitability Index (HSI) models available for use in Manitoba were derived with references and observations from southern ecoregions based on the knowledge and data available at the time. Many of these models had not been validated with observation data within the northern boreal regions

where they would need to be apply (with the exception of the Marten model). For those that have been, there was little preference or alignment with higher HSI values¹. For these reasons, as well as based on feedback heard from rightsholders and the public, NFMC will be looking to implement a new approach for habitat assessments in the FML 2 Forest Management Plan. The approach proposed will use habitat elements at the coarse landscape scale and focus on habitat assessment models derived with known location data from the region, where available.

The approach to forest management planning in Manitoba is open and collaborative with opportunities for ongoing public involvement. Additional species of social, economic, or community importance may be brought forward during public engagement opportunities that are not listed in the Terms of Reference. Additional species of community importance will be recorded during collection of Concerns and Values through engagement. Additional species will be reviewed to understand how the species habitat requirements would be covered by the habitat matrix (Table 4) at a broad scale or how fine-scale requirements could be addressed operationally with Section 9.1 of Implementation Strategies of the FMP guideline.

In some cases, indicator species may be identified as important for communities or of concern/risk, however there are no habitat models available. There are opportunities to quantify broad landscape level forest types and seral stages over time within the FMP that may inform habitat requirements of these species in the future. Other opportunities exist at a finer scale during operational planning and implementation to address site-specific habitat concerns.

The approach proposed for the development of the FMP is to:

1. Represent habitat elements for wildlife species at the coarse strategic scale within the forest model;
2. Assess specific habitat preferences for selected species using available, updated wildlife models;
3. Consider fine-scale habitat element arrangements and requirements during operational planning for selected species; and,
4. Develop research plans to increase available data in FML 2 to refine Manitoba habitat models in future plans.

The species included in the Terms of Reference to be considered in the FMP Matrix of Habitat Elements have been listed based on:

- Distribution within FML 2;
- Availability of quantifiable habitat models and metrics for Manitoba;
- Ability to influence habitat types through forest management;
- Federal or provincial classification of a species of concern or species at risk;
- Importance to stakeholders and rightsholders within or adjacent to FML 2; and,
- Representation of a broad spectrum of forested habitat types.

[Matrix of Habitat Elements for Wildlife Species](#)

A matrix of habitat elements defined using broad forest cover types and seral stages was proposed to categorize habitat elements distributed across FML 2. These habitat elements can be represented directly in the forest model and can be tracked over time as the forest ages and regenerates from disturbances. The matrix of habitat elements covers many representative species found within the region. The forest model can measure and report on the abundance of these general habitat elements within the FML and demonstrate relative changes as a result of the strategic direction identified in the Preferred Forest Management Scenario. The dimensions of the matrix (box) represent general but unique habitat types that occur around the FML and maintaining the dimensions of the box

¹ Berger, R. and J. Ehnes. 1997. Bird habitat suitability index (HSI) validation study. Final Report. Manitoba Model Forest. 150 pp.

is a way to model landscape level habitat elements (coarse filter/strategic) over time in a forest model. Table 4 below has been populated with examples of species that would occupy or potentially use the habitat element represented by each broad forest habitat type.

The habitat elements (combinations of seral stages and forest cover types) will be defined and used during the development of the PFMS in the forest model.

In addition to the general habitat elements, additional habitat types will be defined in the forest model for important wildlife species identified:

1. Boreal Woodland Caribou
 - a. Preferred, Useable, and Refuge general forested habitat types.
2. Moose
 - a. Thermal cover, general cover, and browse/forage general forested habitat types.

Table 4. Habitat elements matrix table describing the broad habitat types represented within FML 2 using seral stages and cover types.

Seral Stages	Softwood	Softwood-leading Mixedwood	Hardwood-leading Mixedwood & Hardwood	Non-Productive Forest
Young	Great grey owl Lynx Marten Red breasted nuthatch White-throated sparrow	Common yellowthroat Great grey owl Lynx Marten Moose (browse) Red-breasted nuthatch White-throated sparrow	Black and white warbler Common yellowthroat Great grey owl Lynx Moose (browse) Ruffed grouse	Beaver Caribou Common yellowthroat Greater yellowlegs Moose
Immature	Marten Red breasted nuthatch Great grey owl	Marten Moose (cover) Red breasted nuthatch Great grey owl	Black and white warbler Moose (cover) Great grey owl Ruffed grouse	
Mature, Old, & Very Old	Caribou Marten Olive-sided flycatcher Red breasted nuthatch Great grey owl	Marten Olive-sided flycatcher Red breasted nuthatch Hairy woodpecker Great grey owl	Black and white warbler Hairy woodpecker Great grey owl Ruffed grouse	

Habitat Assessment Models

Boreal Caribou

The provincial 20-year Forest Management Plan Guideline (Manitoba Agriculture and Resource Development, 2021) directs that:

Within Boreal Caribou ranges proponents would be expected to implement a management strategy using the best available information to mitigate effects of forest management activities on caribou habitat. This includes a Caribou Habitat Protection Plan to be incorporated into the FMP to provide guidance to the management plan. Manitoba will provide further details as the provincial caribou action plan for range plan development is finalized.

It is recognized that Woodland Caribou habitat management is a priority management objective for FML 2 and will provide the strategic landscape direction of the preferred management strategy.

Revision 5.0: At the time of FMP development and revisions to the Terms of Reference a finalized Habitat Protection Plan or Provincial Action Plan were not available. However, information regarding habitat elements, assessments, and direction were available to include in the FMP development that would be consistent with direction for caribou habitat protection.

Woodland Caribou conservation, planning and management requires a larger landscape level approach and considers both the relative abundance of habitat and the arrangement at large scales. Due to the large landscape levels and spatial arrangements that will need to be considered and that will be directly influenced by forestry and access, Woodland Caribou will be addressed directly within the management objectives and within the wood supply model. Woodland Caribou has also been included as an indicator species and the resulting amount and arrangement of habitat will be assessed and reported using the updated annual HSI model that includes current disturbances on the landscape. Current buffered anthropogenic disturbances (not including forest harvesting) used in the development and validation of the Caribou HSI (Arsenault & Hazell, 2021)² will remain static from Plan Start to Plan End for the spatial assessment and be consistent with information available from Environment Canada, updated to include additional known disturbances such as linear features and recent harvest/fire. Future harvest disturbance and road development from management scenarios will be an input into the HSI model.

The post-processing boreal caribou habitat suitability index model:

1. Includes assessment of vegetation types, stand ages, anthropogenic and natural disturbances
2. Assessed for Plan Start (Time 0), Plan End (Year 20), additional projected plan (Year 40)
3. Provides an assessment of habitat quality that considers arrangement of habitat elements

Boreal Songbirds

As discussed previously, many of the available Habitat Suitability Index (HSI) models available for use in Manitoba were derived with references and observations from southern ecoregions based on the knowledge and data available at the time. Many of these models have not been validated with observation data within the northern boreal regions where they would need to be applied for use within this forest management plan. For these reasons, as well as feedback from rightsholders and the public, NFMC proposed a new approach to wildlife habitat assessment using boreal songbird habitat models to assess relative habitat measures in the FMP and for alternative management strategies.

The approach will utilize data driven boreal songbird models from a neighbouring jurisdiction with a similar ecoregion and begins to add local Manitoba observation data to validate model performance for use in this area. NFMC has identified a need to collect additional songbird species data to continually improve models that represent habitat needs and conditions within the FML. On-going research and data collection plans will be included in Part 3 Research sections to assist in developing a rigorous monitoring program to validate and continuously refine the modelling approach.

² Arsenault, A & Hazell, M., 2021. *Technical Memo – Manitoba Government – Woodland Caribou Habitat State Analyses*. Wood Environment and Infrastructure Solutions, a Division of Wood Canada Limited.

The following approach was proposed to and accepted by the Planning Team in 2023. The development of the approach, adjustments to Ontario model using available Manitoba observations, results and continued research will be document in the FMP.

The province of Ontario has developed Boreal Songbird Models as part of the coarse filter application of the Forest Management Guide for Boreal Landscapes³. The Boreal Songbird models within the guidelines available to forest managers were developed by Rob Rempel of the Centre of Northern Forest Ecosystem Research: Forest policy scenario analysis – Evaluating the effectiveness of coarse-filter policy options on conserving songbird communities (Rempel et al. 2007)⁴. These data-driven models were developed based on the boreal shield, a similar northern boreal forest ecoregion (Figure 4).

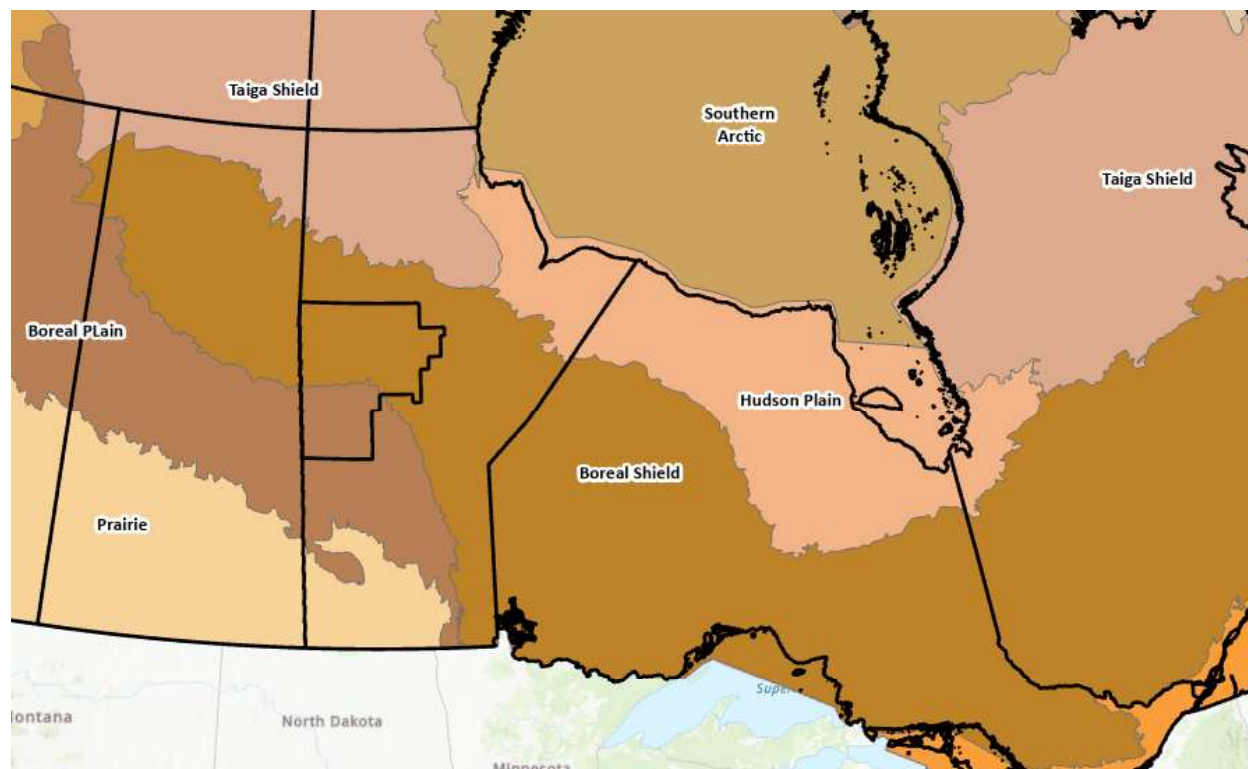


Figure 4. Ecoregions of Manitoba and surrounding provinces. FML 2 boundaries are outlined in black within the province.

Forest model habitat elements will be defined and exported from the Patchworks forest model for assessment in boreal songbird habitat models:

1. Forest model parameters
 - a. Crown closure, distance, height, age, percent hardwood, age density, percent mature, percent young (at local and region scale).
 - b. Exported for Plan Start (Time 0), Plan End (Year 20), additional projected plan (Year 40).

³ Ontario Ministry of Natural Resources, 2014. *Forest Management Guide for Boreal Landscapes*. Toronto: Queen's Printer for Ontario.

⁴ Rempel, R. S., J. Baker, P. C. Elkie, M. J. Gluck, J. Jackson, R. S. Kushneriuk, T. Moore, and A. H. Perera. 2007. Forest policy scenario analysis: sensitivity of songbird community to changes in forest cover amount and configuration. *Avian Conservation and Ecology - Écologie et conservation des oiseaux* 2(1): 5. [online] URL: <http://www.ace-eco.org/vol2/iss1/art5/>

Songbird models will be run initially using Ontario coefficients and occupancy thresholds. Results will be validated using available known songbird location observation data from The Atlas of the Breeding Birds of Manitoba (birdatlas.mb.ca and naturecounts.ca). Using this available data the models will be validated for performance.

The following steps have been proposed for the development of the plan and will be documented once completed in the FMP:

1. Assessment of performance of Ontario models
2. Documentation of initial performance
3. Development of any new Manitoba Bird Models using available data
4. Assessment of performance of Manitoba Bird Models
5. Documentation of validation and results from PFMS for Percent Area Occupied (POA)
6. Recommendations and proposed research program during implementation of FMP for additional regional data collection to further refine initial Manitoba Bird Models.

Moose

Planning for moose habitat is a great example of a species that can be represented at both the strategic, coarse-filter level while also benefitting from more detailed, fine-filter operational planning. In the forest model, general habitat elements will be defined to identify preferred forest types in the region over time (see above for forest model habitat elements for moose – thermal cover, general cover and browse). However, how these habitat elements need to be arranged at the local level to provide fine-scale habitat needs are a key component to moose habitat planning. This level of in-block detail is planned for and implemented at the operational scale, not within the strategic landscape level forest model. Because of these requirements and the cultural and social importance of this species information about moose and moose habitat planning will be addressed at both levels of development.

1. Strategic modelling and scenario analysis for the selection of the PFMS.
 - a. Thermal cover, general cover and browse/forage general forested habitat types.
2. Moose-specific operational considerations for planning during implementation of the FMP.

There is currently no habitat assessment model for moose available for the FML 2 region of Manitoba. The FMP will focus on strategic, landscape scale habitat elements, fine-filter operational planning considerations of specific habitat elements/features, and the management of access (e.g., road decommissioning and minimizing fragmentation).

Other Regionally Important Species

During pre-planning and the development of the Terms of Reference to determine preliminary Indicator Species and review available models for wildlife habitat type modelling it was discussed that no Manitoba Habitat Suitability Index (HSI) currently existed for the Lynx. This is an important fur-bearing species in the region and within FML 2 that utilizes younger habitat types and openings for hunting snowshoe hare. Preliminary research revealed models exist for neighbouring Northwestern Ontario and could potentially be adapted for use in Manitoba. The development and adaptation of a HSI model for Lynx that could be used in this FMP would be contingent on joint participation from both the proponent and the Manitoba Fish and Wildlife and Forestry and Peatlands Branches and an expression of interest from Indigenous Communities during the engagement process. If testing and validation of the HSI model is able to be completed by Manitoba outside of the FMP process the Lynx habitat assessment could potentially be included with the other indicator species. Feasibility of the joint development of the Lynx HSI would be determined through discussions of timing, cost, available data and validation timing.

Revision 5.0: While the development of a Lynx HSI was considered at the pre-planning stage, during the initial stages of plan development it was decided on by the Planning Team that the Lynx HSI model would not be pursued, and NFMC would instead focus on songbird model development as songbird initial data existed and collection of additional data would be more practical and economical.

FMP ASSESSMENTS

Cumulative Effects Assessment

Cumulative effects are defined as: “Changes to environmental, social and economic values caused by the combined effect of past, present and potential future human activities and natural processes.”⁵ The purpose of the Cumulative Effects Assessment (CEA) in this FMP will be to determine how the proposed forest management activities will affect and relate to sensitive values⁶. This will be achieved by consolidating all the different analyses already being completed for the purpose of achieving sustainable forest management.

Scope

The Proponent will identify and assess potential threats from proposed forest management activities to sensitive values. The bow-tie risk assessment tool will be used to help identify policies and procedures to help reduce or mitigate these threats. The following are 5 key sensitive values that will be addressed in the CEA:

1. Watersheds and Aquatic Ecosystems,
2. Carbon Balance, and
3. Biodiversity.
4. Moose
5. Caribou

No additional data will be collected specifically for the CEA, although some additional modelling and analysis of existing information from the FMP development may be conducted. The following information and data layers will be used:

- Productive and Non-Productive Landbase on FML 2
- Preferred Forest Management Scenario
- Existing Roads and Linear Features
- Habitat elements and habitat model assessments (Caribou, songbirds)
- Recent Wildfires
- Watersheds
- Available Wetland Carbon Information
- Generated Forest Carbon Curves

⁵ Government of British Columbia (2016). Cumulative Effects Framework Interim Policy for the Natural Resource Sector. Retrieved from: <https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/cumulative-effects-framework>

⁶ Sensitive values are values not directly addressed already by the FMP, but which are sensitive to cumulative effects, important to communities, and affected by proposed forest management activities.

Effects Assessment and Identification of Risk Mitigation Strategies;

The assessment of effects will be completed using the bow-tie analysis method with guidance from Dr. Rob Rempel.⁷ Based on each value’s hazard and top event, the following will be identified: threats, barriers, controls, consequences, and mitigative controls. The bow-tie analysis identifies possible threats and consequences of the hazard and assesses whether they are addressed by the FMP and associated operations and procedures to limit cumulative effects and reduce the risk of a hazard occurring for each value.

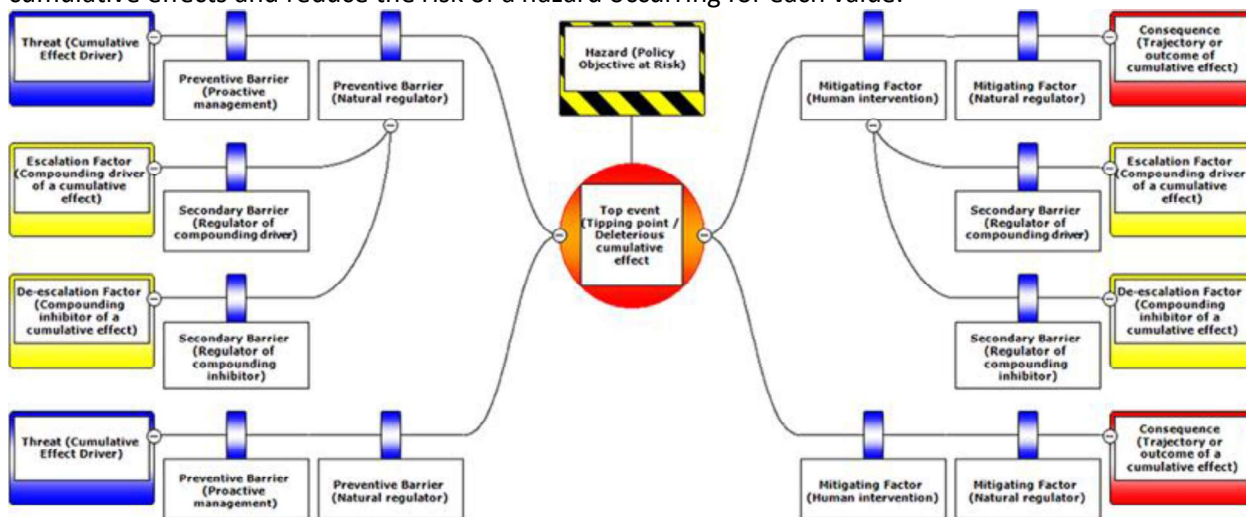


Figure 5. Example bow-tie analysis from FERIT.

Based on the data listed above further analysis will be completed to add understanding to threats within the bow-tie analysis.

1. Watersheds and Aquatic Ecosystems.

A cumulative watershed disturbance analysis will be completed to better understand disturbance effects on the watershed. Thirty percent disturbance is the threshold that is generally set and accepted across Canada, including Manitoba⁸, where disturbance below the threshold will not affect stream flow in spring run-off.^{9,10,11,12,13} Disturbance from harvest (both softwood and hardwood recovery curves) will be included in the FMP wood supply model and provide an estimate of disturbance from management at plan end. Natural disturbance and linear features available at plan start will also be included in the analysis at the watershed level (if available).

⁷ Dr. Rob Rempel is the Principal for FERIT (Forest Ecosystem Research and Information Technologies) and a leader in cumulative effects assessment using the bow-tie methodology.

⁸ D.A. Westworth & Associates Ltd. 1992. An overview of potential forest harvesting impacts on fish and fish habitat in the northern boreal forests of Canada’s prairie provinces. Department of Fisheries and Oceans. Edmonton, Alberta.

⁹ Winkler, R and Boon, S (2017). Equivalent Clearcut Area as an Indicator of Hydrologic Change in Snow-dominated Watersheds of Southern British Columbia. Extension Note 118. Retrieved from: <https://www.for.gov.bc.ca/hfd/pubs/docs/en/EN118.pdf>

¹⁰ The Community Watershed Guidebook for British Columbia uses 30% ECA as the threshold for all watersheds greater than 250ha. Found [here](#).

¹¹ ECA analysis was first published by the US Forest Service in 1974, since then many US watersheds studies in the 1970s and 80s were conducted and found no recognizable changes in stream hydrographs until ECAs approached 30%. Sourced from Haslam Lanf Community Watershed Coastal Watershed Assessment Procedure (CWAP) 2015 Update by Carson Land Resources Management Ltd. From [here](#).

¹² Buttle, J M and Metcalfe, R A (2000) found in their paper “Boreal forest disturbance and streamflow response, northeastern Ontario” that medium to large scale watersheds with ECAs of 5-25% did not show significant streamflow response. Published in *Canadian Journal of Fisheries and Aquatic Sciences*, 57, S2.

¹³ The Government of Saskatchewan sites [here](#) that flow increases are minimized when ECA is limited to 30% in coniferous dominated watersheds, and 20-25% in aspen dominated watersheds.

2. Carbon Balance

Forest ecosystem carbon calculations will be included for the forested area within FML 2 that has been classified into strata and have an associated yield curve. Forest carbon stock estimates by strata will be generated from the Carbon Budget Model of the Canadian Forest Service (CBM-CFS3¹⁴) and included in the FMP wood supply model to track carbon stocks and stock changes in different forest ecosystem carbon pools through time. Estimates of wetland carbon storage obtained through literature review and ongoing research in the area will also inform the cumulative effects on carbon balance within the FML.

3. Biodiversity

Habitat elements for regionally important species will be determined based on the preferred forest management scenario and habitat models available for assessment. Wildlife habitat elements and assessment models have been selected to cover broad habitat types within the forested area based on forest type, age class and rightsholders concerns. Additional analysis for woodland caribou will also inform the spatial arrangement of habitat within the ranges and assess how the Preferred Forest Management Scenario impacts habitat. Existing linear features and natural disturbance events will be considered in caribou HSI assessment. Separate bow-tie assessments will be looked at for Caribou and Moose, to further focus the biodiversity assessments.

Evaluation of Significance; Monitoring and Follow-up

Based on the outcomes of the bow-tie analysis, the mitigation efforts for each value will be summarized and gaps that have been identified will be discussed. The monitoring and reporting timeframe will align with other FMP management requirements. Although the threats assessed in the CEA are part of the FMP process, the CEA will be a separate chapter in the FMP. This will provide an opportunity for review from the FMP Planning Team and Communities before approval.

Climate Change Adaptation

Climate change is a significant change in either the average state of the climate or in its variability, measured over an extended period (usually at least 30 years). Climate change is having an impact on the boreal forest and is expected to continue to do so in the coming decades. The CKP Woodlands and NFMC Staff (herein referred to as Woodlands department) will use a structured and robust forest adaptation¹⁵ framework approach to conduct a Climate Vulnerability Assessment (CVA) to better understand the potential impacts of climate change on the forests, and support actions under increasing uncertainty. The goal of CVA is to identify climate change related risks and potential adaptation measures that will be included in the FMP to reduce forest vulnerability¹⁶, take advantage of any positive opportunities that may be associated with climate change, and increase likelihood that sustainable forest management objectives will be achieved. The CVA framework allows for evidence and science-based decision making to address the complex challenges related to climate change.

¹⁴ Kurz et al. 2009: Kurz, W.A.; Dymond, C.C.; White, T.M.; Stinson, G.; Shaw, C.H.; Rampley, G.J.; Smyth, C.; Simpson, B.N.; Neilson, E.T.; Tyofymow, J.A.; Metsaranta, J.; Apps, M.J. 2009. CBM-CFS3: A model of Carbon-dynamics in forestry and land-use change implementing IPCC standards. *Ecol. Model.*, 220, 480-504.

¹⁵ Adaptation – Actions to manage the risks/reduce negative impacts of climate change, and to increase the magnitude and likelihood of positive impacts. It is the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which in turn moderates harm or exploits beneficial opportunities.

¹⁶ Vulnerability – The degree to which a system is susceptible to, or unable to cope with, the adverse effects of climate change (including variabilities and extremes). It is a function of the character, magnitude and rate of climate change and the variation to which a system is exposed, its sensitivity, and its adaptive capacity.

The process that the CVA will follow is based on the Canadian Council of Forest Ministers' (CCFM) adaptation framework approach, designed for forest managers to use in assessing vulnerability of sustainable forest management system to climate change.¹⁷ The CVA framework is a series of facilitated workshops and discussions that the Woodlands Staff will undertake to complete 5 key steps:

1. Define the scope of assessment;
2. Understand current and future climate conditions;
3. Complete a detailed vulnerability assessment;
4. Identify and prioritize adaptation options; and
5. Implement and monitor adaptation efforts.

Assessment Scoping

The scope of the CVA will be limited to the FML 2 landbase and the Woodlands Staff will be the main group contributing to the analyses. The Woodlands Staff is committed to an extensive communications and engagement plan with Indigenous and general communities. The CVA steps and themed discussions will be incorporated directly into the communication and engagement outlined in the TOR. The goal is to incorporate community feedback, knowledge, and experience as much as possible to inform the decisions made by the Woodlands Staff in the CVA.

The following policies and guidelines have been identified for the Woodlands Staff to consider during the CVA process:

- Made-in-Manitoba Climate and Green Plan;
- Report of the Expert Advisory Council to the Minister of Sustainable Development;
- Canada in a Changing Climate: Regional Perspectives Report (Prairie Provinces);
- Climate Change and Sustainable Forest Management in Canada: A Guidebook for Assessing Vulnerability and Mainstreaming Adaptation into Decision Making;
- Pan-Canadian Framework Third Annual Synthesis Report;
- A Healthy Environment and a Healthy Economy; and
- Adapting to the impacts of Climate Change in Canada: An Update on the National Adaptation Strategy.

The first step that the Woodlands Staff will take in the CVA is to create a problem statement explicit to climate change and specify the challenge and purpose of the assessment.

The second step is to tell the current and future climate story by compiling and analyzing existing historical and future climate data from the Government of Manitoba and/or the Prairie Climate Centre.¹⁸ Climate variables will be chosen based on their availability, ability to describe climate and weather patterns, comparability between historical and future trends, and relationship with forestry operations and management. No new climate data will be created for the CVA. If possible and effective, climate data will be related to the three major ecoregions that exist in FML 2. Current and future forest conditions will be inferred based on the described climate trends, no further modelling or analysis will be completed for the FMP.

To proactively consider a worst-case scenario and better understand the full potential impacts of climate change, the future climate projection used for the CVA will be the Representative Concentration Pathway (RCP) developed by the Intergovernmental Panel on Climate Change (IPCC) of RCP 8.5 (a high carbon emission scenario, representing the upper bound of predicted carbon emission).

¹⁷ J.E. Edwards, et al. (2015). Canadian Council of Forest Ministers' Climate Change and Sustainable Forest Management in Canada: Guidebook for Assessing Vulnerability and Mainstreaming Adaptation into Decision Making. Available online [here](#).

¹⁸ The [Prairie Climate Centre](#) through the University of Winnipeg has developed [The Climate Atlas of Canada](#) where climate data is publicly available to support adaptation and mitigation.

After reviewing the climate data, engagement and a Woodlands Staff workshop will be held to:

- 1) Identify instances of extreme weather events/climate variability that occurred in the past;
- 2) Understand how climate has influenced current management practices;
- 3) List what adaptations already exist; and
- 4) Brainstorm potential positive and negative forest impacts¹⁹ for the future climate scenario.

Vulnerability Assessment

Based on the potential current and future climate change impacts to sustainable forest management, a workshop will be held with the Woodlands Staff facilitating discussions to identify where the NFM forest management system is vulnerable to climate change (adaptation is needed), and where opportunities for positive impacts could occur (enhanced by adaptation).

Each impact will be ranked based on the potential effect (exposure and sensitivity) on the system and whether the system is resilient²⁰ and has the adaptive capacity²¹ to cope with the impact. Uncertainties²² and knowledge gaps are considered vulnerabilities. The vulnerability rankings will be subjective and based on the information and knowledge available (including engagement feedback) to the Woodlands Staff at that time.

Once the climate change impacts have been ranked based on vulnerability, the Woodlands Staff will narrow down which impacts are most vulnerable and require adaptations. The vulnerability assessment allows the Woodlands Staff to focus on impacts where they can influence the most change.

Adaptation Options

The first step will be to brainstorm, through another Woodlands Staff workshop, adaptation options to climate change impacts. Adaptation options will be designed to reduce vulnerability or increase resiliency and capacity to respond to the climate change impact. Adaptation options can be strategic or operational and should address the gaps and weaknesses identified in the vulnerability assessment.

After the adaptation option brainstorming session, the options will be evaluated and ranked based on their importance in achieving sustainable forest management objectives and their feasibility in implementation. Those options considered important will be identified as robust, no-regret, win-win, and must-do options. Adaptations that are not considered important at the time will be considered potential options in future assessments. The outcome of this evaluation will be a prioritized list of adaptation options that can be considered for incorporation into the FMP and other forest systems and procedures.

¹⁹ Impacts – Effects on natural and human systems by physical events, disasters and climate change.

²⁰ Resilience – The ability of a system and its component parts to anticipate, absorb, accommodate, recover or reorganize from disturbances in a timely and efficient manner while retaining the same basic structure and ways of functioning. The capacity for self-organization and the capacity to adapt to stress and change.

²¹ Adaptive Capacity – The ability of a system to adjust to climate change (including variability and extremes) to reduce adverse impacts, moderate potential damages (moderate impacts to reduce vulnerability), take advantage of beneficial opportunities, or cope with the consequences. It includes the strengths, weaknesses, attributes and resources available to prepare and respond.

²² Uncertainty – Degree to which a value or relationship is unknown. Can result from a lack of information or disagreement about what is known or knowable, can originate from many sources (e.g. quantifiable data errors, ambiguously defined terms, uncertain projections of human behaviour), and can be quantitative or qualitative statements.

Implement and Monitor Adaptation

A plan to mainstream²³ and include these climate change adaptations into existing or new systems, and day-to-day decision-making and management will be developed. The monitoring system set up for the FMP and other forest systems and procedures will also address the climate change adaptations with the goal of continuous improvement.

Although climate change will be considered throughout the FMP process, the CVA will be a separate chapter in the FMP. This will provide an opportunity for review from the FMP Planning Team and Communities before approval.

FMP COMMUNICATIONS

Background and Objective for FMP Communication

The Terms of Reference require the creation of a Communication Plan. As the FMP is a complex project, with the development of the FMP spanning from Jan 1, 2020 to Dec 31, 2026, it is necessary to consider processes for both internal and external communication. Vital to the FMP development is ensuring that external groups (Indigenous communities, stakeholders and the public) have a process or processes that allow for engagement and participation, distribution of appropriate information, opportunities for feedback, questions and comments about the FMP process and the FMP itself, and integration of appropriate external information as a result. This Communication Plan should guide internal and external FMP development processes and bring clarity to the proponent, the Government, and the public groups about who is responsible for what elements of communication at what times in the process.

Internal Communication

FMP Planning Team

Regular FMP Planning Team meetings will be scheduled (monthly) to continuously document progress against timelines, deliverables, issues and key next steps. Reported progress or issues from Sub-Committee representatives will provide transparent and collaborative internal communication within the FMP teams. These regular FMP Planning Team meetings will be conducted as appropriate including virtually and in-person. Additional meetings will be scheduled as required during the development of the plan.

Sub-Committees

Sub-committees will meet as required during the development of the plan. Sub-committees are required to report back to the Planning Team on their findings or work in accordance with the timelines agreed upon at the Planning Team level. Sub-committees are expected to return with an agreed upon, single voice/opinion/piece of work at the Planning Team level to avoid lost time of the larger group. Where a sub-committee has differing opinion within the group and is unable to arrive at a unified position, they should engage the Director of Forestry and Peatlands and the General Manager for guidance.

Chapter Approval in Principle

Manitoba Natural Resources and Northern Development (NRND) and NFMC agree to a Chapter Approval in Principle process. Chapters of the FMP, or portions thereof, would be submitted to Forestry and Peatlands Branch for a full Technical Advisory Committee (TAC) review and comments as completed by NFMC. These comments would be forwarded to NFMC for response. Chapters of the FMP, or portions/sections will also be provided to Communities based on Community Engagement Plans for comment prior to submission. A chapter being “Approved in Principle”:

²³ Mainstreaming – Integrating climate change considerations into existing decision-making, planning or operational processes on an ongoing basis (becomes part of ‘business as usual’). This includes all aspects of forest management policies, programs, plans and practices. Mainstreaming supports the ability to account for trade-offs, address uncertainty, and manage adaptively by promoting a continuous process of selecting and implementing options, evaluating and modifying where necessary.

- Is an indication that no significant concern or areas of work remain within the Chapter and that the planning team and TAC support it's content;
- Does not prevent the proponent or the regulator from suggesting or considering change at the FMP final compilation stage; and,
- However, any change should not be significant by virtue of the Chapter having been previously approved in principle.

Once the full plan is submitted, Forestry branch will follow the Manitoba's Twenty-Year Forest Management Plan Guideline, (2021) in coordinating a review.

Dispute Resolution

The Planning Team may encounter an impasse on courses of action. In the event of an impasse, a two-stage process will be used. Stage one mediation consists of a discussion between the NFMC General Manager and the Director of Forestry and Peatlands. Ideally, the impasse would be broken by the General Manager and Director of Forestry and Peatlands agreeing upon a solution. Stage two mediation would be enacted only if stage one mediation fails. Stage two mediation would consist of the General Manager and the Director of Forestry and Peatlands agreeing upon a third-party consultant. Both parties agree that the findings of the third party will be accepted as the appropriate resolution to the impasse. The third-party consultant would provide a solution that would break the impasse, allowing the Forest Management Plan efforts to continue.

External Communication Plan

The Planning Team endeavors to provide FMP development opportunities to the public. The approach to participation and communication is varied depending on each rightsholder and stakeholder. A collaborative approach to development by the proponent, MB Government, rightsholders, and stakeholders is a desirable target.

Indigenous Community Engagement Plans

Indigenous Communities as Rightsholders

NFMC's engagement processes with Indigenous Communities reflect the principals and standards of the United Nations Declaration on the Rights of Indigenous People (UNDRIP). Robust community engagement and listening with Indigenous communities as rightsholders is essential for true collaboration. Inclusion of Indigenous knowledge (IK) and Traditional Land Uses information will be used when available within the FMP. This includes spatial data from land use plans and qualitative data within the development of the VOITs.

The proponent is committed to providing the opportunity for Indigenous Communities to develop engagement plans appropriate to their community. Nekoité communities have representation on the FMP Planning Team as part of the proponent team. The Nekoité liaison and the Nekoité community representatives will assist in facilitating the collaborative development and execution of plans during the FMP process for the Nekoité communities. The proponent will also formally invite non-Nekoité Indigenous Communities to identify a point of contact for the duration of the FMP development.

General Community Engagement Plan

Although each plan may be unique, the following outline provides a general overview of the process. Plans will endeavor to identify groups within the community to contact, as well as outline information and sharing sessions to align with FMP plan development milestones and tasks.

FMP Engagement Milestones

Meetings and events will be determined by proponent and communities as milestones are reached during FMP development and in accordance to the individual engagement plans. As an example, for each of the milestones identified below we envision:

- providing relevant background information on each engagement milestone as it approaches,
 - following-up with communities to hear comments and collect input, and
 - subsequently presenting the updated information prior to moving on to the next engagement milestone
1. Community Information Sessions
 - Pre-planning overview and FMP process information sharing
 2. FMP Objectives
 - Development and review of draft objectives
 3. FMP Modeling Inputs
 - Review and community input
 4. Strategic Timber Supply Analysis to support FMP
 - Review of targets and strategies for analysis
 5. Scenario Results Review and Selection of Preferred Scenario
 - Review and discussion of relative trade-offs
 - Determination of Preferred Forest Management Scenario (PFMS)
 6. Spatial Harvest Schedule and Habitat Assessment
 - Review and discussion of 20 year spatial harvest schedule
 - Habitat assessments for selected species using PFMS
 7. FMP Draft Review
 - Review and comment on draft FMP chapters completed prior to submission

Stakeholder Engagement Plans

Stakeholder Groups

The proponent is committed to providing relevant information on the FMP and receiving feedback from stakeholders. Stakeholder groups on FML 2 will include municipalities and local governments, as well as resource user groups. The proponent will engage with stakeholders at significant milestones for the duration of the FMP development.

General Stakeholder Engagement Plans

1. Seek invitation to address local governments and resource user groups to provide an overview of the FMP process, timeframe for development, and to establish a point of contact.
2. Provide information packages and summary information to local governments and resource user groups through point of contact at significant plan development milestones:
 - FMP objectives
 - Selection of Preferred Forest Management Scenario and 20 year SHS
 - FMP completion and review opportunities
3. Address local governments and resource user groups to provide additional information and collect comments when requested.
4. Maintain a communication log of events, information shared and comments from local governments and resource user groups for documentation in FMP Chapter 4 – Communication.

Public Advisory Group

Sustainable Forest Management Committee/Forest Resource Advisory Committee (SFMC/FRAC)

A Public Advisory Committee exists to serve as an ongoing forum where representatives from across the FMLA can share knowledge, interests, views, values and concerns with respect to forest management activities. This committee includes representatives from a broad cross-section of stakeholders across the FMLA and is currently known as the Sustainable Forest Management Committee (SFMC). Membership is open to Indigenous Peoples, communities, general public and organizations. The proponent commits to providing FMP development updates and information to the SFMC when they are scheduled to meet and hearing comments and concerns related to the development of the 20-year FMP. The proponent will work with the existing point of contact between the SFMC and NFMC, as well as currently existing meeting schedules for the duration of the FMP development.

General Public Advisory Engagement Plan

1. Provide FMP development updates to the SFMC at regularly scheduled meetings (quarterly).
2. Proponent will ensure a representative is in attendance at SFMC meetings to answer questions and collect comments to address.
3. Provide information packages and summary information to SFMC members through point of contact at significant plan development milestones:
 - FMP Objectives
 - Selection of the PFMS and 20-year SHS
 - FMP completion and review opportunities
4. Maintain a communication log of events, information shared and comments from SFMC members for documentation in Communication chapter.

Communication Tools

Formal Letters

Formal letters will be mailed to known point of contacts for communities, local governments and other resource users. These letters will be mailed early in the FMP development process to ensure all rightsholders and stakeholders are aware of the development process, contact information is shared and an invitation to engage further is extended. Formal letters are a communication tool that may be used throughout the process at various times to ensure consistent messaging to all rightsholders and stakeholders or inform of significant milestone achievements.

Information Packages

It is the intent of the proponent, with guidance from the FMP Planning Team, to develop a summary document to outline the FMP Process, phases of development, and opportunities for comment, as well as contact information for additional information and resources. This summary document will be developed by the Planning Team with the objective of simplifying the information contained in the Terms of Reference and Manitoba's 20-Year Forest Management Plan Guideline. The intent is to distribute this summary information to takeholders, stakeholder groups and Indigenous Communities early in the FMP development process to educate and engage at the earliest stage of the FMP. This summary information package is in addition to any formal engagement letters to all Communities on the FML.

Meetings

The Proponent will host FMP development sessions for stakeholders and rightsholders throughout the course of the project. These sessions will be either in person or virtual depending on the state of the pandemic and restrictions at the time. Advertising will take place locally in advance, and local governments will be approached

for approval to conduct the session. Timing and frequency of meetings for stakeholder groups and communities will be determined through the Community Engagement Plans or achievement of engagement milestones.

Social Media/Online Information

The proponent will use social media if deemed appropriate and useful to provide information to the public regarding information, opportunities for participation, and progress of the FMP development. General information regarding the development of the FMP will be available to the public on the NFMC website and will be updated periodically throughout the development of the plan to provide up to date information. Contact information for FMP inquiries will be provided on the website.

Communication History

Information distributed, feedback and comments collected as well as scheduled events and summary meeting notes will be recorded within a communication log and form a component of the FMP focused on Communication. The FMP is a public document and as such information recorded and summarized will be general to protect individual and community privacy.

FMP Development Rightsholders, Stakeholders, and Communities

The following groups were identified in the communication plan development and will be engaged throughout the duration of the FMP development as outlined above based on their willingness to engage.

Group	Members/Communities
Nekoté Limited Partnership Communities	Chemawawin Cree Nation Mathias Colomb Cree Nation Misipawistik Cree Nation Mosakahiken Cree Nation Opaskwayak Cree Nation Sapotaweyak Cree Nation Wuskwi Sipiik First Nation
Other Communities	Cormorant Flin Flon Nisichawayasihk Cree Nation Norway House Cree Nation Pikwitonei Pimicikamak Cree Nation RM of Kelsey (Carrot Valley, Rahl’s Island, Wanless, Cranberry Portage) Sherridon Snow Lake The Pas Thicket Portage Thompson Wabowden
Resource User Groups	Kelsey Conservation District Manitoba Hydro Manitoba Lodge and Outfitters Association Manitoba Metis Federation Manitoba Trappers Association Manitoba Wildlife Federation

Group	Members/Communities
	Mining Association of Manitoba Inc. Quota Holders and Third-Party Operations (Arthur Anderson, Wayne Pokrant, Gary Mosiondz, Spruce Products Ltd.) SNOMAN Inc.
NFMC/CKP Public Advisory Group	Forest Resource Advisory Committee/Sustainable Forest Management Committee (SFMC)
Education/Research	Ducks Unlimited Canada University College of the North

Crown Indigenous Consultation

Manitoba will be undertaking a Crown-Indigenous consultation process with Indigenous communities for the Nisokapawino Forestry Management Corporation (NFMC) 20-Year Forest Management Plan (FMP). This will be a coordinated approach with Manitoba and NFMC to ensure that community's information is considered during development of the FMP. Manitoba will be initiating the consultation process by sending initial information packages to communities in spring/summer 2022.

FMP Contact and Additional Information Requests

The proponent (NFMC and CKP) will be engaging with groups and communities listed above to develop the plan, to solicit feedback on the development of the plan based on the schedule of engagement milestones above, to communicate updates on the planning process and management objectives, and to address comments received from information sessions, letters and informal communication. Efforts will be made to coordinate and integrate timing of proponent engagement activities with the Manitoba government where possible.

For information on the FMP process and opportunities to participate contact:

Andrew Forward
General Manager
NFMC
Andrew.forward@niso.ca
204 623 8510

For information on Section 35 Consultation by the Government of Manitoba Contact:

Evan Finkler
Indigenous Relations Forester
Natural Resources and Indigenous Futures
Evan.Finkler@gov.mb.ca
204 792 4142

For information on Manitoba legislation, policy, regulation, or guidelines contact:

Jane Epp
Planning and Practices Forester
Natural Resources and Indigenous Futures
Jane.Epp@gov.mb.ca
204 794 8545

For more information on the Public Advisory Group/Sustainable Forest Management Committee (SFMC) contact:
 Jeanne Besaw
 Silviculture Forester
 NFMC
Jeanne.besaw@niso.ca
 204 620 8453

MILESTONES AND PLAN DEVELOPMENT TIMELINE

The FMP development schedule is driven by the Engagement Milestones outlined in the Communication Plan to ensure that information shared during engagement can be incorporated at all stages of plan development. Review and approval checks have been included throughout the plan development schedule.

The following items have been identified as important information milestones in the development of the FMP (Table 5). These milestones have been listed in the Terms of Reference to acknowledge that achieving the current approval and review schedule (Table 2) is dependent on the development and delivery of these key items. This information provides background required at Engagement Milestones and decisions points in the process. These dates, along with Engagement progress, will provide the Planning Team with milestones in which adjustments to the schedule and activities can be made where necessary. If the information is not available during the development of the FMP the Planning Team will adjust to best adapt to deliver the FMP when required.

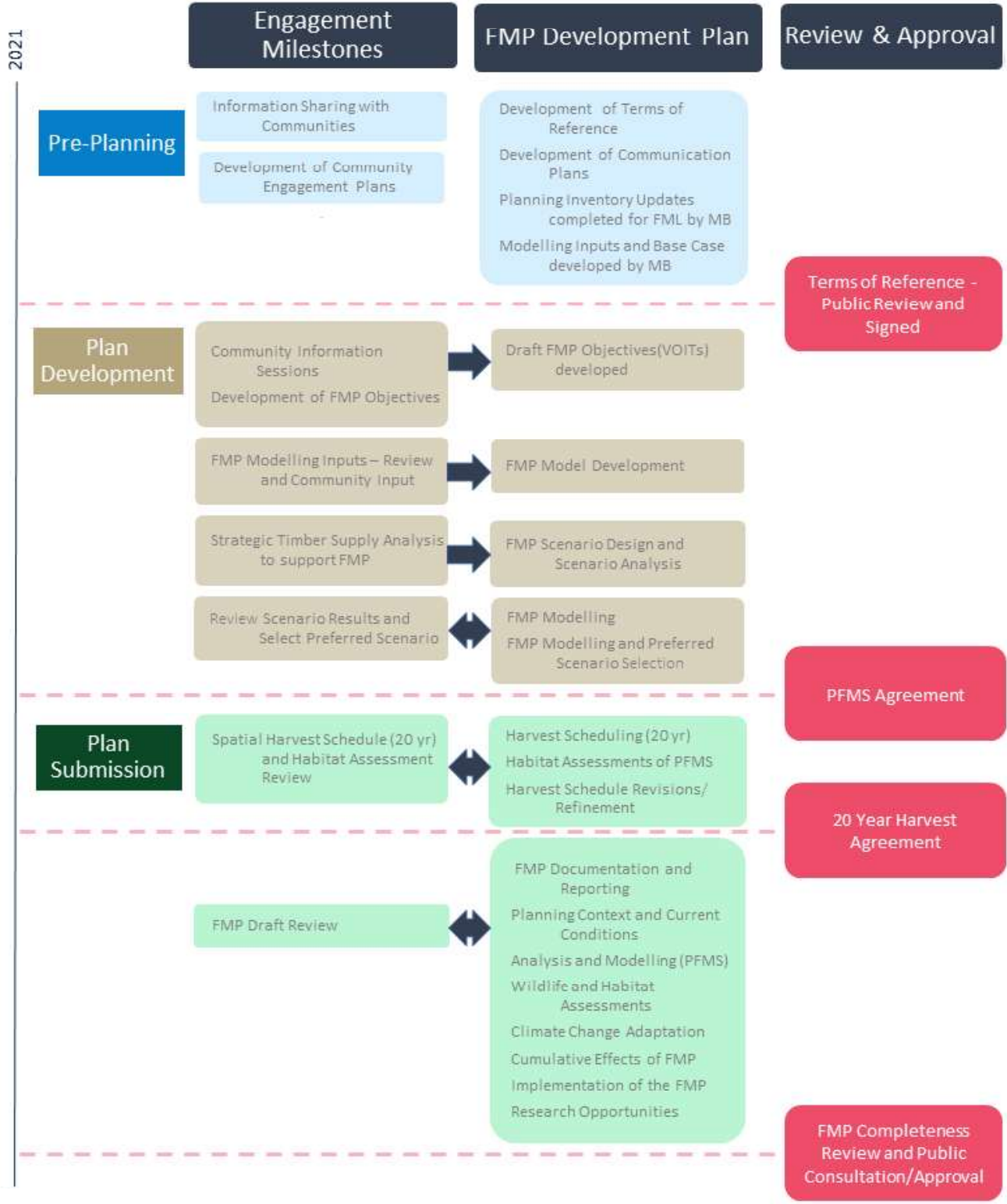
Table 5. Information milestones for FML 2 FMP development schedule.

Information	Description	Source	Date
Data Requirements	FML 2 Planning Inventory including parks	MB NRIF	December 2021
	Model inputs developed for use in Base Case and FMP Model	MB NRIF	December 2021
Policy Direction & Information	Natural Range of Variation (NRV) development complete prior to FMP Model development	MB NRIF	April 2022
	Caribou habitat direction complete prior to FMP Model development	MB NRIF	April 2022
FMP Analysis & Development	Identification of Preferred Management Scenario (PFMS)	NFMC	January 2024
	Submit completed FMP with Final Chapters	NFMC	June 2025

Revision 5.0: At the time of FMP development and revisions to the Terms of Reference a finalized Caribou Habitat Protection Plan or Provincial Action Plan were not available, as well as the Natural Range of Variation (NRV) information. The information and policy direction milestones listed in the table were not available prior to model development. However, information regarding habitat elements, assessments, and landscape direction were included in the FMP development that would be consistent with direction for caribou habitat protection and ecosystem-based management for landscape age classes in the region.

The FMP Analysis and Development milestone dates were updated to include changes to the duration of the FMP upon receiving approval of 2-year extension to the FMLA (updated to state 2027 FMP with associated duration and milestones).

FML2 Forest Management Plan Schedule



GLOSSARY OF TERMS

Annual Allowable Cut (AAC)

The annual allowable cut is the volume of wood per year that may be harvested in the Forest Management Licence area and is expressed in cubic metres.

Base Case

A Base Case Report documents the wood supply in detail for the current forest management practice in the study area, and forms the reference point for further analysis. The Base Case defines the landbase net down, strata, yield curves, succession pathway and its management objectives with non-spatial and spatial constraints. These constraints include harvest volume control and maintenance of ecological values like old forests and wildlife habitat.

Biodiversity

Biodiversity is the variety and variability within and between living organisms from all sources, such as terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are a part.

Forest Land Inventory (FLI)

An ecologically-based forest inventory designed to accurately represent the location and characteristics of the forest resource. An ecosystem field sampling (volume sampling) program was undertaken in conjunction with the development of this updated inventory process to help characterize the forest resource in terms of total and merchantable timber volumes and to help identify ecological characteristics of sites.

Forest Management Plan

Landscape level plan that provides strategic direction for forest resource activities on crownlands, within a license area, over a 20 year period.

Forest Resource Inventory (FRI)

A forest resource inventory is an older forest inventory that represents the location and characteristics of the forest resources. Any forest inventory is the systematic collection of data and forest information for assessment or analysis. Forest resource inventories characterize the forest based on information collected from aerial photography and field sampling information. The inventory information (either FRI or FLI) is the primary information source for forest management and is provided as a spatial data that can be viewed/analyzed in a geographic information system (GIS).

Indicator Species

An animal or plant species that can be used to infer conditions in a particular habitat. Also referred to as regionally important or focal species in this FMP.

Landbase / Netdown (spatial)

Additional spatial information is merged with the forest inventory information (FRI/FLI) to further classify the forest lands within the study area (FML/FMU). This process is referred to as a 'netdown'. Administrative boundaries, riparian areas, parks or deferral areas are not identified in a forest inventory but are essential in forest management planning and decision making for the analysis area. An inventory contains the raw forest information (type, age, location, etc). Additional spatial information is combined with the inventory to identify areas excluded from forestry activities, areas with unique considerations for management or areas available for forest management and harvest activities. The result of the 'netdown' is generally referred to as the Land-base in wood supply analysis and forest management planning. The word landbase is often used to describe the geographical extent of the planning area – in this case the land within the FML 2 boundary may be referred to as the landbase within the Forest management Plan.

Model

A model is an idealized representation of reality developed to describe, analyze or understand the behaviour of some aspect of it. Modeling is a mathematical representation of relationships under study. Modeling involves the quest to find a subset of variables and a function between them that predicts one or more dependent variables.

Natural Range of Variation

Natural range of variation refers to the spectrum of natural conditions possible in ecosystem structure, composition, and function, when considering both temporal and spatial scales. (CBFA, 2016)

Non-Productive Forest

In the context of forest management planning, non-productive forest refers to a forested area that does not contribute significantly to commercial timber production due to factors such as poor growth conditions, low stocking, or non-merchantable species composition (most often, a combination of these and other factors).

Preferred Management Scenario

This is a set of compatible and integrated resource management objectives and strategies that are selected to guide plan implementation.

Proponent

A proponent is a Forest Management Licence (FML) holder, who is required to have a forest management plan as per their FML agreement.

Roads

Primary and secondary roads are defined in Manitoba's Forestry Road Guideline as:

Primary Road: Permanent, all weather, allowing for general access through the forest

Secondary Road: Used for three or more years, all weather, providing access to and within operating areas

Seral Stage

This is the series of plant community conditions that develop during ecological succession from bare ground (or major disturbances) to the climax stage (Dunster, 1996).

Silviculture

Silviculture is the theory and practice of controlling the establishment, composition, structure and growth of forests to achieve specified management objectives.

Strata

Strata - plural, stratum - singular. These are sub-divisions of forest types (*e.g.* aspen-hazel on clay soil stratum; or jack pine-blueberry on sand stratum).

Sustainable Forest Management (SFM)

This describes management that maintains and enhances the long-term health of forest ecosystems for the benefit of all living things while providing environmental, economic, social and cultural opportunities for present and future generations (CCFM 2000).

Technical Advisory Committee (TAC)

The Technical Advisory Committee (TAC) consists of provincial and federal government specialists who provide technical expertise.

Terms of Reference (ToR)

The Terms of Reference is a signed agreement by the proponent and government on the localized, specific details to be included when developing the FMP for a specific area.

VOITs – Values, Objectives, Indicators, and Targets

- The **values** must consider provincial legislation and policies, company policies and commitments, forest certification requirements, and public and cultural values.
- Management **objectives** are to be developed to address the values. Objectives must be measurable, achievable and used for the longer term. These management objectives form the core of the FMP. All other information in the FMP will support these objectives and how they will be achieved.
- **Indicators** must be a measure of the state or condition of the value.
- **Targets** must be the desired future state or condition of the indicator that would meet the objective for the value.

Wood Supply

Wood supply is the quantity of timber available for harvest over time. Wood supply is dynamic, not only because trees naturally grow and die, but also because conditions of the environmental, social and economic factors that affect the availability of trees for harvest change through time.

Wood Supply Analysis

Wood supply analysis is the process of assessing and predicting the current and future timber supply for a geographic area. Therefore, harvest levels from wood supply analysis fully depend on a series of key ecological, economic and social factors, such as:

- biological conservation
- forest development
- technological change
- local communities
- employment opportunities

It is an assessment of future timber supplies over long planning horizons (200 years) that uses wood supply models.

Yield Curves

Yield curves represent forest growth in wood supply models and analysis. A yield curve represents the sum of annual changes in growth over time. Yield curves can be used to determine the amount of net volume (cubic metres) of wood present in the forest at any given time. Yield curves are developed for each STRATA (hardwood types and softwood types will grow differently for example). Yield curves are created based on sample plot information collected within the forests of Manitoba (measuring trees in the same plot location for a number of years to record actual growth and yield). Yield curves are a predicted value and are based on average stand conditions in the forest.

TERMS OF REFERENCE SIGNATURES

If the foregoing accurately reflects your understanding of this Terms of Reference, please confirm your agreement by signing in the space provided below.

Nisokapawino Forestry Management Corporation

Per: 
Andrew Forward
General Manager

June 27, 2025
Date:

Manitoba Natural Resources and Indigenous Futures Forestry and Peatlands Branch

Per: _____
Brad Epp
Director

Date:

Canadian Kraft Paper Industries Ltd.

Per: 
Wally Quiring
Woodlands Manager

June 27, 2025
Date:

Manitoba Environment and Climate Change Environmental Approvals Branch

Per: _____
Agnes Wittmann
Director

Date:

Appendix U – Engagement Activity Details

U.1. Engagement activity for details for rightsholders.

Rightsholders				
Milestone/Topic	When	How	Activity Details	Materials
Community Information Sessions	Began Spring 2021	In-person and virtual meetings with community contacts and Land Committees.	Provided an introduction to the forest management plan development process, Terms of Reference, Communication Plan, and Engagement Plans.	Presentation: 01_FMP_CommunityInformation_Overview
Engagement Plan Development	Began Fall 2021	Communicating with forest management plan community contacts via phone, email, and meetings.	Worked with Indigenous communities to develop individualized engagement plans.	Draft engagement plans.
Forest Management Plan Objectives	Began Fall 2022	In-person meetings with committees and communities.	Provided an overview of values and concerns, tools to address concerns, and objectives. Provided an overview of cumulative effects assessment. Gathered values and concerns.	CCFM Framework for SFM Criteria used to categorize values and concerns raised. Presentation: 02_FMP_Community_Values_and_Objectives
Forest Management Plan Modelling Inputs	Began Summer 2023	In-person and virtual meetings with committees and communities.	Provided an overview of the modelling and analysis process of the forest management plan and examples of how some values and concerns are captured strategically at this development stage (e.g., – water, moose, carbon, caribou, herbicide).	Presentations: 02_FMP_Modeling_Part_1 03_FMP_Modeling_Part_2 FML2_FMP_Wildlife_MooseObjectivesOverview 06_FMP_Herbicide
Timber Supply Analysis, Scenario Results Review and Selection of Preferred Scenario	Began Spring 2024	In-person and virtual meetings with committees and rightsholder communities and contacts.	Reviewed the preferred scenario selection process, objectives, and results.	FMP SHS Community Presentation
Spatial Harvest Schedule and Habitat Assessment	Began Spring 2024	In-person and virtual meetings with committees and rightsholder communities and contacts.	Provided an overview of potential spatial harvest schedule along with key habitat assessment maps.	FMP SHS Community Presentation Maps of the proposed potential spatial harvest schedule. Maps of moose habitat at plan start and end.
Forest Management Plan Draft Review	Began Winter 2025	In-person meetings or digital communications with forest management plan community contacts.	Reviewed how to navigate the components of the draft plan (Parts 1, 2 and 3). Provided examples of how a specific value could be addressed in multiple sections of the plan.	07_FMP_Draft_Review_Overview

2027-2046 FML 2 Forest Management Plan– Appendix U – Engagement Activity Details

U.2. Engagement activity for details for stakeholders.

Stakeholders				
Milestone/Topic	When	How	Activity Details	Materials
Forest Management Plan Objectives	Began Fall 2022	Open house public meetings.	Provided an introduction to the forest management plan development process. Provided an overview of values, concerns, and objectives. Provided an overview of cumulative effects assessment. Gathered values and concerns.	Presentations: 01_FMP_StakeholderInformation_Overview 02_FMP_StakeholderInformation_ConcernsValues CCFM SFM Criteria used to categorize values and concerns raised.
Strategic Timber Supply, Scenario Results Review and Selection of Preferred Scenario; Spatial Harvest Schedule and Habitat Assessment	Began Spring 2024	Open house public meetings.	Introduction of strategic versus operational planning. Reviewed the preferred scenario selection process, objectives, and results. Provided an overview of potential spatial harvest schedule.	Presentation: 20-Year Forest Management Plan Objectives, Potential Spatial Harvest, and Implementation. 07_FMP_Objectives_Overview_HabitatScenario
Forest Management Plan Draft Review	Began Summer 2025	Formal letters.		

U.3. Engagement activity for details for the public advisory group.

Public Advisory Group – Sustainable Forest Management Committee				
Milestone/Topic	When	How	Activity Details	Materials
Pre-Planning – Terms of Reference	Winter 2021	Virtual meeting.	Time was allotted during recurring quarterly meeting to discuss and present on the draft Terms of Reference.	Current draft copy of the developing Terms of Reference.
Forest Management Plan Overview	Spring 2021	Presentation given virtually at in-person quarterly meeting.	Time was allotted during recurring quarterly meeting to discuss and present forest management plan overview.	FMP School Presentation Series 01_FMP_Overview_SFMC
Forest Management Plan Modelling Inputs; Strategic Timber Supply Analysis	Fall 2021	Presentation given virtually at in-person quarterly meeting.	Time was allotted during recurring quarterly meeting to discuss and present first half of a forest management plan modelling overview.	FMP School Presentation Series 02_FMP_Modeling_Part_1
Forest Management Plan Modelling Inputs; Strategic Timber Supply Analysis	Winter 2021	Presentation given virtually at in-person quarterly meeting.	Time was allotted during recurring quarterly meeting to discuss and present second half of a forest management plan modelling overview.	FMP School Presentation Series 03_FMP_Modeling_Part_2

2027-2046 FML 2 Forest Management Plan– Appendix U – Engagement Activity Details

Public Advisory Group – Sustainable Forest Management Committee				
Milestone/Topic	When	How	Activity Details	Materials
Implementation	Winter 2022	Presentation given virtually at in-person quarterly meeting.	Time was allotted during recurring quarterly meeting to discuss and present on implementation and monitoring.	FMP School Presentation Series 05_FMP_Implementation
Cumulative Effects and Climate Vulnerability Assessments	Spring 2022	Presentation given virtually at in-person quarterly meeting.	Time was allotted during recurring quarterly meeting to discuss and present cumulative effects and climate vulnerability assessments.	Presentation: 01_FMP_SFMC_CEA-CVA_Overview_20220428
Forest Management Plan Objectives	Fall 2022.	Presentation given virtually at in-person quarterly meeting.	Time was allotted during recurring quarterly meeting to discuss and present on plan values and objectives.	Presentation: 02_FMP_SFMC_Values_and_Objectives_20220915
Forest Management Plan Objectives; Gathering Values and Concerns Workshop	Winter 2022	Series of presentations given virtually at in-person quarterly meeting.	Quarterly meeting was dedicated to discussion of and presentations related to objectives, including carbon and natural ranges of variation.	Brainstorm Workshop – Group discussion to gather values and concerns based on CCFM Framework for SFM Criteria. Presentations: 02_FMP_SFMC_Values_and_Objectives_CARBON 02_FMP_SFMC_Values_and_Objectives_MODEL 02_FMP_SFMC_Values_and_Objectives_NRV_CR
Forest Management Plan Objectives	Winter 2023	Presentation given virtually at in-person quarterly meeting.	Time was allotted during recurring quarterly meeting to follow up on the information provided and feedback on what was heard during the brainstorm workshop to gather values and concerns.	Presentation: 02_FMP_SFMC_Values_and_Objectives_FOLLOWUP
Forest Management Plan Objectives	Spring 2023	Presentation given virtually at in-person quarterly meeting.	Time was allotted during recurring quarterly meeting to discuss and present on how gathered values and concerns from the SFMC were addressed or implemented in the forest management plan.	Presentation: 04_FMP_SFMC_Values_Concerns_Feedback
Scenario Results Review and Selection of Preferred Scenario	Fall 2023	Presentation given virtually at in-person quarterly meeting.	Time was allotted during recurring quarterly meeting to give a presentation on the preferred scenario selection process and results.	Presentation: 05_FMP_SFMC_PFMS_Process

2027-2046 FML 2 Forest Management Plan– Appendix U – Engagement Activity Details

Public Advisory Group – Sustainable Forest Management Committee				
Milestone/Topic	When	How	Activity Details	Materials
Forest Management Plan Objectives	Winter 2023	Presentation given virtually at in-person quarterly meeting.	Time was allotted during recurring quarterly meeting to give a presentation on moose and caribou-specific plan objectives.	Presentation: FML2_FMP_Wildlife_MooseObjectivesOverview
Scenario Results Review and Selection of Preferred Scenario and Spatial Harvest Schedule and Habitat Assessment	Spring 2024	Series of presentations given virtually at in-person quarterly meeting.	Quarterly meeting was dedicated to discussion and presentation of material related to the selected preferred scenario and proposed spatial harvest schedule. Further presentations were given on moose and caribou.	Presentations: 06_FMP_Objectives_Overview_HabitatScenario 06_FMP_SFMC_Caribou 06_FMP_SFMC_Moose
Forest Management Plan Draft Review	Fall 2024	Presentation given virtually at in-person quarterly meeting.	Time was allotted during recurring quarterly meeting to give provide an overview of the draft forest management plan.	Presentation: 07_FMP_Draft_Review_Overview

U.4. Details for formal engagement letters.

Formal Letters		
Milestone/Topic	Date	Content
Pre-Planning	Winter 2021/22	Introduction of the forest management plan development project. Engagement will occur throughout the process to answer questions and gather feedback. Engagement sessions will begin in 2022. A Terms of Reference will be drafted and posted to the Manitoba Public Registry for a public comment period. Invitation to reach out directly for more information.
Pre-Planning	Spring 2022	The forest management plan Planning Team is made up of representatives from NFMC, Nekoé communities, Canadian Kraft Paper Industries Ltd. and the Province of Manitoba. The draft Terms of Reference will be available on the Public Registry for review and feedback to the Province – link provided as well as contact information for submitting feedback to the Province. Once the Terms of Reference has been approved, next steps will be to engage with rightsholders and stakeholders. Invitation to reach out directly for more information.
Pre-Planning	Summer 2022	The final Terms of Reference was signed June 2022. A virtual public information session was held in April of 2022 to provide an overview of the planning process. Information is shared regularly at our Sustainable Forest Management Committee meetings. NFMC website provides information about the forest management plan development process. Engagement is a priority of this plan, and we continue to reach out to rightsholders and stakeholders. Invitation to reach out directly for more information.
Pre-Planning	Fall 2022	We are in the process of updating the current forest condition information to have a good a starting point for the plan. Then we'll be able to explore potential future forest conditions and what management activities could help achieve our sustainability objectives. Sustainability objectives provide our plan direction and aid in addressing concerns and values raised though engagement. Several community meetings have been scheduled to receive feedback on concerns and values. Invitation to reach out directly for more information.

2027-2046 FML 2 Forest Management Plan– Appendix U – Engagement Activity Details

Formal Letters		
Milestone/Topic	Date	Content
Forest Management Plan Objectives	Winter 2022/23	The first round of community meetings has begun where we collect values and concerns from rightsholders and stakeholders. We will review this feedback and find ways to incorporate it within the plan. The draft objectives of the forest management plan incorporate values such as watersheds, carbon, biodiversity, and habitat for moose and caribou. We will review them with rightsholders and stakeholders in another engagement session. Invitation to reach out directly for more information.
Forest Management Plan Objectives	Spring 2023	Description of what Part 1, 2 and 3 will comprise of. Part 2 is currently being developed as we develop the strategic objectives for the plan. These objectives help protect key values identified through engagement. Engagement is a priority in the development in this plan. Current timelines of plan submission – December 31, 2023, leaving only one year for engagement, thus an extension request for the Forest Management Licence Agreement will be made to the province. Invitation to reach out directly for more information.
Forest Management Plan Objectives/ Strategic Timber Supply Analysis	Summer 2023	The 2-year Forest Management Licence Agreement (FMLA) and Environment Act Licence (EAL) extension request was made to the Province. This extension was made to extend the deadline of the forest management plan submission date in order to have more time for engagement opportunities. Feedback from engagement helps develop strategic and operational objectives. The strategic objectives are used to analyse various potential forest management alternatives. We are working with the province to develop strategic caribou objectives within the forest management plan. Invitation to reach out directly for more information.
Forest Management Plan Objectives/ Strategic Timber Supply Analysis	Winter 2023/24	End of year progress report on the forest management plan: Submission of Part 1, extension request for the Forest Management Licence Agreement (FMLA) and Environment Act Licence (EAL), engagement with land committees and open house communities discussing concerns and values about forestry, development of the strategic objectives, and planning for future engagements. Invitation to reach out directly for more information.
Selection of Preferred Scenario/ Spatial Harvest Schedule and Habitat Assessment	Spring 2024	The preferred scenario and strategic direction for the forest management plan has been selected by the Planning Team. This plan will help guide the implementation of forestry activities and maintain sustainability objectives. The next round of community meetings will be occurring this spring to review the objectives and the proposed potential harvest areas. Invitation to reach out directly for more information.
Forest Management Plan Draft Review	Summer 2024	The final community meetings for the forest management plan occurred in spring where we reviewed the strategic direction of the plan. Feedback received during these engagement sessions is used to refine the plan where possible. Other sections of the plan will be finalized including the climate change adaptation plan, wildlife assessments, and future monitoring and research plans for habitat. Invitation to reach out directly for more information.
Forest Management Plan Draft Review	Winter 2024/25	Forest Management Licence Agreement (FMLA) and Environment Act Licence (EAL) extension request was approved and will expire December 2026. It will renew upon forest management plan approval of January 2027. The forest management plan draft is complete and is broken into three sections. Part 1 – Current Conditions, Part 2 – strategic direction and proposed future management activities, and Part 3 – Implementation. Nekoé communities were made aware that a draft review would be made available prior to submission. Invitation to reach out directly for more information.
Forest Management Plan Draft Review	Summer 2025	20-year Forest Management Plan draft will be submitted to the Province for a completeness check June 30, 2025. Letter outlined the remaining steps up to plan implementation in 2027 and the review process in the coming year. Three-month review by the Province for completeness, after which point NFMC will have up to three months to make inclusions should anything be found to be missing. Following completeness, the 20-year Forest Management Plan will be resubmitted to the Province. At this point, it will become available online through the Manitoba Public Registry for the public to review and provide comment. This review will be another 3-month period.



Natural Resources and Indigenous Futures
Natural Resource Stewardship/Forestry and Peatlands

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May 26, 2025

Andrew Forward
General Manager
Nisokapawino Forestry Management Corporation
P.O. Box 3726
The Pas, Manitoba R9A 1S3
andrew.forward@niso.ca

Dear Andrew,

The Forestry and Peatlands Branch has completed the base case wood supply analysis as part of the ongoing Forest Management Plan (FMP) development for Forest Management License 2 (FML2) area of Manitoba. The determination of the sustainable annual harvest levels (ASH), also referred to as the annual allowable cut (AAC), has been a combination of new modelling for some Forest Management Units (FMU's) and revised modeling for other FMU's within the license area)

FMU	Net Harvest Level	
	Softwood m ³ /yr	Hardwood m ³ /yr
50	26,809	1,189
53	103,990	10,405
58	131,910	11,744
59	93,488	9,805
67	379,371	30,294
68	62,206	4,865
69	222,012	26,783
800	19,712	2,145
801	389,422	43,221
802	135,517	15,138
Total	1,564,436	155,589

The Base Case volumes in the above table form the basis of the new sustainable harvest levels for each of the FMU's and comes into effective April 1, 2025. These Base Case determinations will remain in effect until a new Base Case is developed for the area or a Forest Management Plan preferred management scenario has been approved by the Province. While the base case harvest level information was provided during the Forest Management Planning process, this letter formalizes the communication.

The complete wood supply reports are available from our office and will be published shortly to the Forestry and Peatlands web site:

https://www.gov.mb.ca/nrnd/forest/forestry/files/mb_wood_supply_analysis_report_map.pdf.

If you have questions or concerns, please contact me directly by email at james.boyd2@gov.mb.ca or by phone (204) 330.7760.

Sincerely,

James Boyd
Manager, Inventory and Analysis

Enclosure(s):

c.
Brad Epp, Director
Jianwei Liu