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SOCIAL PERCEPTION OF ECOSYSTEM MANAGEMENT IN QUEBEC'S BLACK SPRUCE FOREST

Can large harvests emulating fire be acceptable to forest users, stakeholders and the uninformed public?

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Résumé

Comme ailleurs en Amérique du Nord, le Québec a pris le virage de l'aménagement forestier écosystémique, basé sur l'émulation des perturbations naturelles afin de diminuer l'impact de la récolte forestière sur les écosystèmes. En imitant les perturbations naturelles en sévérité, fréquence et répartition spatiale, l'aménagement écosystémique vise à garder l'écosystème forestier à l'intérieur de ses limites de variabilité naturelle. Dans la pessière noire à mousses, la principale perturbation naturelle étant le feu, l'aménagement écosystémique pour cet écosystème implique la réalisation de très grandes coupes de type totale. Toutefois, cette forme particulière d'aménagement écosystémique pourrait rencontrer des défis d'acceptabilité sociale en raison de la taille et du type des coupes en résultant puisque les grandes coupes à blanc sont très mal perçues par la population. Afin d'assurer la réussite de l'aménagement écosystémique pour cet écosystème et de répondre aux exigences de l'aménagement forestier durable, il importe d'en documenter l'acceptabilité sociale et au besoin, de le moduler afin de répondre aux valeurs de la population. Ce projet de recherche investigue la perception de l'aménagement écosystémique de la pessière noire qu'ont les utilisateurs du milieu forestier, les parties prenantes impliquées dans un processus de participation à la planification forestière et de gens non affiliés, de type grand public. Dans un premier temps, pour chacun de ces groupes, l'acceptabilité des paysages résultant de possibles traitements sylvicoles écosystémiques est documentée, sur le plan visuel à l'aide d'un sondage. Il en ressort que certains traitements de rétention variable atténuent efficacement les impacts visuels des agglomérations de coupes dans le moyen plan. Dans un deuxième temps, l'acceptabilité de la stratégie est explorée auprès des parties prenantes au processus de participation via des entretiens individuels. La stratégie s'est révélée assez accepta le, surtout en comparaison des options actuelles, quoique des modulations semblent nécessaires pour les territoires fauniques structurés. Finalement, la perception de la stratégie par des répondants de type grand public est investiguée au moyen de groupes de discussion. Les résultats démontrent que les répondants se sont appropriés les bases de l'aménagement écosystémique et ont identifié des balises afin de construire l'acceptabilité sociale de la stratégie en pessière.

Abstract

Quebec has recently embarked on the transition toward ecosystem management, which is la type of forest management that is based on the emulation of natural disturbances in order to decrease the impacts of timber harvesting on the ecosystem. By mimicking natural disturbances in severity, frequency and intensity, ecosystem management aims at keeping the ecosystem within the limits of its natural variability. In the black spruce forest, where the main natural disturbance is wildfire, ecosystem management is implemented in the form of extensive harvests in which all mature trees are cut. While this form of management has a strong environmental component, it faces social acceptability challenges given that people generally dislike large-scale clearcutting. Therefore, the long-term success of ecosystem management in the boreal black spruce forest will depend on the degree to which it can respond to and adapt to the population's values where required. The population maintains a wide range of relationships with this ecosystem and can be divided into three main groups: forest users, stakeholders involved in a participative planning process, and unaffiliated and uninformed members of the general public. This research project investigates the diverse perceptions of ecosystem management held by each of these three groups. Conducted as a survey, the first part of the study examined the visual acceptability of ecosystemic sylvicultural treatments, and found that certain variable retention treatments were considered to be able to mitigate the agglomerations' visual impacts in the middle ground. Then, the acceptability of ecosystem management strategy, as already implemented as a pilot project, is explored for the stakeholders by means of individual interviews. Here, ecosystem management, as a strategy for the black spruce forest, was well received, especially in comparison to the available alternatives and despite a high demand for adjustments in the case of controlled wildlife territories. Finally, the social perception of the ecosystem management strategy for unaffiliated and uninformed general public type people is explored through focus groups. Results show that participants were able to fully understand the theoretical basis of ecosystem management and to identify milestones enabling to build the strategy's social acceptability for the black spruce forest.

Avant-propos

Cette thèse est composée de 5 chapitres. Le chapitre 1 est une introduction générale à la problématique soulevée par la thèse et aux concepts abordés dans celle-ci. Il expose aussi les objectifs et les choix méthodologiques repris dans les chapitres 2, 3 et 4 qui sont rédigés sous forme d'articles. Ces trois chapitres correspondent aux trois parties du projet de recherche doctorale et comprennent les objectifs spécifiques, les résultats et les conclusions spécifiques à chacune de ces parties. En dernier lieu, le chapitre 5 se veut une conclusion générale de la thèse synthétisant et mettant en relation les principaux résultats issus du projet de recherche.

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LES ARTICLES SONT DESTINÉS À ÊTRE SOUMIS DANS DIFFÉRENTES REVUES SCIENTIFIQUES, CE QUI SERA FAIT DANS LES PROCHAINS MOIS.

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Dédicace

Je dédis ma thèse à mes enfants, Vallier, Clarisse, et Grégoire, à mon amoureux, Claude, ainsi qu'à ma mère, Lisette, pour leur support, leur compréhension et pour avoir cru en moi.

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1 INTRODUCTION

Au cours de dernières années, l'aménagement forestier durable (AFD) est devenu le nouveau paradigme guidant l'exploitation forestière au Canada (RNCAN, 2013). Accordant davantage d'importance aux aspects environnementaux et sociaux, tout en conservant les considérations d'ordre économique, ce concept révolutionne progressivement la foresterie en Amérique du Nord et au Québec, particulièrement par la mise en œuvre de l'aménagement écosystémique (AÉ) (MRN, 2013).

L'aménagement forestier durable et l'aménagement écosystémique tentent de remédier au fait que la foresterie traditionnelle, réalisée sous le paradigme du rendement soutenu, engendre, entre autres, des changements dans la composition en espèce et la distribution des classes d'âge des peuplements forestiers, modifie les patrons des paysages forestiers, diminue la capacité des espèces à s'adapter aux variations en réduisant leur diversité génétique, raréfie les forêts matures et surannées et a de nombreux impacts sur la faune, notamment par la perte d'habitats et la fragmentation des forêts continues (Euler et al., 2004; Perron, 2003; Thompson et Harestad, 2004).

Effectivement, l'AÉ représente une avancée majeure en ce qui concerne le volet environnemental de l'AFD. En émulant les perturbations naturelles propres à un écosystème donné, il vise à le maintenir à l'intérieur de ses limites de variabilité naturelle et donc, à diminuer les impacts écologiques des activités forestières sur ce dernier, la finalité étant de protéger la biodiversité (Seymour et Hunter, 1999). Pour atteindre ce but, l'approche écosystémique s'inspire de la sévérité, de la fréquence et de la répartition spatiale des perturbations naturelles afin de déployer une stratégie d'aménagement forestier adaptée à l'écosystème forestier (Bergeron et al., 2002).

Pour l'écosystème de la pessière noire à mousses de la forêt boréale, le feu est le principal agent de la dynamique naturelle (Bergeron et al., 2001). Alors que la majorité des feux font moins de 1000 ha

et couvrent approximativement 10% du territoire, 10% des feux ont une superficie de plus de 20 000 ha et couvrent 40% des superficies brûlées (Bergeron et al., 2002). Sur la Côte-Nord du Québec, 85% des aires brûlées l'ont été par seulement 15 feux de 100 km^2 ou plus chacun (De Grandpré et al., 2008). Par conséquent, la mise en œuvre de l'AÉ en pessière noire repose sur l'émulation de très grands feux par le biais de très grandes coupes de type total.

Toutefois, bien qu'étant justifiée sur le plan environnemental, la mise en œuvre de l'AÉ en pessière noire à mousses pourrait rencontrer de sérieux défis d'acceptabilité sociale (Long, 2009) étant donnée la sévérité des coupes imitant les perturbations sévères (Kimmins, 2004) et leur grande taille des coupes forestières. En effet, plusieurs études ont démontré que les coupes totales, particulièrement celles qui ont une grande superficie, sont perçues négativement par différents groupes du public (Boxall et Macnab, 2000; Gobster, 1995; Magill, 1994; McCool et al., 1986; Palmer et al., 1995; Pâquet et Bélanger, 1997; Ribe, 1989; Schroeder et al., 1993; Sheppard, 1999). Qui plus est, en Ontario, où une approche similaire a été mise en œuvre en forêt boréale dans les dernières années, les groupes environnementaux et la population ont fortement critiqué le gouvernement, mandataire des forêts publiques. Ces groupes percevaient la stratégie d'AÉ émulant les feux comme une façon de permettre à l'industrie forestière de récolter plus de bois, et compromettant par le fait même la durabilité des écosystèmes forestiers (McNicol et Baker, 2004). Par ailleurs, au Québec, le documentaire L'Erreur boréale de Richard Desjardins et Robert Monderie, sorti en 1999, a profondément ébranlé la perception sociale de la foresterie, et contribué à renforcer la crise de confiance envers les forestiers et le gouvernement. Par conséquent, l'acceptabilité sociale de l'AÉ en pessière noire à mousses ne peut être prise pour acquis. Or, la prise en compte des aspects sociaux est un élément essentiel et incontournable de l'AFD, auquel le Québec a récemment souscrit par la mise en place d'un nouveau régime forestier et l'adoption de la Loi sur l'aménagement durable du territoire forestier (L.R.Q., chapitre A-18.1). En plus d'être explicite dans l'aménagement durable, la nécessité d'assurer de prendre en compte les aspects sociaux des pratiques forestières est aussi reconnue dans plusieurs autres définitions ou concepts de l'aménagement forestier écosystémique et de l'aménagement adaptatif (Bengston, 1994; Kimmins, 2004; Manning et al., 1999; Shindler et al., 1993; Shindler, 2004). Grumbine (1994) explique donc que « l'aménagement écosystémique intègre les connaissances scientifiques des relations écologiques dans un cadre incluant les valeurs et les aspects socio-politiques et a pour but général de protéger l'intégrité des écosystèmes indigènes à

long terme. » La définition de l'AÉ adoptée par le gouvernement du Québec est aussi éloquente quant à l'importance de respecter les valeurs de la population :

> *L'aménagement écosystémique constitue une vision écologique appliquée à l'aménagement durable des forêts. Sa mise en œuvre vise à assurer le maintien de la biodiversité et de la viabilité des écosystèmes en diminuant les écarts entre la forêt aménagée et la forêt jugée naturelle. Elle vise, en même temps, à répondre à des besoins socio-économiques, dans le respect des valeurs sociales liées au milieu forestier (Grenon et al.,2010).*

Firey (1960 dans Shindler et al., 2002) explique que l'acceptabilité d'une pratique ou d'une politique repose sur trois critères : la faisabilité physique en accord avec les processus écologiques, la faisabilité économique sur le plan des revenus et la faisabilité culturelle, soit l'accord avec les us et coutumes sociaux. Clawson (1975 dans Shindler et al., 2002) précise que pour les politiques spécifiquement reliées à l'environnement forestier, l'acceptabilité dépend de la faisabilité physique ou écologique, de l'efficacité économique, de l'équité économique, de l'acceptation sociale ou culturelle ainsi que de la fonctionnalité opérationnelle ou administrative La prise en compte convenable des préoccupations des citoyens et l'obtention du support du public sont donc des pré-requis de la durabilité d'une pratique ou d'une politique forestière car l'opposition du public peut retarder, modifier voire même empêcher son application (Ribe, 2006; Shindler et al., 2002). En conséquence, on constate que de par l'exercice de la démocratie, des pratiques justifiées économiquement et scientifiquement, donc écologiquement, pourraient être simplement abandonnées advenant un manque d'acceptabilité sociale (Olsen et al., 2012; Shindler et al., 2002; Vaske, 2001). Cet aspect démocratique est d'autant plus important dans les états où les forêts sont publiques (Robinson et al., 2001).

1.1 LA FORMATION DU JUGEMENT D'ACCEPTABILITÉ SOCIALE ET L'APPROCHE DE LA HIÉRARCHIE COGNITIVE

Dans les premières définitions de l'acceptabilité sociale pour le domaine forestier, Brunson (1996) définit l'acceptabilité sociale comme une « condition résultant d'un processus de jugement par lequel

les individus 1) comparent la réalité perçue avec ses alternatives connues et 2) décident si cette condition est supérieure ou équivalente avec l'alternative préférée ». Brunson explique aussi que suite à ce processus de jugement, « si la condition existante n'est pas satisfaisante, l'individu pourra initier une action, mais pas toujours, en concordance avec son jugement, probablement au sein d'un groupe et visant à corriger la situation pour qu'elle se rapproche de celle qu'il préfère ». Stankey et Shindler (2006) précisent que ce processus de jugement individuel est précurseur de l'acceptabilité sociale puisque celle-ci provient des formes réunies, ou de l'agrégation, des jugements menant ou non au consentement public. Shindler et al., (2002) ajoutent que ces jugements d'acceptabilité sont partagés et articulés par un ou des segment(s) identifiable(s) et politiquement significatif de la population. De façon plus succinte, Allen et al. (2009) définissent l'acceptabilité sociale comme les jugements publics sur le caractère approprié d'une pratique d'aménagement donnée ou d'une condition environnementale. L'acceptabilité sociale est aussi appelée acceptation publique ou adoptabilité culturelle (Olsen et al., 2012). Ces auteurs définissent l'acceptabilité sociale comme la volonté du public de tolérer l'utilisation de pratiques d'aménagement spécifiques, au moins occasionnellement et dans des endroits dûment sélectionnés. Finalement, pour Hansis (1995), une foresterie socialement acceptable, en est une dont les pratiques prennent en compte les valeurs que les gens utilisent pour comprendre les forêts et les pratiques forestières.

La définition opérationnelle retenue pour cette thèse s'appuie sur les travaux de Brunson (1996), Shindler et al., (2002) et Stankey et Shindler (2006) et réunit leurs définitions dans celle-ci :

L'acceptabilité sociale est l'agrégation de jugements individuels portant sur l'acceptation ou non d'une pratique ou d'une condition par lesquels les individus la comparent avec ses alternatives possibles pour en déterminer la désirabilité. Elle est véhiculée par des groupes politiquement significatifs au sein de la société et partageant un même jugement face à cette pratique.

Bien que l'acceptabilité sociale n'existe pas sans un groupe qui véhicule sa position dans la sphère publique, la composante attitudinale individuelle de l'acceptabilité sociale est d'une grande importance puisque le processus de jugement individuel est le précurseur de l'acceptabilité sociale lorsque son résultat est partagé par plusieurs personnes et groupes dans la société. Aussi, bien que Brunson (1996) recommande de s'en tenir aux manifestations de l'acceptabilité sociale en tant qu'actions entreprises par des groupes, plusieurs autres auteurs croient qu'en s'intéressant au

processus de jugement individuel, il est possible de prédire, ou comprendre, l'attitude des gens face à l'aménagement forestier (Brown et Reed, 2000) et donc l'acceptabilité sociale d'une pratique (Allen et al., 2009). En conséquence, l'information sur les valeurs et attitudes du public, peut servir à guider l'aménagement forestier (Manning et al., 1999).

Le modèle de hiérarchie cognitive Valeurs-Croyances-Attitudes (VBA en anglais) proposé par Rokeach en 1968 et en 1973 (dans Allen et al., 2009), largement repris dans la littérature scientifique portant sur l'acceptabilité sociale (Allen et al., 2009; Ford et al.,2009; Brunson et Shindler, 2004; Wyatt et al., 2009), propose qu'un individu possède quelques **valeurs** de bases très fortement ancrées chez-lui qui déterminent la façon dont il juge de ce qui est bien ou mal, désirable ou pas. Ces valeurs donnent lieu à ses **croyances** qui sont des jugements sur ce qui est vrai ou faux et qui sont attribuées à un objet ou une action spécifiques. À leur tour, les croyances contribuent à générer les **attitudes** qu'a l'individu face à l'objet de son jugement, soit sa manière de réagir à telle ou telle situation, personne, politique, pratique, etc. Manning et al (1999), citant Theodorson et Theodorson (1969) précisent qu'une attitude est apprise et peut être comprise comme une expression des valeurs ou croyances puisqu'elle résulte de l'application d'une valeur générale à des objets ou situations concrets.

Ainsi, selon ce modèle (Allen et al., 2009), le jugement d'acceptabilité initié par un individu repose sur ses valeurs et ses croyances par rapport à un objet et le résultat est son attitude face à cet objet qu'il évalue. L'individu développe par la suite une **intention**, c'est-à-dire une conviction de la conduite qu'il devrait adopter face à l'objet de son jugement. Il est alors possible que l'individu pose une **action** cohérente avec son intention, mais ce n'est pas toujours le cas, le lien étant ici moins direct. Interviennent alors, selon la Théorie de l'Action Raisonnée (Fishbein et Ajzen, 1975 dans Allen et al., 2009) les croyances normatives de l'individu, c'est-à-dire ses croyances sur ce que les autres, ces personnes significatives pour lui en tant que personnes ou groupes, croient qu'il ou elle devrait faire ou non. Ces croyances normatives interagissent avec la norme subjective, c'est-à-dire la motivation de l'individu à se plier à ces normes.

Au final, on comprend que le processus de jugement individuel d'acceptabilité repose sur le système de valeurs d'un individu (Stankey et Shindler, 2006), et on peut supposer qu'à l'intérieur des groupes

qui partagent une même attitude et conduite face à une pratique ou une politique forestière, les individus partagent des valeurs et des croyances communes. En effet, les valeurs forestières sont contingentes aux préférences, donc aux attitudes face à l'aménagement forestier et les attitudes et opinions tendent à être être associés en groupe particuliers de valeurs et reliés à des systèmes de croyances, aussi appelés « worldviews » (Huddart-Kennedy et al., 2009; McFarlane et Boxall, 2000; Tindall, 2003). Manning et al. (1999) utilisent un concept similaire, l'éthique environnementale, intermédiaire entre les valeurs par rapport aux forêts et les attitudes face aux pratiques et politiques forestières.

1.1.1 VALEURS PAR RAPPORT À LA FORÊT

On distingue les « held values », valeurs de base, des « assigned values », valeurs assignées ; les premières étant des valeurs en générales et les secondes, des valeurs attribuées à un objet en particulier (Tindall, 2003). Les valeurs assignées aux forêts précèdent donc les croyances d'un individu sur les forêts et sont des conceptions du bien relié aux forêts et écosystèmes (Bengston, 1994). Elles sont utilisées pour évaluer la désirabilité des buts et des conduites face à la forêt (Bengston et al., 2004). Les valeurs d'un individu sont organisées selon une hiérarchie qui lui est propre et qui permet alors le compromis (Hansis, 1995). Hansis précise que dans une société, certaines valeurs prédominent alors que des gens ayant d'autres valeurs contesteront cette prédominance. Il note que les valeurs s'expriment lors de la résolution de problèmes, ce qui est assez concordant avec le modèle des cités de justification de Boltanski et Thévenot (1991). Ces derniers expliquent que différents registres de valeurs, ou cités, peuvent se côtoyer dans la société et chez un même individu et que les principes de bases régissant ces cités, s'affrontent lors d'épreuves. L'épreuve peut-être réglée en ayant recours aux valeurs d'une seule cité dans laquelle les acteurs en cause reconnaissent se trouver tous et ils agissent alors conformément au principe supérieur de cette cité, ou alors en effectuant un compromis entre les valeurs des deux cités différentes, ce qui est possible car plusieurs cités peuvent coexister chez un même individu ou groupe social. Dans un autre langage, mais dans une même logique, Hull et al. (2001) expliquent que la nature est une construction sociale et que les conflits reliés à celle-ci viennent d'une différence des représentations sociales selon les groupes (Peterson 1995 dans Hull et al., 2001). Les cités présentées par Boltanski et Thévenot sont les cités marchande, inspirée, domestique, industrielle, civique et de l'opinion. Dans le monde des ressources naturelles, une nouvelle cité semble faire son apparition.

En effet, dans les dernières décennies, les valeurs relatives aux forêts ont fait l'objet de nombreuses typologies, dont la plus simple témoigne de la montée rapide des valeurs biocentriques, ou centrées sur l'environnement, chez le public, par opposition aux valeurs anthropocentriques, utilitaires (Bengston, 1994 ; Bengston et al., 2004 ; Steel et al., 1994 *dans* McFarlane et Boxall, 2000). Cette importance accrue des valeurs environnementales donne lieu au nouveau paradigme environmental (NEP ou New Environmental Paradigm) dans lequel le développement durable, l'harmonie avec la nature, le scepticisme envers les scientifiques et les procédés technologiques, l'aspect limité des ressources naturelles, les limites à la substitution, et l'emphase importante sur la participation du public dans le processus de décision sont considérés comme l'expression du bien commun à atteindre (Bengston, 1994). À ce titre, le NEP pourrait constituer ce que Boltanski et Thévenot (1991) appellent une cité, ou un système de valeurs dans lequel s'expriment les principes de bases sur lesquels les acteurs s'entendent pour juger de ce qui est convenable, désiré et reconnu. Par opposition, le paradigme social dominant par rapport aux ressources naturelles reposait jusqu'alors sur une autre cité, misant sur la croissance économique, le contrôle de la nature, la foi en la science et la technologie, le rôle dominant de l'expert, une conception des ressources naturelles illimitées, substitution des ressources (Bengston, 1994), ce qui se rapproche plus de la cité industrielle exposée par Boltanski et Thévenot (1991).

Les valeurs forestières peuvent aussi se différencier selon qu'elles sont instrumentales ou non-instrumentales (Bengston et al., 2004 ; Lee et Kant, 2006 ; Xu et Bengston, 1997 *dans* McFarlane et Boxall, 2000). Les valeurs non-instrumentales sont celles qui ne supposent pas une utilisation par l'Homme (Bengston et al., 2004 ; Lee et Kant, 2006), alors que les instrumentales sont celles dont l'utilité peut servir à l'Homme pour une certaine finalité, telles les valeurs économique, récréative ou de subsistance (Lee et Kant, 2006). Toutefois, certaines valeurs instrumentales supposent une utilisation passive par les humains, ce qui a entraîné une distinction entre les valeurs d'usages, qu'elles supposent 1) un usage direct, tel que l'extraction d'une ressource, 2) indirect, comme par exemple les services écologiques, ou 3) d'option, c'est-à-dire qu'on se réserve pour le futur, par rapport aux valeurs de non-usage, telle la préservation et la valeur intrinsèque de la forêt pour (Ford et al., 2009 ; Schuster et al., 2003).

Manning et al.(1999) proposent 11 valeurs potentielles pour les forêts nationales américaines basées sur une revue de littérature (Rolston 1998; Rolston et Coufal 1991; Manning 1989; Kellert 1985) :

1. Esthétique
2. Ecologique
3. Recreation
4. Education
5. Morale/Ethique
6. Historique/culturelle
7. Therapeutique
8. Scientifique
9. Intellectuelle
10. Spirituelle
11. Economique

Au Canada, Lee et Kant (2006) proposent dix univers de valeurs forestières, déduits des valeurs citées par les répondants à leur étude :

1. Économique
2. Environnementale
3. Spirituelle
4. Bénéfices sociaux
5. Valeurs personnelles
6. Usages
7. Éducation
8. Aborigène
9. Tourisme
10. Recréation

Au Québec, le ministère des Ressources naturelles et de la Faune du Québec lors d'un sondage a eu recours à 6 types de valeurs forestières (Roy, 2008):

1. Économiques (emplois, revenus, développement économique)
2. Éducationnelles et scientifiques (sensibilisation à l'environnement, connaissances sur la nature, recherches scientifiques)
3. Récréation (activités de plein-air et loisir)
4. Esthétisme (beauté des paysages)
5. Environnementales et écologiques (préservation des habitats pour la faune, qualité de l'eau, maintien de la biodiversité)
6. Spirituelles et traditionnelles (ressourcement en nature, méditation, exercice des activités traditionnelles)

Tarrant et al. (2003) dans leur Public Values of Forest (PVF) Scale, utilisent quant à eux une classification des valeurs non-économiques aussi inspirée de la classification proposée par Rolston et Coufal en 1991 :

1. Commodités ou agrément : qualité de vie, esthétisme, nature
2. Environnementales : qualité de l'air, de l'eau…
3. Écologiques : conservation d'habitat, durabilité, espèces menacées, biodiversité…
4. Usage public : subsistance, recréation, tourisme
5. Spirituelles

Dans le cadre de cette thèse, nous utiliserons une classification des valeurs basée sur celle utilisée par Tarrant et al. (2003), à laquelle nous ajoutons les valeurs économiques de la forêt. Nous regroupons aussi les valeurs écologiques et environnementales, tel que Roy (2008). La catégorie des valeurs spirituelles a aussi été bonifiée pour inclure les valeurs traditionnelles et historiques. Finalement, afin de prendre en compte les valeurs morales ou éthiques de la forêt, nous ajoutons la valeur intrinsèque de la forêt. Cette échelle, en raison de son nombre limité d'éléments (6), a l'avantage d'être simple à appréhender pour d'éventuels répondants et de permettre, tel qu'il est souhaité de le faire ici, de connaître les valeurs des répondants pour ajouter des connaissances contextuelles sur leur profil soci-économique en procédant à une simple procédure de « ranking ». Les catégories que nous retenons sont donc les suivantes :

1. Valeurs d'agrément (esthétique, nature, mode de vie)
2. Valeurs économiques (exploitation forestière ou minière, retombées, emplois)
3. Valeurs écologiques/ environnementales (préservation des habitats, biodiversité, espèces menacées, milieu de vie)/ (qualité de l'eau et de l'air)
4. Valeurs d'usage public (récréation, subsistance, tourisme, recherche scientifique, éducation)
5. Valeurs spirituelles/historiques/traditionnelles
6. Valeur intrinsèque

1.1.2 VALEURS PRINCIPALES ATTRIBUÉES AUX FORÊTS

En Colombie-Britannique, une étude réalisée auprès de groupes locaux dépendants de la foresterie, provinciaux et nationaux conclut que les plus importantes vocations de la forêt sont la protection de l'environnement et le maintien des écosystèmes (Robson et al., 2000). À l'échelle canadienne,

Robinson et al. (1997 dans Robinson et al., 2001), rapportent que le public désire que les valeurs écologiques et non-ligneuses de la forêt soient mieux représentées dans l'aménagement forestier. De même, en Ontario, Lee et Kant (2006) ont constaté que l'environnement, la spiritualité et la récréation font partie des 2 valeurs associées aux forêts jugées les plus importantes divers groupes d'intérêt. Également, en Alberta, les bénéfices environnementaux des forêts étaient jugés de première importance sur trois par rapport aux bénéfices sociaux ou économiques (McFarlane et Boxall, 2000). Au Nouveau-Brunswick, dans une enquête provinciale, les valeurs de protection de l'environnement ont été classées au premier rang en importance suivies des valeurs de protection de la biodiversité (Nadeau et al., 2007). Pareillement, au Québec, les bénéfices environnementaux des forêts étaient considérés de première importance suivis par les bénéfices économiques, puis en dernier lieu les bénéfices sociaux (OFBSL, 2002). Dernièrement, le ministère des Ressources naturelles du Québec a mené un sondage téléphonique sur les valeurs forestières des populations des régions du Saguenay Lac-St-Jean et de la Capitale Nationale où les principales valeurs de la forêt pour les répondants étaient, dans l'ordre : les valeurs environnementales et écologiques, les valeurs d'esthétisme puis les valeurs de récréation (Roy, 2008).

Tindall (2001, *dans* Harshaw et Tindall, 2005) affirme que les valeurs forestières d'une personne sont reliées à la relation qu'a cette personne avec la forêt. Par ailleurs, Harshaw et Tindall (2005) expliquent que les valeurs sont formées à travers les comparaisons et communications dans les réseaux sociaux et que certaines identités sociales tendent à être associées avec des valeurs ou groupes de valeurs particulières (Erikson, 1998 *dans* Harshaw et Tindall, 2005; Friedman et McAdam, 1992 *; dans* Harshaw et Tindall, 2005). Ces auteurs ont constaté que l'étendue du réseau social d'un individu a une certaine influence sur la diversité des identités reliées aux ressources naturelles et au plein-air et, qu'à son tour, la diversité des identités a une influence directe sur la diversité des valeurs forestières. Subséquemment, ils en concluent que les valeurs forestières sont la transition entre les variables sociodémographiques et les attitudes envers l'aménagement forestier. Ces études relèvent aussi le fait que les attitudes et valeurs d'un individu peuvent changer en fonction des relations qu'il entretient avec les autres membres de la société. On voit donc qu'il existe une relation bidirectionnelle entre les valeurs, croyances et attitudes d'un individu qui peuvent l'amener à s'associer à un groupe et les relations entre l'individu et son réseau social, qui peuvent l'amener à modifier ses valeurs, croyances et attitudes.

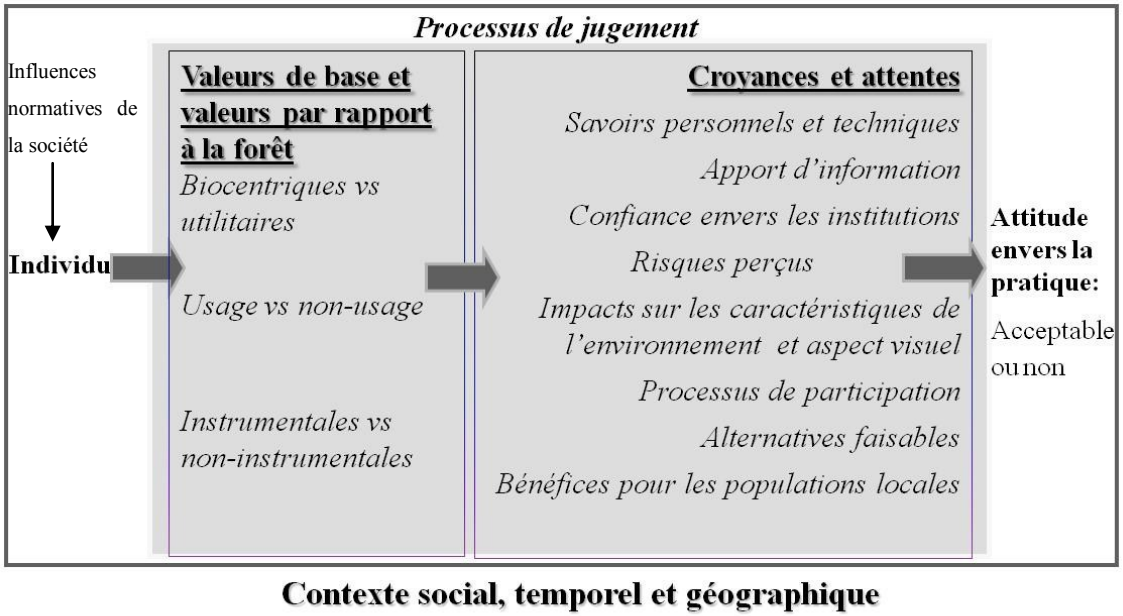
1.1.3 FACTEURS INFLUENÇANT L'ACCEPTABILITÉ SOCIALE DE L'AMÉNAGEMENT FORESTIER

La littérature scientifique identifie plusieurs facteurs influençant l'acceptabilité sociale de l'aménagement forestier prenant leur source dans les systèmes de valeurs et de croyances des individus. D'abord, le contexte, soit-il pré-intervention, spatial, temporel, géographique ou social, est reconnu pour influencer l'acceptabilité sociale et interagir avec les valeurs et les croyances individuelles (Brunson, 1993; Brunson et Shindler, 2004 ; Kakoyannis et al., 2001; Shindler, 2000). Le contexte géographique et social comprend, entre autres, l'importance que les gens accordent à des endroits particuliers du territoire (Shindler, 2000). De même, les bénéfices pour les populations locales (Shindler et Collson, 1998 dans Shindler, 2004), les risques perçus (Brunson, 1993; Kakoyannis et al., 2001; Wagner et al., 1998), la manière dont les caractéristiques naturelles de l'environnement sont affectées (Bliss, 2000; Shindler, 2004), les impacts esthétiques des interventions (Shindler et Collson, 1998 dans Shindler et al., 2004) et le niveau de confiance envers les forestiers et les institutions (Kakoyannis et al., 2001 ; Olsen et al., 2012 ; Shindler et Collson, 1998 dans Shindler et al., 2004;; Wondolleck et Yafee, 2000 dans Stankey et Shindler, 2006) sont aussi des facteurs influençant l'acceptabilité sociale des pratiques forestières. De plus, la possibilité de participer à la planification forestière et l'apport d'information peuvent aussi influencer l'acceptabilité sociale (Ford et al., 2009; Shindler et Collson, 1998 dans Shindler et al., 2004; Shindler et al., 2004). En dernier lieu, l'acceptabilité sociale requiert qu'une comparaison soit faite entre les conditions actuelles et ses alternatives possibles, en considérant leur faisabilité, leur équité et leur désirabilité (Brunson, 1996). Puisque le contexte est un facteur important de la formation du jugement d'acceptabilité sociale, l'importance relative de chacun des facteurs peut varier selon le contexte général à l'intérieur duquel le jugement est porté.

À la lumière des connaissances actuellement disponibles, on peut considérer comme que le jugement d'acceptabilité est le fruit d'un processus de jugement initié par un individu et au cours duquel les différents facteurs pouvant influencer le jugement d'acceptabilité interagissent entre eux, selon une importance qui sera appelée à varier en fonction du contexte général où se situe l'individu. Ce contexte général est composé des contextes social, temporel et géographique. Ce concept opératoire du jugement d'acceptabilité social est illustré à la figure 1.1. Ainsi, on pourrait s'attendre

qu'en modifiant le contexte général, il puisse exister des différences dans les jugements d'acceptabilité.

Figure 1.0 : Formation du jugement d'acceptabilité par l'individu



1.1.4 RÉACTIONS POSSIBLES SUITE AU JUGEMENT D'ACCEPTABILITÉ

L'acceptabilité ou non d'une condition peut amener les individus à prendre diverses actions. En effet, les attitudes ne se traduisent pas toujours en conduites ou en actions (Kennedy et al., 2009). Bien qu'elle soit le fruit d'un processus de jugement cognitif, et qu'elle reflète par conséquent les orientations attitudinales d'une personne envers l'aménagement forestier, l'acceptabilité d'une pratique forestière est souvent déduite par l'absence de réaction (Brunson, 1996 ; Horne et al., 2005) et à l'inverse, comme le mentionne Brunson (1996), l'acceptabilité sociale s'observe plus fréquemment lorsque son absence se reflète dans les actions du public, ce qui pousse certains à parler de réfutabilité sociale (Wyatt et al, 2009).

En effet, lors d'un jugement favorable, souvent, les individus ou groupes n'initieront pas de réaction. Par contre lors d'un jugement défavorable, deux conduites sont possibles. Soit les individus ou groupes ne réagissent pas car l'attitude n'est pas assez forte ou le soutien du groupe n'est pas assez

solide, soit une réaction sera manifestée afin de changer la pratique, particulièrement lorsque la condition est intolérable (Hoss et Brunson, 2000). Selon Petty et Cacioppo (1986 *dans* Hoss et Brunson, 2000), il y aurait une zone intermédiaire entre les extrêmes de l'acceptable et de l'inacceptable pour laquelle les gens ne se prononceront pas. Hoss et Brunson (2000) ont observé qu'en présence d'une situation inacceptable, les individus n'ont pas fait de demande pour des actions politiques, mais plutôt des requêtes pour des actions d'aménagement afin de restaurer à un niveau acceptable les conditions de l'environnement forestier. On constate ainsi que le manque d'acceptabilité sociale peut être véhiculé à travers les conduites à l'égard des pratiques forestières (Brunson, 1996) ou demeurer non dit.

1.1.5 L'ACCEPTABILITÉ SOCIALE DE L'AMÉNAGEMENT ÉCOSYSTÉMIQUE

Selon Gobster (1996), l'acceptabilité sociale de l'aménagement écosystémique dépend de la perception et de la signification de l'environnement forestier. Plusieurs études ont permis de constater que l'aménagement écosystémique était généralement bien perçu (Brunson et Shelby, 1992 ; Manning et al., 1999 ; Ribe et Matteson, 2002). En effet, les valeurs du public relatives à la forêt accordent de plus en plus d'importance aux aspects environnementaux, délaissant par le fait même les valeurs économiques qui primaient auparavant (Shindler et al. 1993 ; Tarrant et al., 2003). Ainsi, puisque l'aménagement écosystémique repose sur des bases écologiques et inclue bien souvent principes du développement durable dont les usages multiples de la forêt (Manning et al., 1999 ; Salwasser 1994 *dans* Brunson, 1998), il correspond mieux aux valeurs du public (Clausen et Schroeder, 2004 ; Manning et al., 1999) et serait en mesure de négocier un compromis entre l'ancien paradigme anthropocentrique et le nouveau paradigme biocentrique (Brunson 1993 ; Ribe et Matteson, 2002). Toutefois, la prudence est de mise en ce qui concerne l'émulation des feux dans les pratiques forestières puisque dans étude réalisée chez nos voisins du sud, la majorité des répondants ne pensaient pas que la coupe à blanc imitait la dynamique naturelle des feux (Robson et al. 2000). Ainsi, étant donné la sévérité des perturbations qui en résultent, le principal défi de l'aménagement écosystémique émulant le feux pourrait provenir de son acceptabilité sociale (Euler et al., 2004; Hunter, 1993; Kimmins, 2004 ; Long, 2009)

En dernier lieu, si une condition forestière est perçue comme ayant des origines ou un design humain, son acceptabilité dépendra probablement d'un jugement sur la pratique qui l'a engendrée.

Pour Brunson (1996), tant que l'aménagement écosystémique sera présenté comme une tentative honnête de maintenir la biodiversité et la durabilité écologique, et que cela demeurera vrai, l'aménagement écosystémique pourrait être acceptable, même si les gens n'aiment pas les conditions un peu désordonnées qui en résultent.

1.1.6 ÉVALUATION DANS LE CADRE DES PRATIQUES FORESTIERES

Lorsqu'il s'agit d'évaluer l'acceptabilité sociale des pratiques forestières des forêts étatiques, Marchak (1983 *dans* Tindall, 2003) et Hoberg (2000 *dans* Tindall, 2003) font remarquer qu'il ne faut pas en rester qu'au niveau des communautés locales puisque la forêt appartient à toute la population. Toutefois, la population n'est pas un ensemble homogène. En effet, elle est composée de communautés géographiques au niveau local, mais aussi de communautés dispersées d'utilisateurs du milieu forestier (Tindall, 2003). Horne et al. (2005) recommandent ainsi que les aménagistes forestiers et les décideurs s'assurent de l'acceptabilité sociale des pratiques forestières, tant au niveau des populations locales qu'au niveau des utilisateurs du milieu forestier. À ces deux groupes, s'ajoute le public de type général, ou non familier, qui ne fréquente ni n'utilise cet écosystème, mais dont l'opinion est importante, en raison de la tenure publique de la forêt.

Dans les dernières décennies, plusieurs études ont rapporté que les valeurs du public n'étaient pas adéquatement représentées dans les politiques forestières, probablement par manque de représentation du public (Robinson et al., 2001). De fait, au Canada, déjà dans les années 1990, le public demandait à ce que les forestiers prennent mieux en compte les valeurs de la population par rapport à la forêt et y soient plus réceptifs (Beckley et al., 1999; Robinson et al., 2001; Robson et al., 2000. Plus récemment, dans un sondage mené par Nadeau et al. (2007) au Nouveau-Brunswick, les répondants étaient insatisfaits de l'aménagement forestier actuel et croyaient que le public devait être mieux inclus dans les processus décisionnels et traité en tant qu'égal des spécialistes. Selon Harshaw et Tindall (2005), il est d'autant plus important que des non-forestiers participent à l'aménagement forestier car les valeurs forestières des forestiers sont plus limitées que celles des autres types de public. En effet, plusieurs études démontrent que les forestiers ont des valeurs forestières différentes de celles du public, notamment en accordant plus d'importance aux valeurs utilitaires et économiques alors que les valeurs du public sont plus environnementales (Lee et Kant, 2006; McFarlane et Boxall, 2000; Robinson et al., 2001; Wagner et al., 1998). De plus, les processus

participatifs habituellement utilisés en foresterie s'adressent davantage aux groupes d'intérêt qu'aux simples citoyens, d'où l'importance de compléter les approches participatives pour inclure les valeurs et attitudes du public (Horne et al., 2005), surtout qu'il n'est pas acquis que le public se considère représenté par les groupes d'intérêt (Shindler et al., 1993). Ainsi, divers types de publics doivent être reconnus lorsqu'il s'agit de valider l'acceptabilité sociale des pratiques et politiques forestières dans le cas des forêts publiques: les groupes d'utilisateurs du milieu forestier, les communautés locales et enfin, la population en général, sans qu'elle ait nécessairement un intérêt direct envers le territoire visé par ladite pratique.

Afin de prendre en compte l'acceptabilité sociale, Allen et al. (2009) recommandent de mesurer les attitudes. Toutefois, l'étude de l'acceptabilité sociale doit aussi prendre en compte que chaque type de groupe entretient une relation différente avec l'aménagement forestier écosystémique (AFÉ) mis en œuvre sur un territoire donné car les contextes sociaux et géographiques changent selon le type de groupe et que les valeurs forestières d'une personne sont reliées à la relation qu'une personne a avec la forêt (Tindall, 2001 *dans* Harshaw et Tindall, 2005). Ainsi, alors que les groupes d'utilisateurs font l'expérience des stratégies d'AFÉ physiquement, à l'échelle de la coupe, les populations locales le vivent sur leur territoire alors que la population à l'échelle provinciale en a une expérience plus abstraite, basée sur les concepts, sans nécessairement vivre l'application comme telle de la stratégie. De ce fait, bien que demeurant importants pour les trois types de groupes, les différents facteurs pouvant influencer l'acceptabilité sociale d'une pratique forestière interviendront différemment selon le niveau de proximité avec les stratégies d'AFÉ auquel se situe le groupe en faisant l'expérience et leur contexte particulier. Par exemple, les modifications apportées à l'environnement et l'aspect visuel des opérations forestières devraient avoir plus d'importance pour un répondant se situant à l'échelle de la coupe, i.e. un utilisateur du milieu forestier. Pareillement, la possibilité de participer au processus de planification, l'apport d'information, l'existence d'options d'aménagement, la confiance envers les aménagistes, le contexte spatial du déploiement d'une stratégie sur le territoire auront probablement une portée plus grande pour les communautés locales. Finalement, le contexte social, la confiance envers les institutions et l'apport d'information primeront possiblement dans la perception de l'acceptabilité d'une pratique chez un public plus large.

1.1.7 OBJECTIFS ET HYPOTHESE

Au moment d'amorcer ce projet, le gouvernement du Québec en était à expérimenter l'AÉ en pessière par la mise en place d'un nouveau modèle de répartition spatiale des interventions dans cet écosystème. Ce modèle de répartition vise entre autres à répondre aux enjeux de fragmentation des grands massifs de forêts matures caractéristiques de la pessière occasionnés par les coupes à blanc traditionnelles et la coupe mosaïque, une situation problématique pour le caribou forestier. D'abord expérimentée sous la forme de projets pilotes, cette stratégie d'aménagement écosystémique est devenue la norme pour l'écosystème de la pessière à compter d'avril 2013.

Concrètement, ce modèle de répartition spatiale résulte en la création de très grandes coupes de type total, appelées agglomérations, visant à émuler les feux et dont la superficie peut varier entre 30 et 250 km^2. La forêt résiduelle doit représenter 25% à 30% de la superficie d'une agglomération. Elle peut être composée de bandes riveraines, de péninsules et corridors ainsi que d'îlots résiduels. Les fragments forestiers peuvent aussi être comptabilisés dans la forêt résiduelle lorsqu'ils font plus d'un hectare. En addition, 20% des coupes doivent être réalisées en rétention variable, alors que le reste de l'agglomération peut être récoltée au moyen de coupe avec protection de la haute régénération et des sols (CPHRS) partout où il est possible de le faire et par coupe avec protection de la régénération et des sols (CPRS) lorsque ça ne l'est pas. Les agglomérations doivent être distancées de 1,5 Km au minimum et les secteurs récoltés doivent être situés à moins de 10 Km d'un massif forestier d'au moins 30 Km^2. Plus de détails sont disponibles dans Jetté (2007).

Il serait naïf de croire que puisqu'elles sont situées au nord, les agglomérations demeureront inconnues du public puisque la pessière à mousse couvre 71,2 millions d'hectares (Commission d'étude sur l'aménagement de la forêt publique au Québec, 2004) et que la majorité des unités d'aménagement qui y sont situées seront aménagées par le moyen d'agglomérations de coupes résultant de la mise en œuvre de la stratégie d'aménagement écosystémique du MRNF (Jetté, 2007). En conséquence des éléments explicités ici, et dans le but d'assurer le succès de l'aménagement écosystémique, il s'avère nécessaire de s'assurer de l'acceptabilité sociale de l'AÉ de la pessière noire à mousses..

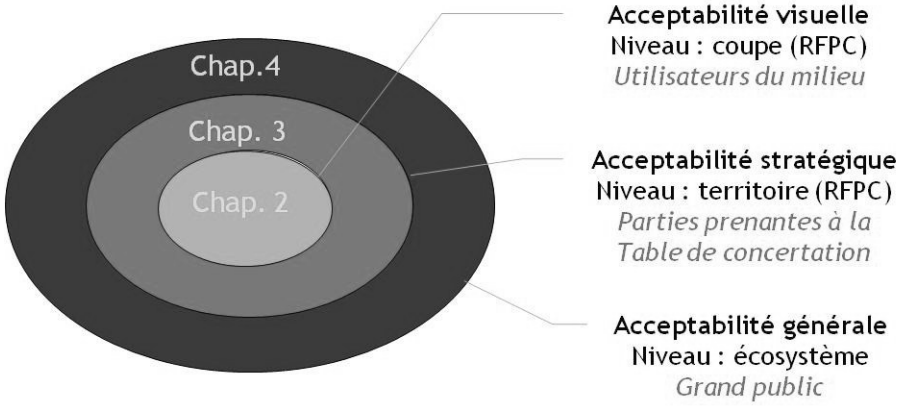
L'objectif principal de cette thèse est donc d'explorer l'acceptabilité sociale de la stratégie d'aménagement écosystémique pour la pessière en s'attardant aux attitudes des gens face à cet objet qu'est la stratégie d'aménagement écosystémique en pessière et ce, dans différents contextes sociaux et géographiques afin d'en dégager les facteurs influençant l'acceptabilité et ainsi mieux comprendre les jugements d'acceptabilité portés sur cette stratégie. Les résultats témoignent des perceptions, attitudes et croyances de l'aménagement de la pessière noire pour ce moment-ci de l'histoire forestière du Québec puisque le contexte temporel, bien qu'important, n'est pas abordé ici. Il s'agit d'un premier pas vers une meilleure compréhension de la perception sociale de l'aménagement écosystémique en pessière au Québec, aucune n'ayant documenté ce phénomène précis à ce jour. Par conséquent, la thèse documente la perception sociale de divers aspects de la stratégie d'aménagement écosystémique pour l'écosystème de la pessière noire à mousses selon différents contextes. Afin d'aborder ces contextes logiquement, nous utilisons différentes échelles de perception (utilisateurs du milieu, communautés locales, grand public) à travers trois études de cas. Le caractère exploratoire de la thèse ne permet pas de généraliser les résultats à d'autres groupes que ceux enquêtés, toutefois, elle donne un premier aperçu de l'acceptabilité sociale de la stratégie d'aménagement écosystémique en pessière, selon trois angles différents. Puisque ces groupes diffèrent dans leur relation à la forêt, et à cet écosystème en particulier, des méthodes d'investigation adaptées à leurs contextes particuliers sont utilisées pour chacun d'entre eux.

Notre hypothèse générale est que l'aménagement écosystémique, puisqu'il correspond davantage aux valeurs de la population et que sa mise en œuvre comporte des traitements sylvicoles différents des coupes à blanc, pourrait être bien reçu par les différents groupes enquêtés, malgré la grande superficie des coupes qu'il implique.

Il est à noter que cette thèse n'aborde pas la perception des stratégies d'aménagement forestier par les communautés autochtones; non pas parce que les autochtones ne sont pas des acteurs importants du territoire mais parce que ce type de recherche requiert des méthodologies particulières et une approche différente que celle utilisée ici. En effet, le taux de réponse des communautés autochtones aux outils de sondage traditionnels est généralement très bas. Par ailleurs, ils ont développé une certaine méfiance face aux recherches étant donné l'historique d'appropriation par les non-autochtones de leurs connaissances, et le fait qu'ils sont généralement dans un contexte de

revendications fait souvent en sorte qu'ils ne souhaitent pas partager l'information les concernant (Tindall, 2003).

Figure 1.1. Investigation de l'acceptabilité sociale de la stratégie d'aménagement écosystémique en pessière noire à mousses



Ainsi, dans le chapitre 2, nous nous intéressons à l'acceptabilité des conditions visuelles résultant de l'AÉ en pessière noire à mousses pour des utilisateurs du milieu forestier de la Réserve faunique de Port-Cartier Sept-Îles, un territoire situé au cœur de la pessière noire à mousses de l'Est. En effet, les utilisateurs du milieu forestier seront confrontés aux agglomérations de coupes sur le terrain et conséquemment, notre investigation portera sur les aspects visuels de la stratégie d'AÉ. Dans la littérature, les impacts visuels des coupes sont souvent associés à leur acceptabilité et à une interprétation plus large que la simple esthétique paysagère. Certaines études démontrent les gens font peu de différences entre l'acceptabilité d'une coupe et sa beauté (CALP, 2003; Ribe, 2002). Les signaux paysagers sont interprétés en fonction des croyances et valeurs d'un individu pour constituer son jugement sur la coupe. Ainsi, Bliss (2000) affirme que l'aversion des gens pour les coupes à blanc n'est pas seulement due à leur impact visuel choquant mais au fait qu'elles sont associées à un aménagement irresponsable et une exploitation trop intensive et qu'elles incarnent un système utilitaire, industriel, révolu ne correspondant plus aux valeurs de la société. Puisque la principale manière percevoir les paysages est visuelle, les impacts visuels des activités forestières revêtent une

importance majeure (Tahvanainen et al., 2001) et doivent être considérés lors de la formulation des stratégies d'aménagement (Ode et Fry, 2002). D'ailleurs, lors de consultations publiques au Québec, le maintien de la qualité des paysages s'est révélé être une préoccupation importante des citoyens (Domon et al., 2005), et par conséquent, elle constitue une dimension importante de l'acceptabilité sociale (Ribe, 2006). Puisque les agglomérations peuvent avoir des impacts visuels négatifs intenses, étant donnée leur taille, ce volet de la recherche s'intéresse à la perception visuelle de la stratégie actuelle et de ses possibles mesures d'atténuation visuelle. La représentation visuelle des agglomérations permet à ce segment du public, qui est le plus familier avec les conditions habituelles de la pessière noire à mousses de l'Est, de considérer la façon dont les caractéristiques naturelles de l'environnement sont impactées par la stratégie d'AÉ. La perception des conditions visuelles de ce groupe est comparée avec celles des deux autres groupes impliqués dans le projet de recherche dans le but de déceler des différences entre les préférences visuelles de groupes ayant des relations différentes avec la forêt.

Dans le chapitre 3, nous nous intéressons à l'acceptabilité sociale de la stratégie d'AÉ telle que déployée sur un territoire donné auprès d'un groupe de parties prenantes au processus de planification forestière ayant fait l'expérience de la stratégie d'aménagement écosystémique dans le cadre d'un projet pilote en pessière. L'inclusion des parties prenantes (stakeholders) dans le processus décisionnel de planification forestière s'inscrit dans les principes de l'aménagement écosystémique puisqu'elle permet de prendre en compte les aspects sociaux de l'aménagement forestier (Bengston, 1994; Grumbine, 1994, Mabee et al., 2004). Ainsi, dans les dernières années, plus d'importance a été donnée à ces groupes d'intérêt, au niveau des populations locales. Au Québec, avec l'avènement du nouveau régime forestier, la création des Tables de gestion intégrée des ressources et du territoire (TGIRT) a consacré cette philosophie d'inclusion de ceux qui étaient autrefois appelés les tiers. . Puisque les communautés locales vivent avec les conséquences de l'aménagement forestier sur leur territoire, ce volet nous permet d'englober le contexte géographique et le fait que les parties prenantes, bien que peu nombreuses, forment un groupe particulier puisqu'elles ont la possibilité de participer à et d'influencer planification forestière et un accès privilégié à de l'information pertinente à propos de l'aménagement écosystémique.

Puis, dans le chapitre 4, nous explorons la perception de la stratégie d'AÉ pour un public de type « non familier, mais intéressé » auprès de trois groupes de citoyens n'ayant aucune relation particulière avec la pessière noire ou la foresterie, mais tout de même assez intéressé à la foresterie pour allouer quelques heures de leur vie personnelle à une discussion s'y rapportant. Les approches participatives généralement utilisées en foresterie visent généralement les groupes ou les personnes ayant un intérêt particulier envers la forêt ou l'aménagement forestier. Or, ces approches doivent être complétées pour inclure les valeurs et attitudes de la population en général (Horne et al., 2005) et ainsi assurer la représentativité de la population (Robinson et al., 2001).

Finalement, le chapitre 5 présente les conclusions émanant du projet de recherche en général et formule des propositions visant à approfondir les connaissances sur l'acceptabilité sociale de l'aménagement écosystémique en pessière noire.

2 ACCEPTABILITY OF VISUAL CONDITIONS RESULTING FROM VARIABLE RETENTION TREATMENTS: A CASE STUDY EXPLORING SIZE, PATTERN AND VOLUME THROUGH VISUALIZATIONS

2.1 ABSTRACT

Ecosystem management in Quebec's black spruce forest could face social acceptability challenges given the extent of the clearings made to emulate fires while commercially logging the forest. However, variable retention, accounting for 20% of the harvest, could mitigate negative visual impacts of harvests. Green tree retention, as a form of variable retention, may have a range of different visual impacts depending on the volume retained, on whether the trees are retained in clumps or dispersed, as well as on the pattern and size of the clumps. This study identifies which form of variable retention achieves the highest visual mitigation with regard to the acceptability of the visual conditions of the felled landscapes. Visualizations representing the combinations of the above mentioned factors were organized into a questionnaire and administered to forest users, stakeholders and uninformed public type respondents. Variable retention treatments combining high retention percentages in dispersed or small aggregates forms were identified as an acceptable form of ecosystem management. From a visual point of view, this treatment is an improvement compared to the available alternatives.

2.2 RÉSUMÉ

L'aménagement écosystémique de la pessière noire à mousses du Québec pourrait engendrer une problématique d'acceptabilité sociale étant donnée la grande superficie des coupes visant l'émulation du régime des feux lors de la récolte forestière. La rétention variable, présente sur 20% des superficies récoltées, a le potentiel d'atténuer les impacts visuels négatifs résultant des coupes de type total. Ce traitement peut prendre plusieurs formes selon le volume retenu, le type de rétention (dispersée ou par bouquets), le patron de répartition et la taille des bouquets. Des simulations visuelles ont été utilisées pour représenter les diverses combinaisons des facteurs mentionnés ci-haut, puis assemblées dans un questionnaire administré à des utilisateurs du milieu forestier, des parties prenantes et des répondants de type public non-familier. Les traitements de rétention variable combinant un fort pourcentage de rétention, dispersée ou par petits bouquets, ont été identifiés comme étant acceptables, contrairement aux alternatives actuellement utilisées.

2.3 INTRODUCTION

2.3.1 THE AESTHETICS-ECOLOGY DEBATE

In the last decades, ecosystem management has frequently been adopted as a paradigm for guiding forestry, where it seeks to mitigate the impacts of forest management and preserve the ecological integrity of ecosystems. Ecosystem management emulates natural disturbances in severity, frequency and spatial distribution (Bergeron et al., 2002; Gauthier et al., 2009) so as to maintain or restore the forest landscape to its historical range of variability (Landres et al., 1999). In this way, it endeavours to minimize the human footprint on the forest landscape and to help conserve its biological diversity. However, recent studies have identified several challenges, both practical and conceptual, for the implementation of such an approach (Long, 2009; Keane et al., 2009). For Long (2009), the greatest challenges are socioeconomic rather than ecological. The limited social acceptance of a management based on high-severity natural disturbances such as wildfires represents one such challenge (Kimmins, 2004). Finding socially acceptable methods for these types of applications could be difficult even when there is broad-based support for ecosystem management (Long, 2003). This disconnect between aesthetics and ecological functions are at the heart of what Gobster et al. (2007) identify as the aesthetics-ecology debate. They propose that landscape planning should address both aesthetics and ecological goals when planning future landscapes.

The limited social acceptance applies in particular to the boreal forest, where an emulation of natural disturbance regimes generally means emulating wildfires (Gauthier et al., 2009) that span over several hundreds of square kilometres (Bouchard et al., 2008; Cumming, 2001; Cui and Perera 2008; Perron et al., 2009). Conservation issues in the boreal forest related to fragmentation combined with habitat loss (St-Laurent et al., 2007; 2009) also prompts calls for larger, more aggregated harvest blocks (Courtois et al., 2004; Meitner et al., 2005). In Ontario, for example, harvesting guidelines have moved from evenly distributed patch cutting to more natural landscape patterns with more variable sizes and more variable spacing (OMRN, 2001).

These new orientations in forest harvesting across the boreal forest have created what Meitner et al. (2005) have qualified as a paradox, given the conflict between ecologically defendable larger and more aggregated harvest blocks on the one hand and, on the other hand, a public rejection of large clearcuts on the grounds of reduced aesthetic quality (Magill, 1994; McCool et al., 1986; Palmer et al., 1995; Pâquet and Bélanger, 1997; Ribe, 1989; Schroeder et al., 1993; Sheppard, 1999) and their

assumption that such forest practices are bad (Bliss, 2000; Robson et al., 2000; Sheppard et al., 2004). Such a paradox is typical of the "future shock" confronting Canadian forestry in its efforts to find solutions to sustainable forest management issues (Kimmins, 2002). As such, the paradox is at the heart of the aesthetics-ecology debate (Gobster et al., 2007).

2.3.2 VARIABLE RETENTION FOR VISUAL MITIGATION OF LARGE CLEARCUTS

As mentioned earlier, clearcuts, especially large ones, are likely to run up against public opposition (Gobster, 1995; Pâquet and Bélanger, 1997; Ribe, 1989; Ribe, 2005; Ribe, 2006), mostly due to visual concerns (Bliss, 2000; CALP, 2003; Silvennoinen et al., 2002; Tahvanainen et al.,2002). However, one interesting component of fire-emulating ecosystem management—variable retention—could help improve the social acceptability of this management type. Actually, in order to emulate full range of effects of forest fires, namely their severity, ecosystem management in the boreal forest also requires that biological legacies be left into the harvested areas in the form of variable retention (Franklin et al., 2007). Referred to as "variable retention harvest," this approach is based on the retention of structural elements or biological legacies such as trees, snags or trunks from the harvested stand into the new stand in order to achieve diverse ecological objectives, including significant variation in the type, density and spatial arrangement of the retained structures (Helms, 1998 *in* Franklin et al., 2007). Indeed, fire does not reduce the entirety of a forest stand to ashes, but instead leaves unburned trees individually or in clumps depending on the site and weather conditions (Perera et al., 2007). As well, following a fire, burned tree structures are left standing or lying on the ground. Referred to as post-fire residuals (Perera et al., 2007), these remaining structures, which may be dead or alive, have important roles in post-fire ecosystems, such as being a source of propagules enabling regeneration, acting as habitat for wildlife, and providing nutrients for the forest's productivity (Perera et al., 2007). Thus, retaining forest residuals during a harvest is considered to help maintain the natural processes and biodiversity (Hunter, 1990 *in* Perera et al., 2007).

In addition to its ecological benefits, variable retention also has the potential to mitigate the negative visual impacts of harvesting. Indeed, the presence of vegetation in a clearcut contributes to its acceptability or aesthetic quality while bare ground is usually perceived negatively (Brunson and Shelby, 1992; Ford et al., 2009; Magill, 1994; Pâquet and Bélanger, 1997; Ribe, 1989; 2005, 2006; Shelby and al., 2003; Yelle et al., 2008).In the guidelines currently being implemented in Quebec,

variable retention has been identified as a means to lessen the negative visual impact of more aggregated cutting (Jetté, 2007).

If variable retention is to be used to mitigate the visual impact of the agglomerated clearcuts, and since it can be applied in a many ways, it is important to know which form of variable retention has the most positive impact on the acceptability of the resulting visual conditions. Previous research in the Pacific North West of Canada and the United States has outlined that the acceptability of agglomerations could be linked to an increase in the amount of retention (Meitner et al., 2005). Indeed, an increase in the retention percentage improves the acceptability of a forest cut (CALP, 2003; Ford et al., 2009; Ribe, 2005) as well as its aesthetic quality (Ribe, 2002). Dispersed retention was shown to be preferred to aggregated retention (Meitner et al., 2005; Ribe, 2005), and a 25% retention of the volume was shown to be necessary to pass the threshold from inacceptable to acceptable (Ribe, 2005). Moreover, a CALP (2003) study reported that aggregated retention was visually associated to clearcutting, and therefore less appreciated than dispersed retention. Finally, even though it is not known specifically for variable retention, it is acknowledged that systematic or geometrical patterns are usually disliked in natural setting contexts (Lucas, 1991; Magill, 1994; Silvennoinen et al., 2002). Overall, some forms of variable retention could help improve the social acceptability of types of ecosystem management that emulate fire.

2.3.3 THE FORMATION OF SOCIAL ACCEPTABILITY JUDGMENTS ABOUT VARIABLE RETENTION

Social acceptability (or inacceptability) is the aggregation of judgments of a condition by individuals (Stankey and Shindler, 2006) of a politically significant and identifiable group of citizens (Shindler et al., 2002). As such, social acceptability comes from different groups within the general public. According to the Values-Beliefs and Attitude cognitive hierarchy model (Rokeach 1968;1973 in Allen et al., 2009), an individual's values and beliefs about forests will results in his attitude towards forests and forests practices. In this model, the acceptability judgment is an attitude, or the individual's reaction to a given situation.

As most people experience the forest visually, Ode and Fry (2002) argue that visual aspects are therefore an important element to be considered when formulating forest management strategies and that by addressing the aesthetics of a forest stand, its acceptability could be enhanced. Similarly,

Sheppard et al. (2004) call for an integration of the visual aspects into sustainable forest management certification stating that this could increase the acceptability of forest practices. Indeed, the visual condition of a practice has been found to influence its social acceptability (Ford et al., 2009; Shindler and Collson, 1998 *in* Shindler et al., 2004; Ribe, 2002; Ribe, 2006). Furthermore, some study show that the visual conditions and beauty of a forest stand are linked to its acceptability. A CALP study (2003) concluded that asking respondents for scenic beauty or acceptability yielded no difference. With diverging forest value orientation groups (productionists, protectionists and general public type), Ribe (2002) found that scenic beauty and acceptability were strongly linked, especially for the general public. Earlier, Ribe (1999) had also found aesthetics and acceptability to be linked but the difference between the two tended to vary according to the scene's intensity of harvest. The implicit link between a harvest's acceptability and its aesthetics is further assessed by the fact that most studies about the acceptability of forest practices addressed it visual component (Brunson and Reiter, 1996). Therefore, it can be argued that the visual conditions resulting from a forest treatment is an important component of its acceptability, especially in the case of high intensity harvests.

As such, the direct visual experience of variable retention, , is more likely to be experienced by forest users than by non-forest users, and is thus judged by what Tindall (2003) calls a dispersed community of forest users. In this study, forest users are people performing nature-based tourim activies, such as fishing, hunting and other types of recreational activities. Since people's values and attitudes, among which acceptability judgments, toward forestry and forest management are shaped by their respective relationships to the forest (Tindall, 2001 *in* Harwhaw et Tindall, 2005) it is interesting to look for differences in how forest users accustomed to this type of forest judge these kinds of silvicultural treatments compared to people who have different relations to the boreal forest. , This is particularly true in the context of publicly owned forests (Marchak 1938 *in* Tindall, 2003; Hoberg, 2000 *in* Tindall, 2003). Stakeholders involved in a forest management participatory process are a group of interest since their participation and enhanced knowledge about forests and forest management could influence their acceptability judgments (Ford et al., 2009; Shindler et Collson, 1998 *in* Shindler et al., 2004; Shindler et al., 2004). Lastly, Horne et al. (2005), recommend to complete participatory approaches focussing on the local level by including the values and attitudes of the public about forests and forest management. This type of public is here referred to as the uninformed public and differ from the two previous groups by its lack of familiarity with the blackspruce forest environment and forest management.

In order to investigate forest users' perception of variable retention from a visual perspective, it is important to use landscapes which they are accustomed to, since pre-harvest conditions can influence acceptability judgments (Brunson, 1993; Kakoyannis et al., 2001; Shindler, 2000). Moreover, these visual conditions have to come from a geographical place that forest users are used to, so as to take account of the geographical context they will refer to when making their judgments. Finally, we have to provide these groups with alternatives to variable retention treatments in order to enable them to compare these methods with feasible alternatives. Indeed, a comparison with possible alternatives alongside an examination of their feasibility, equity and desirability is necessary when forming acceptability judgments (Brunson, 1993). Current alternatives in the black spruce forests of Quebec are either cuts with protection of regeneration and soils (CPRS), or clearcut, and cuts with protection of high regeneration of soil (CPHRS).

2.3.4 ACCEPTABILITY OF VISUAL CONDITIONS RESULTING FROM AGGREGATE CUTTING IN QUEBEC'S BLACK SPRUCE FOREST

In the province of Quebec, Canada, the ecosystem management strategy for the black spruce boreal forest results in clearcuts that vary in size from 30 km^2 to 250 km^2. Of the different treatments permitted in conjunction with clearcutting, variable retention counts for 20% of the logged areas (Jetté, 2007). Even though ecosystem management is a means to address the growing social concern that forestry activities could negatively affect biodiversity, this particular form could be challenged by a negative social perception due to the large scale of the forest cuts. In the guidelines provided by the government (Jetté, 2007), variable retention has been identified as a mitigating agent for the visual impacts of such clearings.

However, variable retention is still new in Quebec and its implementation usually results in patches of aggregated clumps of trees spanning over 200 m^2, left at regular intervals in the harvested area and representing 5% of the pre-harvest volume. Except for one study (Yelle et al., 2008), where the only tested retention percentage was 5%, the effect of variable retention on the social acceptability of the visual conditions of clearcutting has not been measured and no information is available on the type or form of retention that could have the most positive effect on acceptability judgments. Many aspects of variable retention can affect acceptability judgments, yet it is unknown which of these would be more

likely to apply to Quebec's black spruce forest, which is quite different from the Pacific Northwest forests. Indeed, leaving green, living trees in a harvest can differ with regard to the volume or quantity of the trees left, the pattern subsequently generated by the trees, which may be dispersed or aggregated, the size of the aggregates, and the way in which the aggregated clumps of trees are left on the site. The latter can be systematic, i.e., at regular intervals, or unaligned, i.e., according to the terrain's conditions. In that case, the clumps of trees are left where most appropriate and to the extent that their structure or composition is suitable. Since real landscapes showing various forms of variable retention do not exist, visual simulations can be used to represent the combination of factors of variable retention in order to estimate their acceptability.

In the remaining parts of this paper, and in light of the knowledge outlined previously, we will formulate research hypotheses about the perception of variable retention. Then, the acceptability scores of the visual conditions of different variable retention treatments that had been rendered with visualizations were obtained through a survey questionnaire carried out among three groups of respondents having different relationships with the boreal forest, will be presented. For the purposes of this study, variable retention will be studied with green living trees only.

2.4 HYPOTHESES

As mentioned previously, variable retention can take many forms. It can be dispersed or aggregated retention and there can be variations in the volume left, in the way the clumps of trees are left in the cutblock and in the size of the clumps. From the examination of existing literature, our hypotheses were the following:

1. Dispersed retention would be more acceptable than aggregated retention since the harvested ground is less visible with dispersed retention.

2. Landscapes where more retention is left would be more acceptable than those with less retention and to clear-cuts, and untouched forest would be the most acceptable landscape since an increase in the amount of trees left is generally associated with increased visual appreciation of the landscape.

3. Unaligned clumps of trees would be more acceptable than systematic aggregates that generate checkerboard-like landscapes, because geometrical patterns are usually disliked in a natural context.

4. For the same volume left, small clumps of trees would be more acceptable than large ones, because it would show less of the cut's ground, which is associated with clearcutting.

5. The respondents' type (forest users, stakeholders,uninformed public) will influence the acceptability of the visual conditions of the silvicultural treatments since different relationships with the forest are related to different forest values and thus, attitudes.

2.5 METHODS

2.5.1 THE USE OF VISUALIZATIONS

As mentioned earlier, variable retention is quite new in Quebec and the desired combinations of size, pattern and volume do not exist on the field. Therefore, visualizations, or computer generated images of the landscape (Tyrvainen et al., 2006) were needed to show respondents the different forms that variable retention can take. It is now recognized that visualization is an effective tool to collect information about forest preferences (Tyrvainen et al., 2006). Visualizations have advantages compared to photographs. They are less expensive than multiple visits on the field to gather photographs of the desired conditions and they allow controlling for variables that are not intended to be tested, such as light, weather conditions and surroundings (Tyrvainen et al., 2006). Daniel and Meitner (2001) have shown that the higher the realism of the visual simulation, the higher its validity compared to a photograph of the same landscape. Indeed, Williams et al. (2007) found a correlation between the inclusion of details and texture in the understory and on the ground of visual simulations and the real landscape. Therefore, realism is important in order to be able to apply the results to real landscapes. In a visualization, realism is provided through technical precision, including the quality of the illustration achieved through realistic colors, fidelity of textures and figures, high resolution and correct perspective, as well as data integrity, i.e., having verifiable and precise data that accurately represent the reality of the territory studied (Karjalainen and Tyrvainen, 2002). Since realism in the foreground is difficult to achieve (Williams et al., 2007), visualizations are best suited for the middle ground, where small details lose their importance and blend into the landscape (Tyrvainen and Tahvanainen, 1999 *in* Tyrvainen et al., 2006). Indeed, in the foreground, the observer is more concerned about fine details, like stumps and slash, whereas in the middle-ground, forms, textures and lines will draw his attention (McCool et al., 1986).

2.5.2 DISTRIBUTION OF THE QUESTIONNAIRE

A classical means to investigate visual preferences with regard to forest landscape is the Scenic Beauty Estimation Method (SBE), developed by Daniel and Boster in 1976. This method presents participants of a given study with photographic representations, which they then rate for their scenic beauty. SBE has also proven to be useful to evaluate other landscape qualities (Daniel and Schroeder, 1979) and as such lends itself to studying forest landscape acceptability. This method

moreover allows showing respondents a large volume of photographic representations, while simultaneously capturing their perceptions thereof—an advantage not offered by ranking procedures or paired comparison where only a small amount of photographs can be shown in a similar time period (Daniel and Boster, 1976). Since the minimum of repetition for a given landscape condition to be tested is four or five (Brush, 1979; Rudis et al., 1988), five replicas of each treatment were rendered for this study.

Usually, this method involves the projection of slides to groups of respondents. As we are interested in the perceptions of different groups of people, among them forest users accustomed to this particular forest type and for whom the agglomerated clearcut strategy is implemented, and given that these users are neither geographically grouped nor necessarily belong to interest groups, we organized the images in a self-administered questionnaire that was distributed to the visitors of Port-Cartier-Sept-Île Wildlife Reserve, located in the Côte-Nord region of Quebec. This site was chosen because it is a territory in the boreal black spruce forest where agglomerated clearcuts and variable retention are and will be implemented and because, as a wildlife reserve, it enabled to reach a diversity of forest users in their activity settings. It was thought that the questionnaire would provide more flexibility to the forest users, thereby increasing the participation rate, compared to a person-to-person questionnaire conducted at the registration desk or the formation of groups on site. The latter would also have been less expedient given the extended time period we wanted to cover. Indeed, distributing the questionnaire from May through October allowed to reach the different kinds of forest users visiting the territory, for example, anglers visiting the Wildlife Reserve earlier in the season, vacationers during the summer and hunters in fall.

Figure. 2.0. Location of the Wildlife Reserve

Therefore, during the open season of the Wildlife Reserve in 2009, from May to October, visitors were asked by the Wildlife Reserve staff to participate in a survey on a voluntary basis when they registered at their arrival.

Furthermore, the questionnaire was also administered to stakeholders representing various organizations and participating in a forest licensee's planning process for a territory situated nearby the Wildlife Reserve where the ecosystem management strategy was implemented as as pilot project, as well as to uninformed participants encountered in the context of other parts of the research project These two groups were asked to fill out the questionnaire while either participating in individual interviews (stakeholders) or in focus groups related to the research project (uninformed public). They were asked to fill out the questionnaire at the end of the individual or group interviews. The context for answering the questionnaire was different for each of the three groups. The Wildlife Reserve visitors were not engaged in any exchange about the agglomeration strategy, were using the forest environment for recreational purposes and filled the questionnaire individually without meeting the researcher. By contrast, the stakeholders (interview respondents) and the focus group participants (uninformed public) completed the questionnaire after having exchanges with the researcher. In any event, as the visual aspects of the harvest were not the focus of either the focus groups or the interviews, and since the questionnaire was not presented to the participants as an

extension or a subject of the discussion but as a completely different task, impacts of the three different settings were not thought to have a stronger impact on the aesthetic judgment than the relationship which the various participants already had with the ecosystemic management of the boreal black spruce forest. Still, the setting could have an impact on the participants' judgement, and the statistical analysis will help address this. Furthermore, all respondents were presented with the exact same set of visual simulations. The instructions provided with the questionnaire were the same for all groups (see Appendix 1).

To ensure an adequate response rate, efforts were made to design a respondent-friendly questionnaire that the participants would not get frustrated or bored with. It was designed to take no more than 15 minutes to fill out, including the reading of the instructions. Between 8 and 10 seconds were allotted per image (Daniel and Boster, 1976), and one page per image, thereby allowing to include up to 120 visualizations in the questionnaire. The questionnaire was pre-tested with graduate students before its distribution. The final questionnaire had 18 pre-test visualizations (one of each treatment), which served as a warm-up to get the respondents accustomed to the exercise and the range of landscapes to be rated (Daniel and Boster, 1976), and 89 visualizations. Printed front and back, in colour, it had 114 pages in total. Besides the visualizations and the pre-test, the other pages of the questionnaire consisted of questions about the respondents' socio-economic status, relationship to the forest and the importance of forest values to them. The respondents were asked to rank six forest values (amenity, economic, ecological, public use, spiritual/traditional/historical, and intrinsic). Those values were based on Tarrant et al.'s (2003) classification of non-economic forest values, as proposed by Rolston and Coufal in 1991 (in Tarrant et al., 2003). To this classification, we added the economic values.

Each image occupied one 8 x 11–inch sheet of paper in landscape layout. Respondents were asked to rate each image for its acceptability on a -4 to +4 numerical scale (Brunson, 1993) as if they saw this landscape while pursuing their principal activity on the Wildlife Reserve or other recreational context. As these judgment scores are relative, they will enable to classify variable retention alternatives in an order of acceptability. An absolute score was not sought after. For the purposes of this study, the -4 to +4 scale had the advantage of having a neutral point, 0, between the inacceptable (negative) and the acceptable (positive) part of the scale.

2.5.3 *RENDERING OF THE VISUALIZATION*

The landscape simulator Visual Nature Studio 2.6 from 3D Nature was used to generate images of the silvicultural treatments. Data used to render the visualizations, such as topography, hydrography, forest stand composition and height, came from the Wildlife Reserve's territory, while the treatments were simulated on the actual harvest planning cutblocks by the forest licensee. Since the crucial distance for perception studies is the middle ground (Hull and Buhyoff, 1983), and in order to avoid biases due to the lack of realism in the foreground, visualizations were rendered from lakes as if the observer was looking at them from a boat, about 200 to 500 meters from the shore. As water bodies are often used for nature-based recreation, this choice seemed logical. All images had the same blue sky included by the software and a cirrus cloud model (RMFY Blue Sky) at 3500 m altitude. To avoid shade on the ground, the clouds were prevented from casting a shadow. The date and time of the sunlight were set to noon, in July. Two suns were needed in order to ensure that the visualizations were not too dark. Also, in order to generate clear images, reflected light from the sky was set at 50% and at 10% for the ground. Forest roads were not included in the visualization so that all images would be identical with regard to this aspect, as roads differed in length or proportion in each selected viewpoint. The viewpoints (where the cameras were placed) were selected to provide an extensive view on the middle ground where the forest treatments were implemented, and without showing any background of untouched forest, as this might have influenced the acceptability judgments. Therefore, all images had a forested hill side where the treatments had been implemented in the middle ground and a body of water in the foreground. The camera angle was 45 degrees to avoid distortion in the images, and the pitch of the camera was adjusted to equilibrate the proportion of sky and water. Six different viewpoints were chosen from which to look at the harvest treatments, one for the warm-up procedure and five for the replications of each treatment used in the statistical analysis.

The silvicultural treatments included different combinations of variable retentions (different with regard to type, volume, size and pattern) as well as alternatives commonly used in Quebec's black spruce forest, i.e., CPRS (cut with protection of regeneration and soils or clearcut) and CPHRS (or cut with protection of high regeneration and soils). In both cuts, all merchantable trees equal to or greater than 10 cm dbh (diameter at breast height) are harvested, though for the CPHRS an a priori identification of the stands abundantly regenerated with high stems, i.e., 2 to 8 cm dbh saplings, allows for a better protection while harvesting (MRNFP, 2003; Rioux, 2006). In the field, CPHRS presents high and abundant regeneration at heights between 4 and 5 meters (Rioux, 2006). To

optimize the selection, we also included visualizations of untouched mature forest. The retention variables tested were the following: type, volume percentage, size of the aggregates, and dispersion pattern of the aggregates.

The type of variable retention has two values: dispersed or aggregated. Dispersed retention is not used in Quebec, as it is often feared that it might be susceptible to windthrow. In consequence, forest users' perception of this silvicultural treatment is unknown.

The volume percentage has three values: 5%, 10% and 25%. In Quebec, the actual retention volume used is 5%, and in the Pacific Northwest, 25% is the percentage known to achieve neutrality in acceptability judgments (Ribe, 2005). The 10%, for its part, is an in-between value that could represent, for Quebec, an improvement in visual terms.

The aggregate size variables have three values: 200m^2, 1ha and 5ha. At present, 200m^2 is most commonly used in variable retention treatments. However, before, the 5ha aggregate size was more in use as moose blocks and was identified as having the best biodiversity value for wildlife (Rhéault, 2007), thereby also allowing to meet ecological objectives. The in-between option of 1ha was included in the visualization to allow testing for a size gradient.

Aggregate retention can generate one of two patterns: systematic and unaligned. Systematic aggregates are left at an equal distance alongside the path taken by the tree felling machine, resulting in a checker-like pattern, while unaligned aggregates are left wherever most suitable according to the understory structure. This option was tested at only 10% of the retention volume in order to minimize the quantity of images in the questionnaire.

All visualizations except for the clearcut and the mature forest had an understory of CPHRS and all presented a riparian buffer of 20 m between the harvest and the water body. Table 2.1 shows the variables' combinations that were included in the questionnaire:

Table 2.1: Silvicultural treatments included in the questionnaire and number of visualizations for each

Sivicultural treatment				**No. of images**
Clearcut (CPRS)				5
Dispersed retention				15
5%				5
10%				4
25%				5
CPHRS (cut with protection of high regeneration and soils)				5
Aggregated retention (systematic)				45
5%	0.02 ha	1 ha	5 ha	15
10%	0.02 ha	1 ha	5 ha	15
25%	0.02 ha	1 ha	5 ha	15
Aggregated retention (unaligned)				15
10%	0,02 ha	1 ha	5 ha	
Untouched mature forest				5
TOTAL				89

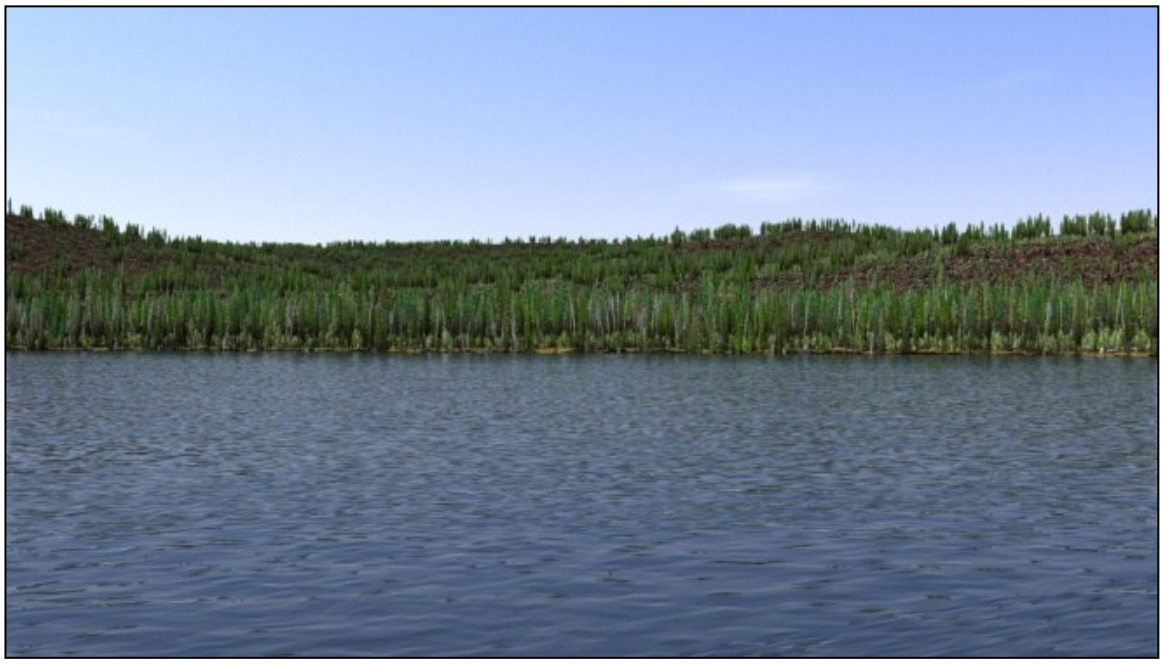


Fig. 2.1 Random aggregated 10% retention 0.02ha

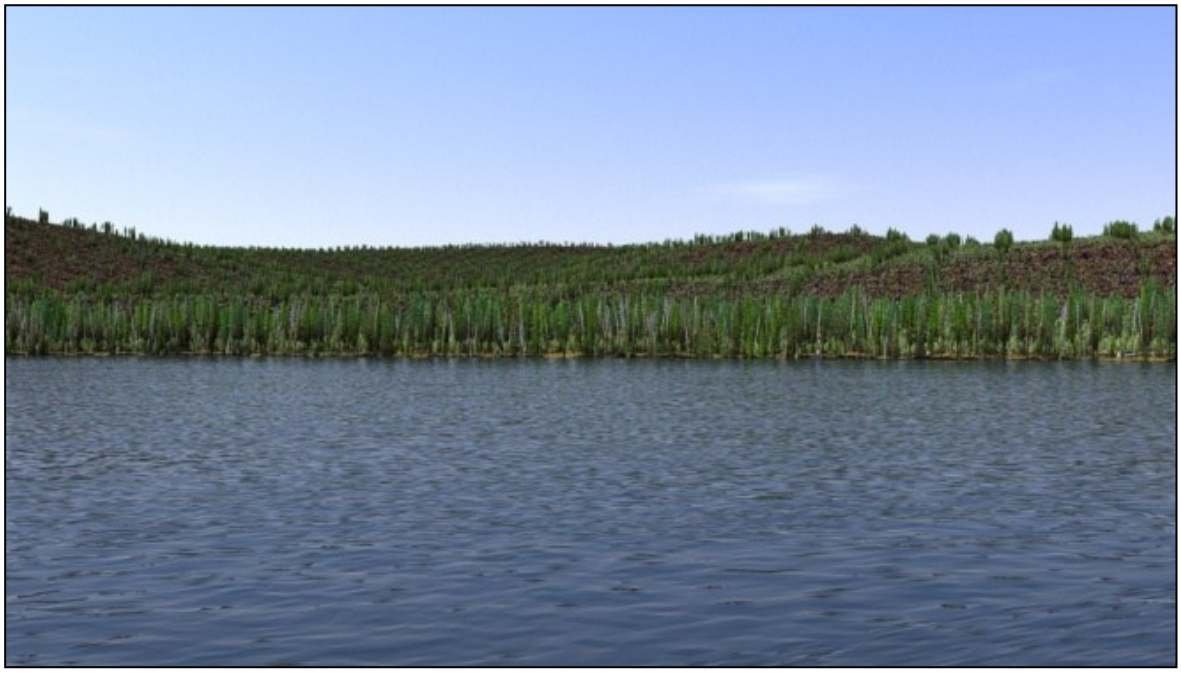


Fig. 2.2 Systematic aggregated 10% retention 0.02ha

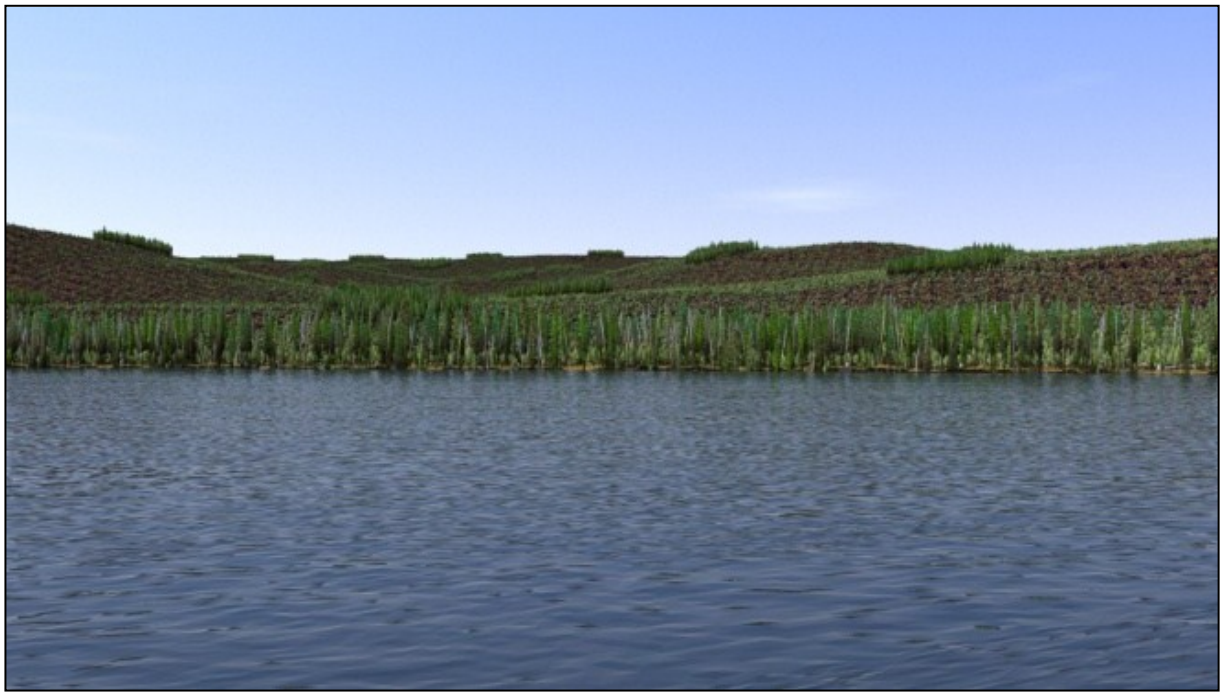


Fig. 2.3 Systematic aggregated 10% retention 1ha

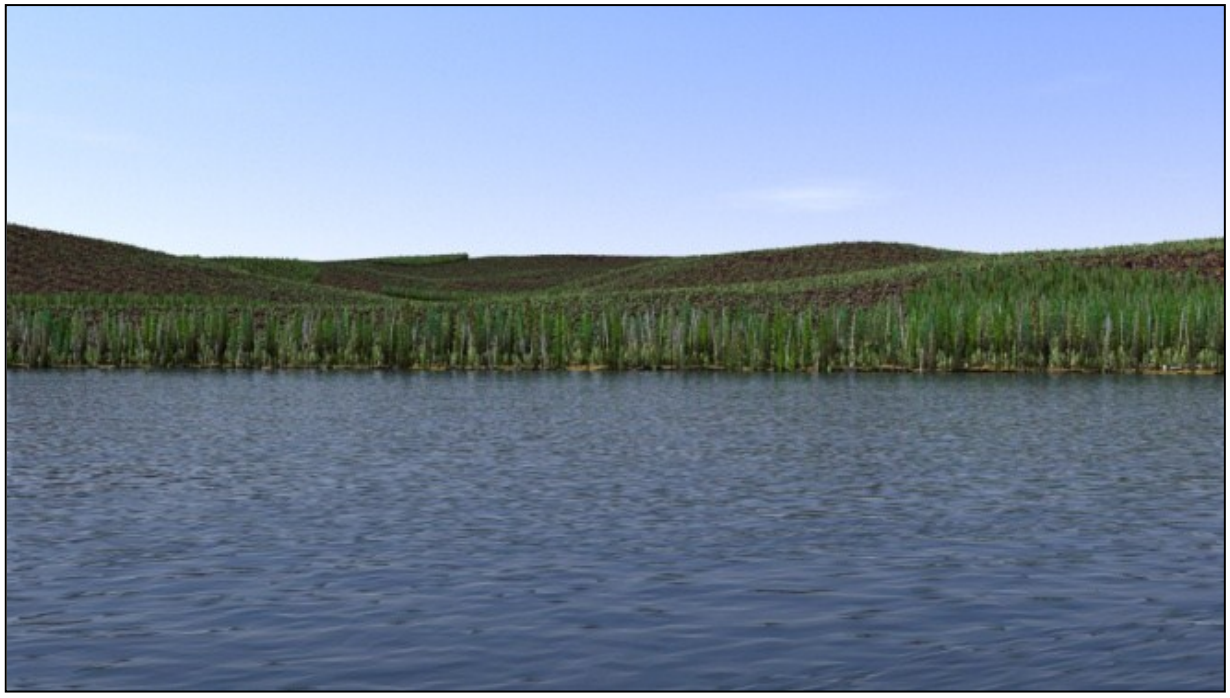


Fig. 2.4 Systematic aggregated 10% retention 5 ha

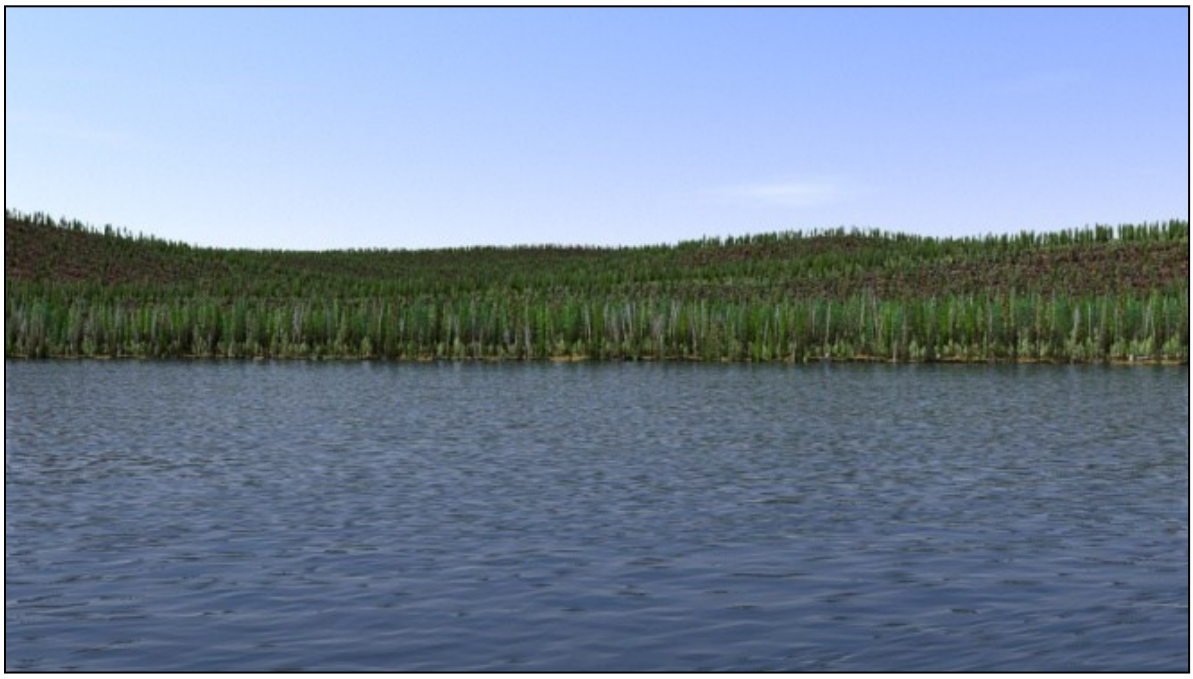


Fig. 2.5 Dispersed retention 10%

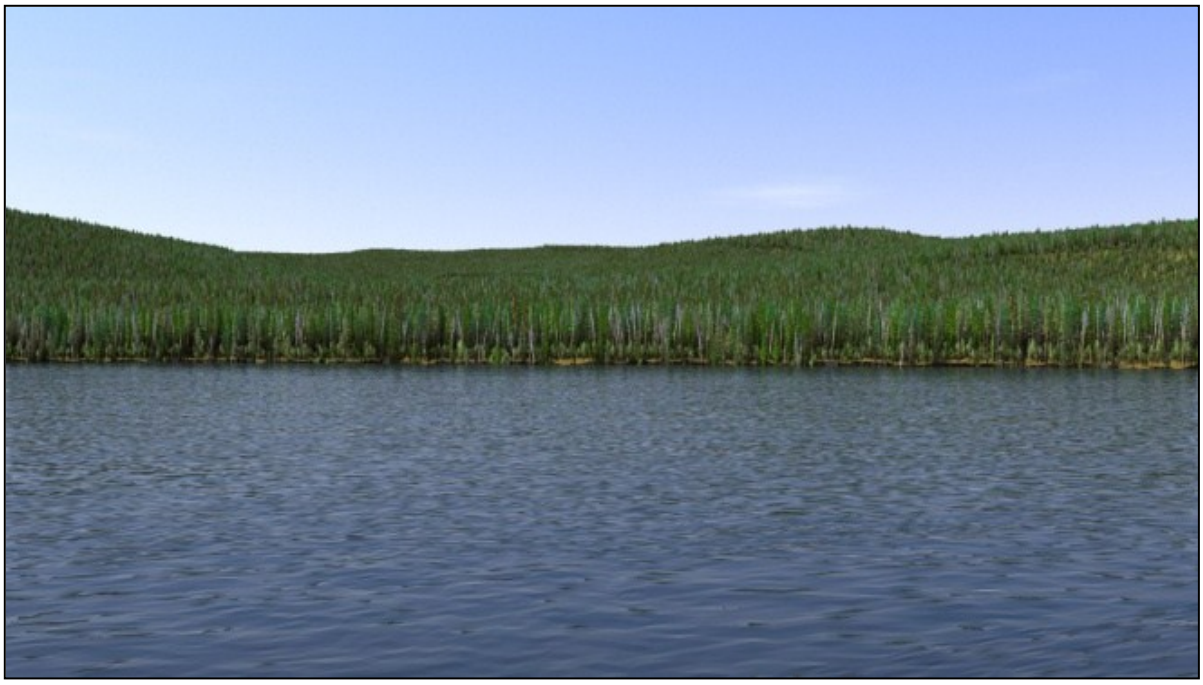


Fig. 2.6 Mature forest

2.6 RESULTS AND ANALYSIS

The experiment has a non-factorial design. There were 18 forest treatments, replicated on 5 different sites (except for one treatment that only had four replications), for a total of 89 images. There were also three different types of respondents: forest users, stakeholders and uninformed respondents. At the Wildlife Reserve, 68 forest users agreed to answer the questionnaire. Added to this, 16 stakeholders from the individual interviews and 32 uninformed individuals from the focus groups took the questionnaire. In total, 116 persons filled out the questionnaire, but 8 people's scores had to be removed from the data set since they systematically answered -4 to every image. Each image was given an acceptability score from each respondent, on a -4 to +4 scale. For the treatment, the experimental unit is the image, whereas for the respondent's type, the experimental unit is the individual. We gathered 9,612 observations from 108 individuals. As seven observations were not used due to missing data, 9,605 observations were employed for the analysis. The analysis had to allow for a determination of which treatments generated visual conditions that were acceptable or not using their acceptability mean score, a comparison of treatments with one another with regard to their acceptability mean scores, and a determination of whether acceptability was influenced by the respondent's type. In order to meet these objectives, a mixed ANOVA was carried out. The degrees of freedom for each fixed effect factor were estimated with the Kenward-Roger method. Figures 2.1 to 2.6 show some examples of the silvicultural treatments represented in the visualizations.

Table 2.2 shows the socio-demographic data relative to the respondents. As the goal was not to generalize results to the general population, a comparison with descriptive statistics of the Quebec population is not relevant. Our main purpose was to find out how visitors of the Wildlife Reserve perceived the variable retention treatments and to compare their judgments to other groups having different relationships with the forest.

Table 2.2: Socio-demographic data of the respondents

	Forest users	Stakeholders	Uninformed public	TOTAL	Percentage of respondents
AGE					
18–24	3	0	4	7	6%
25–34	7	5	3	15	13%
35–44	13	6	5	24	21%
45–54	14	4	3	21	18%
55–64	21	0	10	31	27%
65–74	10	1	6	17	15%
75 and up	0	0	1	1	1%
TOTAL	68	16	32	116	100%
GENDER					
Man	55	14	26	95	82%
Woman	13	2	6	21	18%
TOTAL	68	16	32	116	100%
EDUCATION					
Elementary	2	0	1	3	3%
High School	18	3	5	26	22%
College	25	4	9	38	33%
University, undergraduate	19	3	9	31	27%
University, graduate and postgraduate	4	6	8	18	16%
TOTAL	68	16	32	116	100%
REGION OF RESIDENCE					
Bas St-Laurent			1	1	1%
Centre du Québec	1			1	1%
Chaudière-Appalache			10	10	9%
Côte-Nord	43	15		58	50%
Estrie	1			1	1%
Gaspésie-îles de la Madeleine	3		1	4	3%
Mauricie	0	1		1	1%
Montérégie	3			3	3%
Montreal	12			12	10%
Québec	5		20	25	22%
TOTAL	68	16	32	116	100%

Since attitudes toward forests and forest management are related to forest values, we documented the respondents' forest values in order to give us some insight as wether they follow the general trend toward the biocentric paradigm (Bengston, 1994) or not, in order to better discuss and interpret the acceptability of variable retention. Table 2.3 presents the respondents rank order of the forest values while figure 2.7 summarizes them. Not all respondent answered this question and the results come from the 93 to 95 people who agreed to do the rank order procedure. The respondents were asked to rank six forest values (amenity, economical, ecological, public use, spiritual/traditional/ historical, and intrinsic). The ecological and public use values of the forest stood out as the two most important ones to the respondents, with the ecological value ranked first and the public use value second.

Table 2.3 Respondents rank order of forest values

VALUE'S RANK	FOREST VALUE	UNINFORMED PUBLIC	FOREST USERS	STAKEHOLDERS	TOTAL
1st rank	*Amenity*	1	11	4	16
	Economical	1	1	0	2
	Ecological	13	32	8	53
	Public use	0	7	0	7
	SHT	3	2	0	5
	Intrinsic	7	4	1	12
2nd rank	*Amenity*	2	11	2	15
	Economical	0	6	4	10
	Ecological	7	13	1	21
	Public use	10	19	2	31
	SHT	2	2	2	6
	Intrinsic	4	5	2	11
3rd rank	*Amenity*	5	13	1	19
	Economical	1	12	4	17
	Ecological	3	4	3	10
	Public use	8	15	4	27
	SHT	3	10		13
	Intrinsic	5	2	1	8
4th rank	*Amenity*	8	13	5	26
	Economical	8	15	0	23
	Ecological	2	3	1	6
	Public use	3	9	2	14
	SHT	2	10	2	14
	Intrinsic	2	4	3	9
5th rank	*Amenity*	7	9	1	17
	Economical	9	6	0	15
	Ecological	0	4	0	4
	Public use	2	6	4	12
	SHT	6	13	4	23
	Intrinsic	1	19	4	24
6th rank	*Amenity*	2	0	0	2
	Economical	6	16	5	27
	Ecological	0	0	0	0
	Public use	2	0	1	3
	SHT	9	18	5	32
	Intrinsic	6	21	2	29

Figure. 2.7 Ranking of respondents' forest values

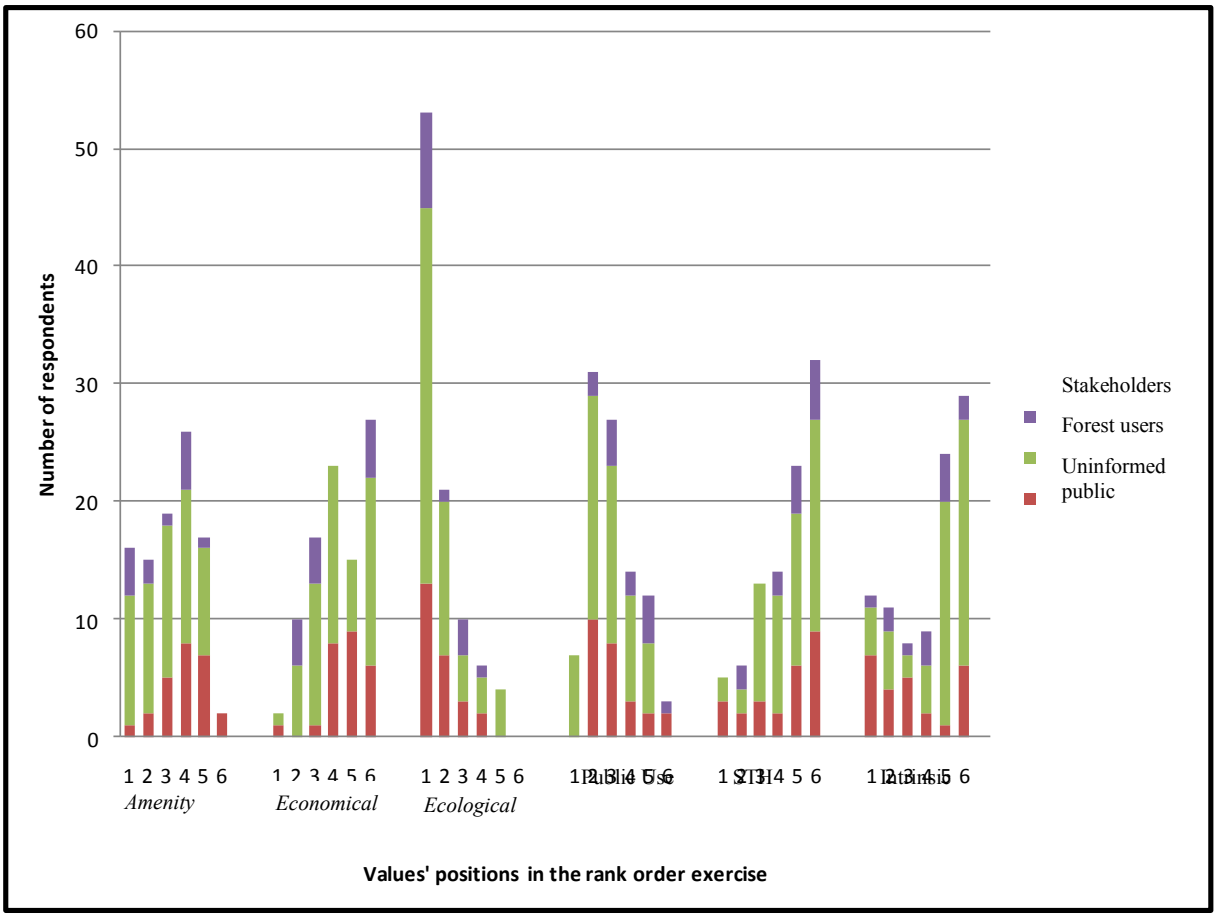


Table 2.4 shows that acceptability scores vary largely from one individual to another. Individuals are responsible for 31.2% (=1.1622/(1.1622 + 0.1664 + 2.4012) of the observed variation, while the site, i.e., the place where the cameras were placed, in the model only explains 4.5% of the observed variation. Acceptability scores are the mean score obtained by each treatment.

Table 2.4: Random part of the mixed anova

Covariance Parameter Estimates			
Cov Parm	Estimate	Standard Error	Z Value
Individual	1.1622	0.1955	5.94
Site	0.1664	0.1183	1.41
Residual	2.4012	0.03489	68.82

As Table 2.5 shows, acceptability depends greatly on the treatment (F=348.69, p< 0.0001), but does not seem to be dependent on the respondent's type (F=1.29, p=0.2789). An interaction between the respondent's type and the treatment is detected, but does not seem to be important compared to the effect of the treatment due to its low F value (F = 2.79, p < 0.0001). The degrees of freedom have been estimated with the Kenward-Rogers method.

Table 2.5: Fixed part of the mixed anova

Type 3 Tests of Fixed Effects			
Effect	Num DF	Den DF	F Value
Treatment	17	9,473	348.69
Respondent's type	2	192	1.29
Treatment*type	34	9,473	2.79

As shown in Table 2.6, with a test of effect slice, the treatments show no significant differences with regard to the acceptability judgments according to respondent type. Therefore, the effect of the treatment does not depend on the respondent's type at a 5% threshold.

Table 2.6: Test of effect slices: Interaction between treatment and respondent type

Effect	Treatment	Num DF	Den DF	F Value	Pr > F
treatment*type	CPHRS__._. (cut with protection of high regeneration and soils)	2	298	2.23	**0.1089**
treatment*type	CPRS__._. (clearcut)	2	298	0.51	**0.6029**
treatment*type	aggregated_unaligned_10%_200sq.m.	2	298	0.60	**0.5489**
treatment*type	aggregated_unaligned_10%_1ha	2	298	2.47	**0.0861**
treatment*type	aggregated_unaligned_10%_5ha	2	298	2.69	**0.0692**
treatment*type	aggregated_systematic_5%_200sq.m.	2	298	1.71	**0.1828**
treatment*type	aggregated_systematic_5%_1ha	2	298	2.55	**0.0798**
treatment*type	aggregated_systematic_5%_5ha	2	298	2.17	**0.1162**
treatment*type	aggregated_systematic_10%_200sq.m.	2	298	2.85	**0.0594**
treatment*type	aggregated_systematic_10%_1ha	2	298	1.53	**0.2190**
treatment*type	aggregated_systematic_10%_5ha	2	298	2.24	**0.1077**
treatment*type	aggregated_systematic_25%_200sq.m.	2	298	1.50	**0.2252**
treatment*type	aggregated_systematic_25%_1ha	2	298	0.73	**0.4806**
treatment*type	aggregated_systematic_25%_5ha	2	298	1.08	**0.3396**
treatment*type	dispersed__5%	2	298	1.63	**0.1979**
treatment*type	dispersed__10%	2	324	0.77	**0.4646**
treatment*type	dispersed__25%	2	298	0.16	**0.8562**
treatment*type	mature	2	298	1.04	**0.3544**

With the help of contrasts, as presented in Table 2.7, it is possible to discern the effect of the treatment according to many factors. All factors are highly significant. Factors Retention Volume and Retention Type seem especially important given their high F value.

Table 2.7: Contrasts

Contrasts			
Label	Num DF	Den DF	F Value
Retention volume	5	9473	914.87
Retention type	1	9473	827.38
Size of aggregates	2	9473	163.52
Aggregated retention pattern_unaligned_10%	1	9473	32.39

Table 2.8 and Figure 2.8 identify 10 groups of similar treatments with regard to acceptability scores. In the first group, mature untouched forests stand out from other treatments with a high positive score near +3. The second most preferred treatment, as the only representative of group (B), is the dispersed 25% retention with a mean acceptability score around 1. Then come three treatments that have acceptability scores around zero or, put in another way, the acceptability threshold: dispersed 10% retention, 10% retention with unaligned 200 m^2 aggregates, and 25% retention with systematic 200 m^2 aggregates. The fourth group (D) comprises three treatments generating approximately -1 acceptability scores: 25% retention with systematic 1ha aggregates; 5% dispersed retention; and 25% retention with systematic 5 ha aggregates. The latter treatment is also part of the fifth group (E) and, approximating -1.5, also contains 10% retention with systematic 200 m^2 aggregates. Group F is formed by this same 10% retention with systematic 200 m^2 aggregates, plus 5% retention with systematic 200 m^2 aggregates and 10% retention with unaligned 5 ha aggregates. The seventh group (G) has 5% retention with systematic 200 m^2 aggregates and 10% retention with unaligned 5 ha aggregates again, plus 10% retention with systematic 5 ha aggregates, CPHRS and 10% retention with systematic 1 ha aggregates. The eight group, H, shows that 10% retention with systematic 5 ha aggregates, CPHRS and 10% retention with systematic 1 ha aggregates, 10% retention with unaligned 1 ha aggregates, and 5% retention with systematic 5 ha aggregates have similar acceptability scores, around -2. The ninth group, I, is composed of CPHRS, 10% retention with systematic 1 ha aggregates, 10% retention with unaligned 1 ha aggregates, 5% retention with systematic 5 ha aggregates, plus 5% retention with systematic 1 ha aggregates. Finally, in the tenth group, J, CPRS, or clearcut, stands alone, with an acceptability score of about -3.5, which is well below the other treatments.

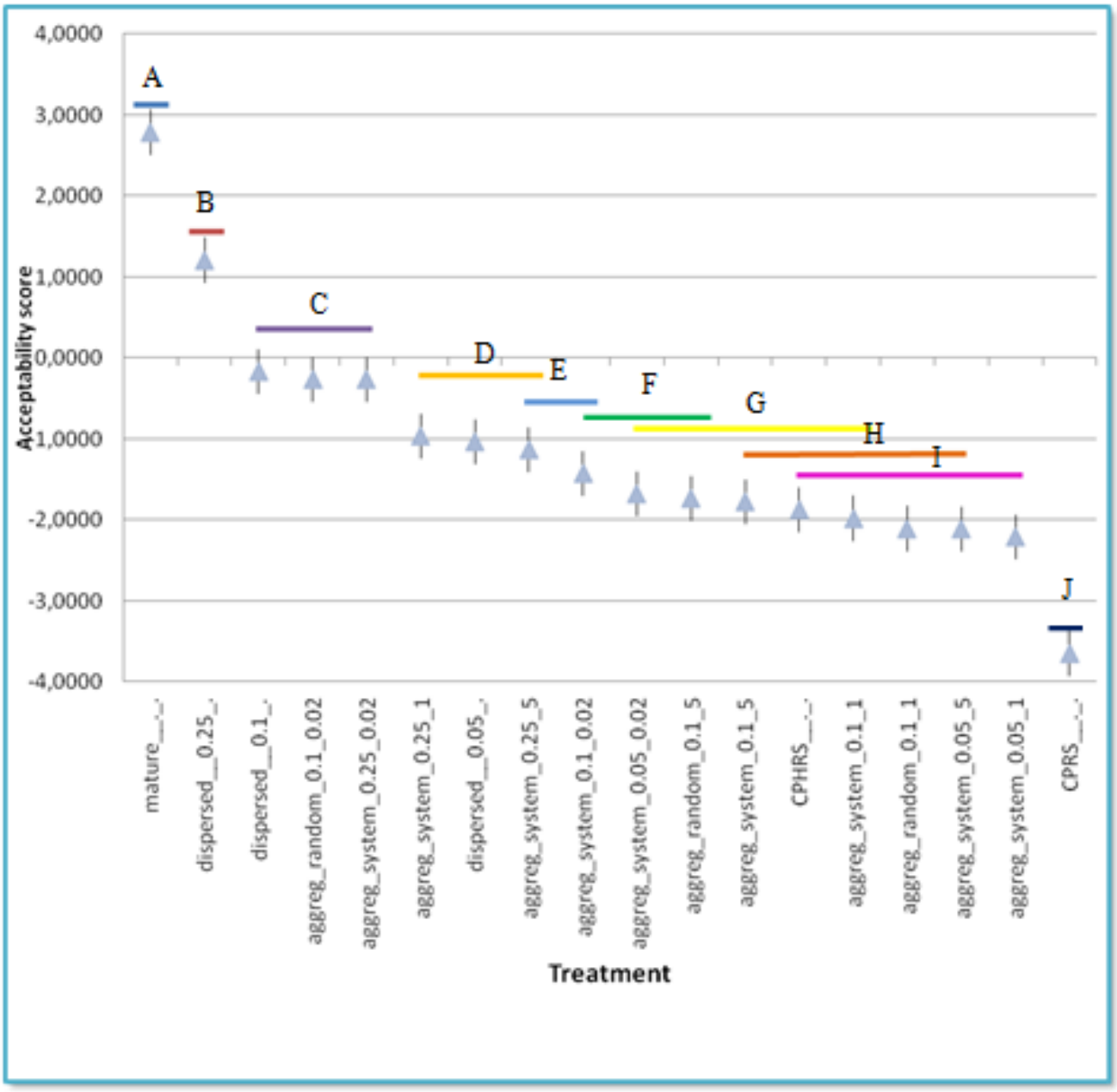
Table 2.8 presents the mean acceptability score and standard error for each treatment, for all respondents. These results are also illustrated in Figure 2.7.

Table 2.8: Comparison of treatments for all types of respondents[1]

Obs	Treatment	Acceptability Mean score	Standard Error	Letter Group
1	mature__._.	2.7870	0.2763	A
2	Dispersed 25%	1.2070	0.2763	B
3	Dispersed 10%	-0.1692	0.2791	C
4	aggreg_unaligned_10%_200 sq.m	-0.2680	0.2763	C
5	aggreg_system_25%_200 sq.m	-0.2700	0.2763	C
6	aggreg_system_25%_1ha	-0.9675	0.2763	D
7	dispersed__5%	-1.0341	0.2763	D
8	aggreg_system_25%_5ha	-1.1366	0.2763	DE
9	aggreg_system_10%_200 sq.m	-1.4276	0.2763	EF
10	aggreg_system_5%_200 sq.m	-1.6773	0.2764	FG
11	aggreg_unaligned_10%_5ha	-1.7371	0.2763	FG
12	aggreg_system_10%_5ha	-1.7765	0.2763	GH
13	CPHRS (cut with protection of high regeneration and soils)	-1.8751	0.2763	GHI
14	aggreg_system_10%_1ha	-1.9812	0.2763	GHI
15	aggreg_unaligned_10%_1ha	-2.1099	0.2763	HI
16	aggreg_system_5%_5ha	-2.1120	0.2763	HI
17	aggreg_system_5%_1ha	-2.2102	0.2763	I
18	CPRS__._. (clearcut)	-3.6461	0.2763	J

[1]Observed thresholds for 2-to-2 comparisons were corrected according to the Stepdown Bonferroni method.

Figure 2.8: Acceptability mean scores with standard error for each treatment and comparison between treatments



2.7 DISCUSSION

2.7.1 PARTICIPATION RATE AND TYPE OF RESPONDENTS

The annual number of people visiting the Wildlife Reserve was not available for the year of our study, it was thus impossible for us to calculate a response rate. However, based on the 1,546 overnight stays registered at the Reserve in 2000 (SEPAQ, 2004), we expected to have around 150 respondents over the 6-month period from May to October, which corresponds to less than one respondent per day. The actual response rate was lower than that. This may have been due to the fact that the questionnaire was distributed by the Reserve's staff upon registration and not by the researchers, which, as a separate step, would have put more emphasis on the research. However, the presence of the researcher on site was impossible given the remoteness of the Wildlife Reserve and the extended period of time to cover. It must also be considered that the visitors who agreed to answer certainly had more interest about forest management or about giving their opinion on the subject than those who did not. This may also mean that the people who answered the questionnaire were more critical of forestry than those who did not. Due to ethical considerations, we could not require every visitor, or a randomly selected subset, to fill out the questionnaire, meaning that we had to rely on their willingness to answer. However, together with the responses from participants of other parts of the research project, i.e., stakeholders and uninformed public, a fair number of respondents were ultimately attained (116).

The absence of respondent type effect suggests that the setting in which respondents filled out the questionnaire, be it in the field at the reserve, at the end of an individual interview or at the end of a focus group, did not influence their responses much. This infers that the paper questionnaire is a good means for investigating people's preferences of visual treatments with regard to the acceptability of their visual conditions, in different settings. Yet, this does not support our Hypothesis 5, where we anticipated that participants from an uninformed public, stakeholders and forest users would have different acceptability judgments for the visual conditions of the silvicultural treatments tested. Indeed, differences between rural, or forest dependent, and urban residents' environmental values orientation and beliefs have been reported in previous research (Huddart-Kennedy et al., 2009; McFarlane et al., 2011; McFarlane and Boxall, 2000; Robson et al., 2000; Tarrant et al., 2003; Tindall, 2003), though they were somewhat subtle. Since most of the respondents at the Wildlife

Reserve and those from the interviews were residents of Côte-Nord, a region where the forest industry is important in Québec (Lemelin et Mainguy, 2008)differences in acceptability scores were possible. Furthermore, as the stakeholders involved in the planning process have the opportunity to influence the outcomes of the forest planning and since they benefit from information about ecosystem management, it was anticipated that they could also rate the silvicultural treatments differently from the two previous groups. Information about forest practices and the opportunity to participate in the planning process are known to influence the social acceptability of forest practices (Shindler and Collson, 1998 *in* Shindler et al., 2004; Shindler et al., 2004). Another research study conducted in Quebec about visual perception of forest treatments also found no difference between urban and residents of a forest region (Yelle et al., 2008). It was suggested that, since values about forests were similar among the three groups, their perception of forest treatments would be similar as well. This hypothesis still seems appropriate in the present study, as respondents share strong ecological forest values and also value public use of the forests, even though stakeholders also put more emphasis on economical values. This is similar to the results from McFarlane et al. (2011), where communities having a high forest dependency were found to share biocentric values with less dependent or urban communities, though according more importance to maintaining the industrial use of the forest. According to Tindall (2003), values about forests are an important determinant of attitudes and opinions about forestry as well as support for visual forest management. Therefore, people having similar forest values are expected to judge forest activities or treatments in similar ways.

2.7.2 BEST CASE SCENARIO

The higher acceptability score of mature untouched forests is not surprising in itself. Yet, what is surprising is that a mature untouched forest did not achieve an even higher score since natural forest are generally preferred to harvested ones (Karjalainen et Komulainen, 1999; McCool et al., 1986; Ribe, 1989). This forest type could have been expected to reach an acceptability score closer to +4 instead of score of slightly under +3. Furthermore, with the warm-up section, respondents were expected to have adjusted their judgment to the type of landscape and scale provided. When compiling the data, it was observed that respondents sometimes gave mature forests strong negative scores. It would be interesting for future research to explore if people acting this way are suspicious

of the images and think there is some kind of forest cut disguised in the image or if they really do not like mature boreal forest. In the case that these respondents were suspicious of unvisible forest treatment, it could be infer that acceptability judgments about a visual condition are not solely based on the visual characteristics of the landscape seen but that they also rely on the meaning people give to the landscape. Indeed, according to Wyatt et al. (2011) the aesthetic assessment of a landscape is not only a question of whether the forest practice looks good or bad, but rather implies a complex judgmental process involving temporal and geographical contexts and the values and beliefs of the observers. In this sense, our observation about the negative ratings of mature forest when suspecting an unvisible intervention would be consistent with the fact that when people see human intention in the landscape, they judge it negatively compared to perceived natural forests (Magill, 1994) With regard to suspicion, the issue of trust could play an important role. Indeed, trust into institutions and forest managers is an important component of the social acceptability of forest practices (Shindler et Collson, 1998 *in* Shindler et al., 2004; Kakoyannis et al., 2001; Wondolleck et Yafee, 2000 *in* Stankey et Shindler, 2006). Furthermore, even though they were removed from the data, some respondents systematically gave all images, even those of mature untouched forest, a score of -4 in what could be an attempt to express their dislike of forest harvests. They did not seem to pay attention to the design of the cuts or to the fact that in some images there had been no harvest at all. They seemed simply clearly against any form of harvest and probably saw the questionnaire as a means to express that opposition. Maybe the questionnaire was their only opportunity to manifest their opinion. Qualitative research could look deeper into this attitude to verify if it is due to a lack of possibility to influence forest management, a lack of trust or other reason. Since literature reports that the acceptability of a forest treatment may be influenced by the possibility to participate in the planning process (Shindler and Collson, 1998 *in* Shindler et al., 2004; Shindler et al., 2004) and by trust in the managers and institutions (Shindler and Collson 1998 *in* Shindler et al., 2004; Kakoyannis et al., 2001; Wondolleck and Yafee, 2000 *in* Stankey and Shindler, 2006).

2.7.3 DISPERSED VERSUS AGGREGATED RETENTION

At a 25% retention level, the dispersed form is preferred to the aggregated ones. At the 10% retention level, dispersed retention scores equal the unaligned 200 m^2 aggregates score, and are preferred to the other unaligned or systematic aggregated forms. At the 5% retention level, dispersed

retention is preferred to other 5% retention treatments, which usually score quite low, but achieves higher scores than some aggregated retention treatments with higher retention percentages. This is consistent with previous studies (CALP, 2003; Meitner et al., 2005; Ribe, 2005, 2006; Tonnes et al., 2004) where dispersed retention was better perceived than the aggregated one, which supports our Hypothesis 1 that dispersed retention would be preferred over an aggregated one. In Australia, however, aggregated retention was more acceptable than dispersed retention (Ford et al., 2009). According to the CALP study (2003), people visually associate aggregated retention to clearcut, even with high retention volumes, whereas dispersed retention is perceived as distinct from a clearcut. This preference could be explained by the fact that when aggregated, retention leaves a considerable portion of the ground bare, thus showing the harvests in an evident way, whereas with dispersed trees, the feeling of a forest still remains, even if as many trees have been removed (CALP, 2003). This means that, possibly with regard to terrain conditions and where windthrow is not a big concern, dispersed retention should be preferred over aggregated retention, especially with higher volumes of retention.

2.7.4 SIZE OF AGGREGATES

When looking at the size of aggregates for a same retention percentage, smaller aggregates are preferred to larger ones. Indeed, for a 25% retention level, 200 m^2 clumps of trees are preferred to larger ones. The same can be observed at 10% retention and at 5% retention. This is most certainly due to the fact that larger aggregates leave more of the cut area in a clearcut state, whereas smaller clumps hide this clearcut ground, at least from a middle ground perspective. As mentioned earlier, forest treatments associated with clearcutting are less liked than those that are clearly distinguished from clearcutting, since people evaluate forest treatment on a visual rather than a silvicultural basis (CALP, 2003). These findings confirm our Hypothesis 4.

2.7.5 UNALIGNED VS SYSTEMATIC AGGREGATES

The unaligned aggregated treatments have been tested with 10% retention. With small aggregates of 200 m^2, unaligned aggregates generate better acceptability scores than the systematic ones. Systematic and linear patterns are indeed known to be disliked in natural forest settings (Lucas,

1991; Magill, 1994, Silvennoinen et al., 2002). However, for the medium (1 ha) and bigger size aggregates (5 ha) the aligned and unaligned treatements show no difference with regard to the acceptability of their visual conditions, as unaligned or systematic aggregates are perceived similarly. Therefore, our hypothesis (Hypothesis 3) about the better perception of unaligned patterns is not entirely supported here. As mentioned earlier, when the size of the aggregate is bigger, more of the ground surface is exposed, showing the underlying clearcut with protection of the high regeneration and soil (CPHRS). This exposure of the clearcut might lead observers to visually associate aggregated retention to clearcut (CALP, 2003). Furthermore, with larger aggregates, fewer of them are needed to yield a given retention percentage, due to which the unaligned effect may become lost and less evident. As well, unaligned aggregates can sometimes be close to one another, generating the impression that many trees are left. However, on some visualizations, the contrary was also true. There, aggregates were far apart, sometimes with none left in proximity to the observer.

2.7.6 RETENTION VOLUME

When retention is dispersed, consistent with our Hypothesis 2, the more volume is left, the higher the acceptability. When retention is aggregated, an effect between the volume left and the size of the aggregates prevents establishing a direct link with regard to the volume left. With small aggregates, 25% retention is clearly more acceptable than 10% and 5% retention, which are judged similarly. With medium-size aggregates of 1 ha, the same pattern is observed, although the 10% and 5% retention volumes have lower acceptability scores. With larger aggregates of 5 ha, this is also true. In general, a higher volume with smaller aggregates seems to be more acceptable than a lower volume with larger aggregates. In previous studies conducted on the West Coast, Ribe (1999) found that 15% retention was considered unacceptable whereas in Australia, retaining 15% of the volume significantly improved social acceptability of forest harvests (Ford et al., 2009). In Oregon, Ribe 2005 identified 25% retention as the threshold to achieve acceptability and Ribe (2006) concluded that 40 to 50% retention is optimal to achieve acceptable harvests.. However, in our study, from Eastern Canada, 10% retention has gathered acceptability scores higher than zero with dispersed and around zero for small clumps unaligned retention. The differences between observations about variable retention on the West and on the East coasts could be the same than those identified by Picard and Sheppard (2002), who suggested that differences between visual preferences thresholds for the size

of clearcut harvests in Québec and British Columbia could come from cultural bias or visual and physical conditions such as strong slope or mountainous terrain. This is further supported by Tonnes et al. (2004) who found that topography has an influence on the scenic impacts of clearcutting. Overall, our results are consistent with Meitner et al. (2005), who conclude that the acceptability of large agglomerated harvest blocks could be linked to the amount of variable retention left. As Ribe and others (2002) conclude, ecosystem management has the potential to mitigate visual impacts of harvest and the use of variable retention could definitely be of help in giving cues to care (Nausser, 1995) and developing a stewardship aesthetic where forest practices generate landscapes with ecologically beneficial elements are also culturally well perceived (Gobster et al., 2007; Sheppard, 1999).

2.7.7 PROTECTION OF HIGH REGENERATION VS SOME RETENTION TREATMENTS

It is quite odd that the judgment of the CPHRS treatment, which is basically the ground treatment used to generate the aggregated retention treatments where mature trees were added, resembles that of some retention forms with regard to acceptability. For example, CPHRS was considered unacceptable and equal to treatments 10 to 17 (see Table 2.6). However, since no mature tree was left, we expected it to have been perceived less acceptable than any treatment with mature trees. This effect has also been observed in previous research (Yelle et al., 2008) with real landscape images. At that time, the effect was attributed to the fact that without the mature trees to give an idea of the scale of the remaining trees, CPHRS with its green and even ground seem well regenerated, whereas mature trees reminded observers of the removed forest cover—an explanation we still consider to be appropriate to this study. Furthermore, the positive effect of regeneration of the appreciation of forest landscape has long been documented (Pâquet et Bélanger, 1997; Ribe, 1989; Schroeder et al., 1993; Sheppard, 1999).

2.7.8 CLEARCUT / CPRS

As expected, the clearcut treatment was the least acceptable one, i.e., totally inacceptable, which is consistent with previous studies in which clearcut was judged negatively compared to treatments retaining trees (Benson and Ulrich, 1981; Brunson et Shelby, 1992; Ford et al., 2009; Lindhagen,

1996; Ribe, 1989; 2006; Yelle et al., 2008). While this alternative was presented to account for the worst case scenario, it is actually implemented in the boreal forest. However, real life cases most often do not generate landscapes as bare as those from simulations, for they generally have some separators, riparian buffers or higher regeneration patches. In that sense, CPRS might possibly achieve a slightly higher score, albeit still very unacceptable. The real life implementation of this treatment can also be expected be influenced by slash or soil disturbances since their negative impact on the visual aspect of the harvests have be reported before (Benson and Ulrich, 1981; Ribe, 1990; Schroeder et al., 1993)

2.7.9 THE USE OF VISUALIZATIONS

Our findings should be used with caution since they were obtained with middle ground visualizations where others aspects of forest operation such as roads, soil disturbances and slash debris were disregarded. It is likely that in the field, acceptability score values differ from those generated by visualizations, since these aspects might interfere with the acceptability judgments as they are usually disliked (Ribe, 1989; Ribe 1990; Sheppard, 1999). As well, the foreground was not incorporated in the visualizations, which could clearly influence the observers. The importance of the foreground and immediate surroundings in landscape appreciation is well known (Ribe et al., 2002) since it enables the observer to see details in the landscape such as debris and soil disturbances (McCool and Benson, 1988) and, and can play an important role in the acceptability of forests visual conditions in territories prone to public use.

The use of the visualizations has allowed for the representation of treatments that did not already exist on the field and thus to fully explore the range of options offered by variable retention in mitigating the visual impact of ecosystem management The fact that participants visually discriminated among the forest treatments suggests that visualizations were a good medium to measure attitudes related to the acceptability of visual conditions. As the visualization used for this study represented a high level of realism, using real inventory data for the region under study, we are confident that our images were representative of the real landscape. Indeed, as Ode et al., 2009 point out, real landscape and computer-based simulations are highly correlated and the level of realism is important when it comes to study people's landscape preferences.

2.8 CONCLUSION

This study aimed to identify green tree retention treatments that could improve acceptability judgments made by about the visual conditions of agglomerated clearcuts in the black spruce forest. Our results indicate that clearcuts, be they CPRS or CPHRS, which are the alternatives to green tree retention usually used in the boreal forest, are clearly unacceptable in a recreational context. However, as certain variable retention treatments were revealed as acceptable, there is a possibility of reconciling aesthetic and ecological goals and thereby calming the debate about which of these goals should prevail in forest management. Here, the improvement of the visual aspects of total cuts through variable retention, a treatment originally conceived for its ecological virtues, serves to mitigate the controversy. For those territories where ecosystem management implies total cuts, some forms of variable retention can lessen the visual impact and even generate landscapes for which acceptability of the visual conditions is quite good.

Indeed, according to our respondents, some types of variable retention treatments can significantly improve the level of acceptability of harvesting. With a high level of retention, dispersed retention is more acceptable than aggregated retention. The second best results come from high retention volume combined with small size aggregates. Other treatments that trigger neutral or near zero acceptability judgments those presenting either a low retention volume with a dispersed form, larger aggregate sizes combined with higher retention volume, or medium-range retention volume with small aggregates. Low retention volumes and large or medium size aggregates are negatively perceived but still, they present an improvement compared to clearcut.

Though the results from this study are not intended to be generalized, they do give a preliminary idea of how variable green tree retention is perceived by forest users, uninformed public and stakeholders in the black spruce forest in the context of an agglomerated harvest resulting from ecosystem management. Since few visitors of the Wildlife Reserve took the time to answer the questionnaire, those who did probably had a higher interest in forest management issues and were probably more critical than the rest of the visitors. Although the number of respondents does not allow for a generalization about the general population, the results have shown that of the acceptability judgments of this study, there were no significant differences between those made by uninformed participants, stakeholders and forest users with regard to the visual aspect of the forest intervention.

Visualization of forest treatments were used with success with different types of respondents, in different settings and on a paper questionnaire. This methodology could be interesting for forest managers seeking to known more about the public's preferences about different management options in a time and cost-efficient manner. Replicating this study in many places of the boreal black spruce forest, including with aboriginal communities, would enable to have better confidence in the acceptability of the visual conditions of these various variable retention treatments.

Even though visualizations are now often used in preference research, it is not known how well they represent Quebec's black spruce forest treatments. It would be interesting in further research to compare results from this study to acceptability scores of real, in-the-field images of the same treatments is they are to be implemented. As well, future research could address the perception of a mix of various types of variable retention on the same landscape in an attempt to better emulate post-fire residuals.

Finally, this study showed that variable green tree retention, a silvicultural treatment aiming to maintain a structural diversity and legacy in harvested forests and thus to mitigate the ecological impacts of forestry, also has the potential to mitigate the visual impacts of forest harvest. This gives great hope of reconciling aesthetics and ecology and provides managers with tools to implement ecosystem management emulating severe disturbances like fire while also addressing the population's values and concerns about forests. Some forms of variable retention thus allow to meet the economical, ecological and social goals of ecosystem management, thereby embedding this practice into sustainable forest management.

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3 SOCIAL ACCEPTABILITY OF ECOSYSTEM MANAGEMENT FROM A STAKEHOLDER'S PERSPECTIVE: A CASE STUDY IN QUEBEC'S BOREAL BLACK SPRUCE FOREST

3.1 ABSTRACT

By participating in planning processes, stakeholders have enhanced opportunities to influence the outcomes of forest management. In Quebec's black spruce forest, ecosystem management can result in immense fire-emulating forest harvests. Eleven stakeholders participating in a forest planning participation process were interviewed about their perception of the ecosystem management strategy, contrasting it with its current alternatives. Respondents were from varied sectors. Results indicate that participants generally preferred the ecosystem management strategy because of its ecological benefits, except for nature-based tourism areas, where the patch cut system was preferred. Participants were concerned by the strategy's large clearcuts, loss of habitat, visual impacts and multiple use integration. Mitigation measures concerned the residual vegetation left either in the form of variable retention or as residual forest as well as the protection of large forest blocks and old growth. Participants considered that the strategy does not sufficiently emulate the actual natural disturbances regime. Adaptability was an important component of the strategy's acceptability.

3.2 RÉSUMÉ

En participant à la planification forestière, les parties prenantes peuvent en influencer les résultats. Dans la pessière noire du Québec, l'aménagement écosystémique se concrétise par de très grandes coupes de type totales imitant les feux. Onze parties prenantes ont été interviewées sur leur perception de la stratégie écosystémique, en la comparant avec ses alternatives. Les résultats indiquent la stratégie d'aménagement écosystémique est généralement préférée en raison des ses bénéfices écologiques, sauf pour les zones de tourisme de nature où la coupe mosaïque est privilégiée. Les participants étaient préoccupés par la grande superficie des coupes, les pertes possibles d'habitats fauniques, les impacts visuels et l'intégration des usages multiples de la forêt. Les mesures d'atténuation concernaient la végétation résiduelle et la protection de massifs forestiers. Les participants considéraient que la stratégie écosystémique devait mieux émuler les feux naturels. L'adaptabilité est aussi un élément important de l'acceptabilité de la stratégie.

3.3 INTRODUCTION

Recently, forestry has undergone a major shift with the adoption of "ecosystem management," a paradigm for managing forests in a more ecological way (Long, 2009). Ecosystem management is based on the emulation of natural disturbances as a means to minimize human impact on the ecosystem. Indeed, it is thought that by emulating natural disturbances while harvesting the forest, the ecosystem will remain in its historical range of variability (Landres, 1999), and will therefore be best suited for the species that have evolved within it. In the boreal black spruce forest, where the most important agent of the natural dynamic is fire, logging is done through the deliberate cutting of vast areas of forest in order to mimic fire in size, intensity, frequency and spatial distribution (Gauthier et al., 2009).

Many studies document that people's values, beliefs and expectations about forests have changed in the last decades toward more biocentric and environmental values (Bengston et al., 2004; Manning et al., 1998; McFarlane and Boxall, 2000; Robinson et al., 2001; Williamson et al., 2012), suggesting that the new, more ecological forest cuts could respond to a growing concern within the population. However, research has also shown that large clearcuts are usually negatively perceived by different segments of the public (Bliss, 2000; Gobster, 1995; Magill, 1994; McCool et al., 1986; Palmer et al., 1995; Pâquet et Bélanger, 1997; Ribe, 1989; Schroeder et al., 1993; Sheppard, 1999). Therefore, questions are raised about the social acceptability of this particular form of ecosystem management. In fact, Long (2009) states that social acceptability could be the greatest barrier to ecosystem management. Social acceptability is the aggregation of individual judgments (Stankey and Shindler, 2006), about the acceptability of a condition where individuals compare a situation with its possible alternatives in order to determine its desirability (Brunson, 1996). The acceptation, or not, of a specific condition is then shared by a group of politically significant and identifiable group of citizens (Shindler et al., 2002). As such, social acceptability comes from different groups within the general public, among them, stakeholders. According to the Values-Beliefs and Attitude cognitive hierarchy model (Rokeach 1968;1973 *in* Allen et al., 2009), an individual's values and beliefs about forests will results in his attitude towards forests and forests practices. In this model, the acceptability judgment is an attitude, or the individual's reaction to a given situation. Social acceptability is also referred to as cultural adoptability of public acceptance (Olsen et al., 2012). These authors also define social

acceptability as the public's willingness to tolerate the use of specific management practices at least occasionally and in carefully selected areas (Brunson, 1996; Shindler et al., 2011 *in* Olsen et al., 2012). They also use the term public support.

Since the possibility to participate in the forest planning process has been identified as a factor influencing the social acceptability of forest management (Olsen et al., 2012; Shindler and Collson, 1998 *in* Shindler et al., 2004; Shindler, 2004; Shindler et al., 2004), it is relevant to investigate how participants involved in forest management planning participation process, i.e., the stakeholders, judge this particular type of ecosystem management.

Stakeholders participate in forest management planning through forest sector advisory committees, or issue table, which are a form of community-based public engagement (Parkins et al., 2006), widely used in Québec, where they work on a consensus basis (Parkins et al., 2006). These issue tables are usually composed of people having a particular interest in the forest or in forest management. Indeed, Québec's legislation identifies which stakeholders have to be invited to advisory committees (Forest Act; LADTF, LRQ) and as such, they are often comprised of groups of interests, though they can be more inclusive. Stakeholders participating in forest management planning committees meet regularly to discuss forest management issues (Parkins et al., 2006) and, in collaboration with the forest licensee, they participate into the elaboration of forest strategies, forest management planning, examination and evaluation of control results, the settlement of conflicts about the use of natural resources (FSC Canada, 2004). The participation of stakeholders into forest management decision process is intended as a means to incorporate local knowledge and values into forest management planning (Parkins et al., 2006), though issue tables generally do not have power over management decisions (Martineau-Delisle and Nadeau, 2010).. At the time this study was undertaken, such committees were enforced in Québec at the territorial level by forest licensees involved in certification processes for one or more given forest management units (Nadeau et al;., 2004). Nowadays, with the new forest regime, integrated resources and land management collaborative tables (TGIRT) are in place in every management unit (Art. 54 LADTF). In the recent years, Parkins and others (2006) have studied forest advisory committees in Canada. Their results indicate that, in Québec, participants in these committees are often required to attend as part of their jobs. The participants to this study also reckon that they can influence the decisions taken by the committee and they generally agree that the values of all those impacted or interested by forest practices are well represented in the

processes they are involved in. Participants to these forest advisory committees also report having learned about forest management and the importance to represent multiple perspectives in forest management decision. Stakeholders thus represent a group of interested, diversified and well informed participants, even though most of them are not forest management experts. Moreover, in a recent survey in New Brunswick, Canada, most respondents supported that stakeholders influenced moderately or strongly forest management decisions (McFarlane et al., 2011). The same result was also observed in Québec (Roy, 2008).

That said, the opinion of these stakeholders is important and relevant, especially since their participation can influence the outcomes of the forest management advisory committees which in turn can inform forest management decisions. Because of their participation they also represent an important group since they have a prominent role in the social network of their region (Olsen et al., 2012). In the United States, studies reported that the benefits for the local population can influence the acceptability of forest management (Shindler and Collson, 1998 *in* Shindler et al., 2004). Since participants in these committees are usually people belonging to the local communities, this could also influence their perception of ecosystem management. Furthermore, the added information these participants receive about those types of harvests, while contributing to the planning process, could also influence the way they judge the implementation of an ecosystem management strategy. Indeed, information can influence social acceptability of natural resources management (Brunson, 1993; Clausen and Schroeder, 2004; Meitner et al., 2005). Consequently, people involved in the planning process form a particular group with regard to the formation of their social acceptability judgment about fire-mimicking ecosystem management. This group may not be composed of many people, but their participation has repercussions, as stated above. For this reason, this case study is meant to explore whether people involved in a planning process perceived fire-mimicking ecosystem management as socially acceptable and why.

3.3.1 THE MANAGEMENT STRATEGY IN THE BLACK SPRUCE FOREST

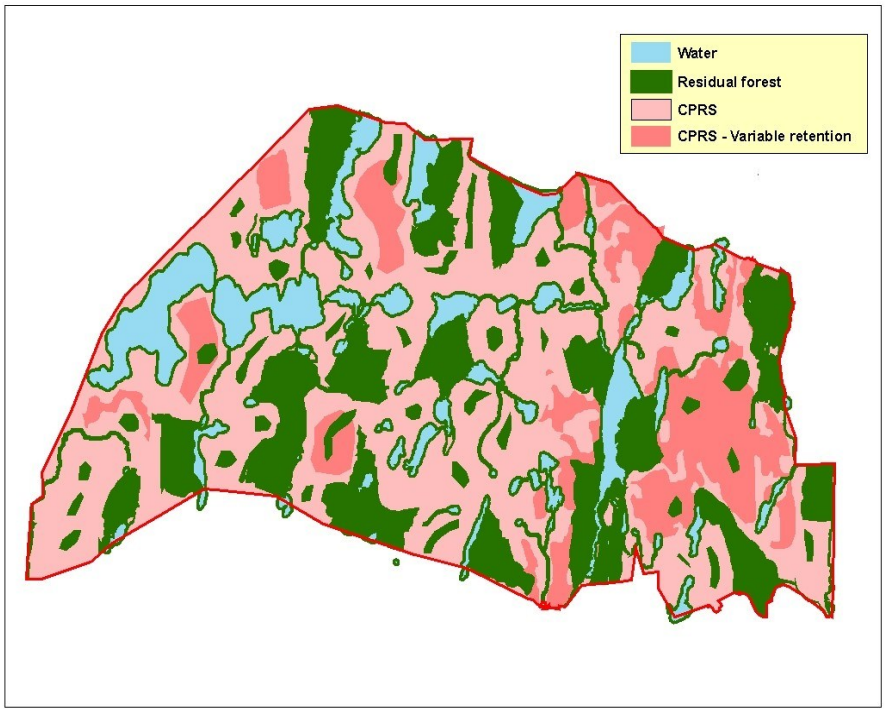
The fire-mimicking ecosystem management strategy has recently been implemented in all Quebec black spruce forests. This management strategy, set out by Quebec's Ministry of Natural Resources, Forests and Parks (MRNFP), specifies the size, form, distribution and use of residual forest in what

is called agglomerations of cuts (Jetté, 2007). It is meant to replace smaller, scattered clear-cuts, known as the mosaic patch-cut system. Due to the fragmentation it causes, the patch-cut system is now believed to be unsuitable for the black spruce ecosystem, particularly for the forest-dwelling woodland caribou (Courtois et al., 2004), which need large forest massifs (Jetté, 2007). These agglomerations span over areas varying between 30 to 150 km^2 and are categorized into three size classes: 30–70 km^2, 70–110 km^2 and 110–150 km^2. In the particular case of habitat conservation plans for caribou, the aggregated cutblocks' area can vary between 100 and 250 km^2. Residual untouched stands, where no intervention is planned, must account for 25% of the agglomeration's area. The composition of these stands must be such that riparian buffers consume 5–8% of the total area, insular blocks a minimum of 10%, and peninsulas or corridors connected to the forest matrix the remaining percentage. In order to limit the border effect and create the interior forest conditions needed by many species, the insular blocks must span over at least 50 ha, the maximum area being 200 ha, while corridors and peninsulas must have a minimum width of 500 m. These two are also meant to ensure connectivity within the greater landscape. Finally, intact stand fragments generated by operational constraints will be included in the final percentage if they are equal to or greater than 1 ha. With this addition, the residual forest would represent between 25 to 30% of the agglomerations.

Furthermore, only 20% of the logged area can be at a distance of 600 m or more from an interior forest and only 2% can be situated at a distance of 900 m or more. Other provisions serve to ensure that the residual forest is representative of the previous stand. Also, if the residual forest is to be harvested in the second pass in the future, the harvested stand in the first pass will first have had to reach 7 m in height. The guidelines (Jetté, 2007) also stipulate that variable retention harvest types, such as CPPTM (cutting with protection of small merchantable stems), CPTDV (cutting with protection of stems of varying diameter), and (CRB) (cutting with retention of aggregated stems), must represent at least 20% of the harvested area in the agglomeration. Then, clearcutting with protection of high regeneration (CPHRS) must be practiced on every site where the potential for high regeneration is strong. Partial cuts are also part of the sylvicultural treatments proposed to maintain vertical structure and to leaving biological legacies in the logged area. Finally, clearcutting with protection of regeneration and soils (CPRS) is permitted but may not be implemented on a large scale.

Moreover, the guidelines stipulate that agglomerations may not be juxtaposed. The minimum distance in between two agglomerations has to be 1.5 km if the regeneration on the adjacent area has not reached 3 m in height. Finally, every open stand sector in an agglomeration must be at a distance of 10 km or less from any forest massif that spans over at least 30 km^2.

Figure. 3.1 Spatial representation of an agglomeration



3.3.2 THE PARTICIPATION PROCESS: ISSUE TABLE

In previous years, many logging companies in Quebec have established issue tables in order to meet forest certification standards as well as the requirements of the Quebec *Forest Act* about inviting groups and persons concerned by local forest management to participate in the planning process. These issue tables are meant to reconcile values and interests concerning forests, and participants of these tables usually represent NGOs or public, para-governmental or private interest organizations, on a local basis. Such groups could be governmental, municipal, First Nations and environmental organizations as well as people engaged in sugarbushing, hunting and fishing (Forest Act, 2007).

Other groups can be invited to participate depending on the occasion. Stakeholders are therefore capable of bringing regional issues to the table. Indeed, since the purpose of issue tables is to contribute to consensus building, these stakeholders essentially gain a certain leverage in influencing forest management outcomes (Martineau-Delisle and Nadeau, 2010). While taking part in the planning process, stakeholders are also given information on forests and forestry that helps them develop a certain expertise in forest management.

3.4 OBJECTIVES

The main objective of this study is to explore stakeholders' perception and acceptability of the aggregated cutting strategy by contrasting it with other alternatives that have been implemented in this ecosystem over the last 20 years. Among these are traditional clearcutting with buffers and the patch-cut system. Furthermore, we sought to reveal which features of the agglomeration strategy influenced its social acceptability from the stakeholders' standpoint and whether the stakeholders' link to the territory influenced their perception of this ecosystem management strategy and their preferences for a given strategy. Finally, we wished to identify which aspects of the aggregated cuts could be improved, and how, from the stakeholders' point of view.

3.5 METHODS

At the time this project was set out, ecosystem management was implemented under an exemption from the legislation in force on regular forest management in the province of Quebec, and as such, was not practiced over all the black spruce forest. A case study was then identified as the best approach to learn about the perception and the social acceptability of ecosystem management for stakeholders. A logging company operating in the black spruce forest was identified that had been operating with an issue table in the implementation of the ecosystem management strategy.

All issue tables being characterized by the uniqueness of their historical, geographical, territorial, informational and relational contexts, the case study was even more appropriate given the fact that a generalization would not have been possible (Denzin and Lincoln, 2005). Our research thus comprises an exploratory study aiming to generate findings that could then be used in a representative study. Moreover, it includes qualitative semi-structured individual interviews with stakeholders, namely those who were engaged in the issue table participatory process together with a forest licensee, about their perception of the agglomeration's strategy.

When depth and richness of data is sought after, semi-structured individual interviews are better suited than qualitative methods, as here the information is revealed from the respondent's point of view rather than the researcher's predefined categories. While the interviewer makes sure to cover pre-identified themes, he or she also gives the participant more freedom in answering in order to keep the conversation smooth and natural (Babbie, 2005). Based on open-ended questions, this type of interview gives participants the opportunity to express themselves in their own words and from their personal viewpoint (Patton, 2002). In this way, the interviewers may obtain information that was unanticipated in their initial research and generally arrive at a more comprehensive understanding of what the interviewees mean (Patton, 2002).

The participants were met in May 2009 at their respective offices or in public places. The interviews lasted about 60 to 90 minutes and were tape recorded with the participant's consent. The interviewer guided the discussion according to the discussion guide. For topics concerning the technical specificities of the agglomerations, the participants were presented a verbal synthesis of the

guidelines (Jetté, 2007) and satellite pictures (figures 3.2, 3.3 and 3.4) of the three different strategies currently applied in the black spruce ecosystem. Satellite pictures had the advantage to convey the main differences between the strategies in an efficient and unequivocal manner. These are agglomerations, regular clearcutting with buffers, and mosaic patch-cutting (CMO). The following topics were covered during the interviews (See appendix 2 for a more detailed version of the interview grid and the information provided to the participants).

- Subject's connection to the forest and the territory where the strategy is deployed
- Subject's interest in getting involved in the participatory process
- Subject's perception of forest management in general
- Subject's knowledge of and agreement with ecosystem management
- Subject's perception of the agglomerations:
    - Acceptability
    - Advantages
    - Disadvantages
    - Concerns
    - Juxtaposition of agglomeration harvest sites
    - Subject's perception of the agglomerations' particularities
    - Residual forest (percentage, subsequent harvest)
    - Variable retention (role, percentage, type)
- Subject's perception of partial cutting:
    - Acceptability
    - Advantages
    - Disadvantages
    - Concerns
    - Ideal ratio in the landscape
- Subject's preferred type of harvest strategy
- Subjects' perception of large mature untouched forest blocks and large altered mature forest blocks with partial cutting

Figure 3.2 Satellite picture of the traditional clearcut with buffer strategy

Figure 3.3 Satellite picture of the mosaic patch cut strategy

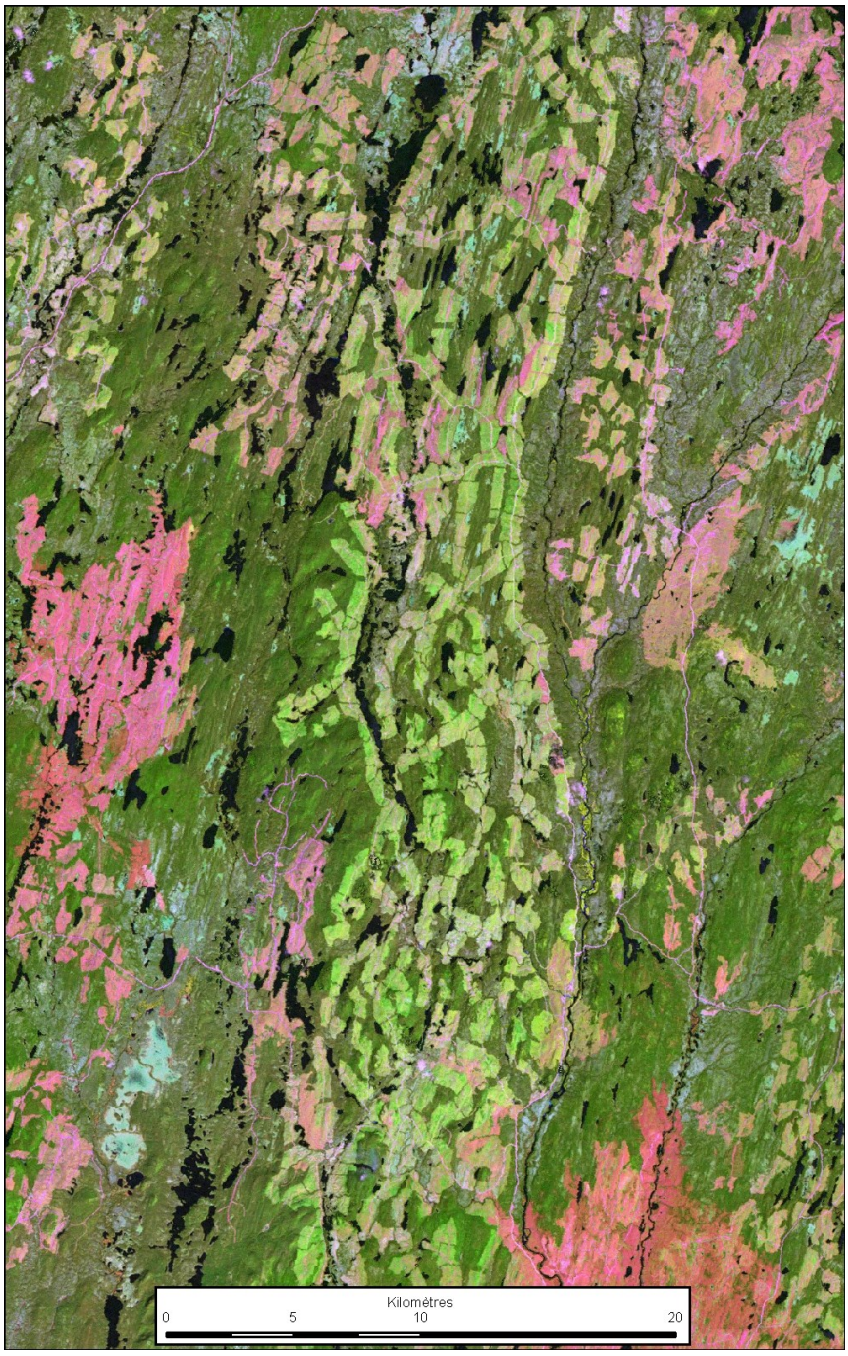
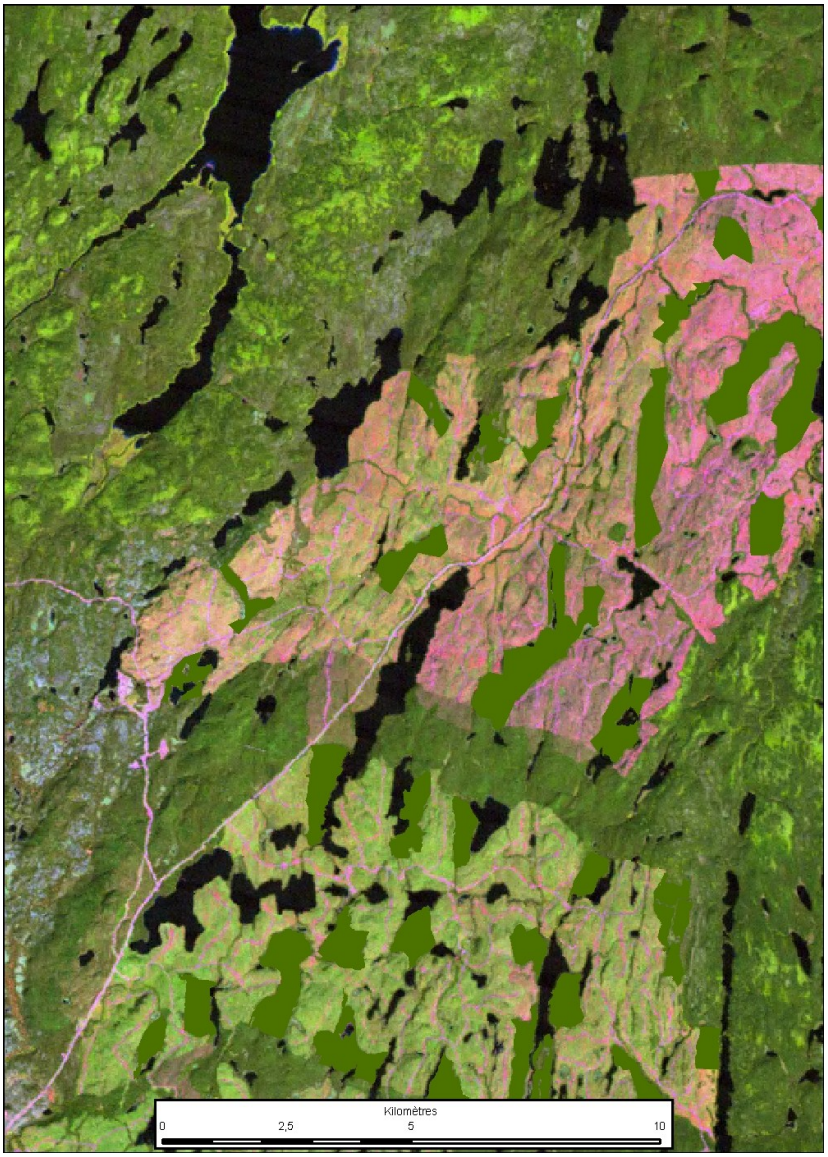


Figure 3.4 Satellite picture of the fire-mimicking ecosystem management strategy



Once the interviews were completed, they were transcribed into Word 2007 and then imported into NVivo 8. Their content was then coded according to the topics covered in the interviews. From this first segmentation of the data, a second, inductive and open coding (Babbie, 2005; Patton, 2002) was subsequently performed on sentences or sentence fragments, with emerging categories (nodes) being created as needed. Then, to ensure that every part of the transcription was coded into the right

categories, each node was reviewed and its content verified one last time and linked to other nodes if needed. At the end of the process, in NVivo terms, there were 19 parent nodes (categories), each with a few child nodes (subcategories) at the first or second level for a total of 183 nodes (Appendix 2).

3.5.1 PARTICIPANTS' DESCRIPTIONS

The participants were all members of the participatory process of the logging company. Therefore, they worked in the region and had a good knowledge of the territory. Eleven out of the 15 participants contacted agreed to participate in the individual interviews. Four were not interested in participating in the interviews, some stating that they did not know enough about forest issues. The interviewees came from the governmental, industrial, private and NGO sectors. Two were women and nine were men. Table 3.1 shows the type of respondent and their respective education. Non-zero values are shown in blue.

Table 3.1: Education, type and gender by number of respondents

SECTOR / EDUCATION	Wildlife harvest	Forest operator	Government (environment)	Government (forest)	Government (fauna)	Environment	Muncipal	Forest user
Forest engineer	0	0	0	1	0	0	0	0
Biologist	0	0	1	0	1	0	0	0
Wildlife resources technician	1	0	0	0	0	1	0	0
Forest technician	1	1	0	0	0	0	0	0
High school	0	0	0	0	0	0	0	1
Land use planning	0	0	0	0	0	0	1	0
Political sciences	0	0	0	0	0	1	0	0
Pedagogy and wildlife resources	1	0	0	0	0	0	0	0
Gender = man	3	1	1	1	0	2	0	1
Gender = woman	0	0	0	0	1	0	1	0

3.6 RESULTS

The results are presented in the order of the interview grid. We first present the participants' perception of forest management and ecosystem management. Then we cover the perception of the aggregated cut strategy and its requirements, followed by the perception of large mature forest blocks. The participants' preferred strategies are subsequently presented along with the reasons for their choices and their perception of a combined strategy involving partial cutting and fire emulation. Lastly, we present the improvements suggested by the participants. Given that the number of respondents is small and that the geographic region is referred to by its name, an identification of each respondent with a code could have led to people being recognized. For this reason, citations are numbered and not linked to the respondents.

In this section, we use tables to report the number of comments which the respondents made regarding our coding categories. This is purely indicative and should not be interpreted or used as a generalization. Of course, the number of comments made by a given participants depends on his or her volubility and does not reflect the intensity of his emotions. This is why the section will also present, for each topic, comments made by the participants that were somewhat typical or representative of the responses received during the interviews. Those comments were originally made in french.

3.6.1 PERCEPTION OF FOREST MANAGEMENT

Most interviewees were not opposed to the commercial harvest of forests, even though they had concerns about it. Seemingly aware that the forest sector was an important source of income and jobs for their region, they were willing to accept commercial harvesting, stating that they were either neutral or in favour of it so long as it was done properly in a sustainable manner. Their major concerns were related to the overexploitation of wood resources and the impacts of logging on the environment. Table 3.2 summarizes the participants' perception and the explanations they gave, if any, to clarify their position. Please note that the general categories (in bold) include subcategories (not in bold), yet that these may be coded separately. This is why when summing the number of comments in subcategories; the total may differ from the number into the general categories. Also,

comments may be classified in many categories. Comments are sentences or parts of a sentence that were attributed by the researcher to a general topic or category or into a subcategory of this topic. For example, in table 3.2, the participant from the municipal sector mentioned five negative things about forest management: one of them related to the employment in the region, two were related to the impacts on the environment and one was about the system's slowness, thus leaving one comment to more general concerns.

Table 3.2: Participant's perception of forest management according to their type in number of references coded

TYPE OF RESPONDENT (nb. of respondent) / PERCEPTION OF FOREST MANAGEMENT	Wildlife harvest (3)	Forest operator (1)	Government (environment) (1)	Government (forest) (1)	Government (fauna) (1)	Environmental (2)	Muncipal (1)	Forest user (1)
Neutral	**1**	**0**	**2**	**1**	**0**	**2**	**6**	**0**
Negative	**3**	**0**	**1**	**5**	**5**	**1**	**5**	**59**
--Arbitrage by the natural resources ministry	2	0	0	0	0	1	0	0
--Employment in the region	0	0	0	2	0	0	1	10
--Overexploitation and wastage of the wood resource	1	0	0	0	0	0	0	23
--Impacts on the environment	0	0	1	0	0	0	2	17
--System's slowness	0	0	0	0	3	0	1	0
--Laws and regulations	0	0	0	2	0	0	0	12
--No access or rights for the local population	0	0	0	0	0	0	0	9
Positive	**5**	**1**	**3**	**1**	**0**	**2**	**1**	**0**
--Sustainable development	0	0	1	0	0	2	0	0
Aesthetic concerns	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**0**

Here are some of the comments made by the interviewees about their perception of forest management:

R: Totally favourable. I think that if we want to be serious about this whole climate change question, we have to promote wood products more than metal or steel…I think it's a sector with a future and a renewable resource and that, of

course, like with anything else, it has to be well managed, well exploited. But I'm totally in favour of forest management.

R2: I would say that I'm neutral, in the sense that I don't know if I can really say neutral. To begin with, we felt that there was an economic need to exploit our resources. Wood is a renewable resource, as long as we respect the ecosystem's capacity to renew itself. At the same time, I'm well aware that harvesting a forest can lead to an increase in greenhouse gases, which we will be making up for with the new growth.

R3: I'm not against it, I think it can be beneficial. For small game animals and for moose hunting, there are some types of forest cuts that can be beneficial.

R4: Overexploitation. The real demand, what is it? The demand is not evaluated. The government gives rights to exploit the forest, but that wood is not sold in advance. We accumulate staggering, extraordinary quantities of wood that rots in the yards or that is dried, but that stays there, sleeps there. Wood prices are too high and people don't have the money to buy it. Wood consumption is extremely minimal. We are creating losses, for no reason. The demand doesn't exist compared to the actual production. We are into overexploitation, overproduction, but there's no need for that. So what justifies this harvest?

3.6.2 KNOWLEDGE AND PERCEPTION OF ECOSYSTEM MANAGEMENT

Since they had been involved for almost two years in the participation process, most of the respondents were familiar with ecosystem management and associated it with a decrease of the stresses on the ecosystem generated by logging, mainly because it emulates natural disturbances. However, a few of them confused it with watershed management, wildlife resources management, integrated management or sustainable development. Even though the majority of the participants thought that emulating natural disturbances was a good thing, some showed concerns about this type of management, including that other factors might not have been taken into account when designing the management strategy or that it could be difficult to implement. Table 3.3 summarizes the respondent's perception of ecosystem management.

Table 3.3: Participant's perception of ecosystem management, in number of respondents

TYPE OF RESPONDENT (nb of respondents) / ECOSYSTEM MANAGEMENT'S PERCEPTION	Wildlife harvest (3)	Forest operator (1)	Government (environment) (1)	Government (forest) (1)	Government (fauna) (1)	Environment (2)	Muncipal (1)	Forest user (1)
Has reluctances towards EM	2	0	0	1	1	1	1	1
because emulation is not total	0	0	0	0	0	0	1	0
because it is difficult to implement	0	0	0	0	0	0	0	1
because other inputs must be taken in account	0	0	0	1	1	1	0	0
Thinks that emulating natural disturbances is good	2	0	1	1	1	1	1	1
Confuses EM with:	2	0	1	0	0	0	1	0
integrated management	1	0	1	0	0	0	0	0
sustainable development	1	0	1	0	0	0	0	0
watershed management	0	0	0	0	0	0	1	0
wildlife resources management	1	0	0	0	0	0	0	0

The interviewees knew their region's natural disturbances quite well, as shown in Table 3.4. Almost everyone mentioned fire and those who did not talk of insects or windthrow directly referred to these as small-scale disturbances. Indeed, both large-scale disturbances, from fire, and small-scale disturbances are present in the black spruce forest ecosystem (De Grandpré et al., 2008).

Table 3.4: Participant's knowledge of natural disturbances for their region, in number of respondents

TYPE OF RESPONDENT (nb. of respondents) / NATURAL DISTURBANCE	Wildlife harvest (3)	Forest operator (1)	Government (environment) (1)	Government (forest) (1)	Government (fauna) (1)	Environment (2)	Muncipal (1)	Forest user (1)
Windthrow	1	1	1	0	0	2	1	0
Insects breakouts	3	1	1	0	0	2	1	1
Fire	3	1	1	1	1	2	1	0
Small-scale disturbances	0	0	0	1	1	1	0	0

Many respondents were aware that the fire regime in their ecosystem is quite long, as demonstrated by the following quotes:

> R1: It's a territory where fire cycles are longer, so it's more about small-scale disturbances.
>
> R2: Yes, the fire regime, they say it may be about 300 to 500 years, the period of fire recurrence.
>
> R3: …but fires, the recurrence, it's not like anywhere else. We have a fire every 500 to 400 years.

Finally, interviewees mentioned that an ecosystem management strategy had to be compatible with social and economic factors in order to be successfully implemented.

> R: In part because there are other social concerns that are contrary to the ecosystem management and that have to be integrated…there are other social inputs and economical inputs that have to be considered…but we must not consider only the economical inputs.
>
> R2: Of course we have to keep in mind the economic aspect of it…it's a societal decision, in a certain way.
>
> R3: I don't know how far it will go, but maybe we won't be able to do ecosystem management at 100% ...is has to be social, economical and environmental or ecological.

3.6.3 PERCEPTION OF THE AGGLOMERATION STRATEGY

Overall, the interviewees were not opposed to the agglomeration strategy. Many thought that, for the time being, it was the best possible option, since the other alternative, the patch cut system, was not adapted to the black spruce forest. Indeed, the patch cut system is responsible for forest fragmentation, requires more roads and contributes to the disconcerting situation of the forest-dwelling woodland caribou. Some also felt that since agglomerated cuts leave significant forested

patches in the harvesting site and since this strategy protects large mature forest blocks, it would be better than the patch cut or the traditional clearcut systems.

> R: Yes, I think that, even if it is not the ultimate solution, it is one interesting way of doing things that we have in our forest management toolbox.

Yet, it was reported by a few interviewees that roads were already being built in the massifs. For those respondents, such a practice discredited the whole agglomeration approach.

> R1: There are all sorts of debates…but yes, they say we'll go here to harvest and we'll go there later. But while they're cutting in one place, they're building roads in another…And for the caribou it doesn't make a difference whether the trucks are there for a harvest or for a road, to them it's a disturbance just the same. So, it's not true that when they are exploiting a large territory they are leaving the caribou alone for 30 years on another large territory…because during those 30 years, there will be road construction.

Table 3.5 shows which respondents, according to their type, believed that the agglomeration were acceptable or not. Those who thought that this strategy was unacceptable reported concerns with regard to wildlife resources, aesthetic aspects and tourism and considered that the agglomerated cuts were not well suited to territories with those kinds of issues. Some said the strategy would be acceptable if it comprised the intensive part of a larger forest TRIAD zoning strategy[1] (Messier et al., 2009) and provided it had some visual and wildlife impact mitigation measures, or contained more residual forest.

[1] In this concept, the forest is divided into three zones in which objectives range from conservation to timber production optimization. The three forest management zones are: (1) ecosystem management zone, (2) intensive silviculture and short rotation forestry, and (3) a conservation zone (Hunter, 1990).

Table 3.5: Acceptability of the agglomeration strategy, in number of respondents

TYPE OF RESPONDENT (number of respondents) / ACCEPTABILITY	Wildlife harvest (3)	Forest operator (1)	Government (environment) (1)	Government (forest) (1)	Government (fauna) (1)	Environmental (2)	Muncipal (1)	Forest user (1)
Acceptable	1	1	1	1	1	2	1	1
--compared to the other strategies	0	1	0	1	1	1	1	0
--provided that…	1	0	0	0	0	1	0	1
Unacceptable	2	0	0	0	0	1	0	0

Nevertheless, some participants did not consider this strategy as being completely ecosystemic. Indeed, as they were aware of the long fire cycles and the presence of small-scale perturbations such as windthrow and insects outbreaks, most of them considered that the agglomerated cuts did mimic the fires well, but that their scale was too great, as expressed in the following quotes:

R1: The ideal situation would be to have 10% of young forests in the larger landscape, so about 10% of the management unit…but that doesn't match our allowable cut, so it doesn't work. But it should be this way because it would better mimic the 300-to-500 year cycle. If we really wanted to have an ecosystem management, it should be like that.

R2: It's a territory where the fire cycles are longer, so it's small-scale disturbances...that means we should go toward micro-perturbation like partial cut or mini-cuts or something like that. You also have a certain proportion of fires, so there is some room to integrate agglomerations as well in there too, a little bit.

R3: But here, fires do not occur very often...you have some every 600 years or so...so the real ecosystem management for this territory, I think, is a mix of fire, partial windthrow and insect outbreaks.

Table 3.6: Advantages of the different strategies implemented or desired in the region, in number of references

TYPE OF STRATEGY	AGGLOME-RATIONS	PARTIAL CUTTING	PATCH CUT cmo	CLEARCUTS WITH BUFFERS
ADVANTAGES	**44**	**31**	**18**	**0**
Access to the territory	2	5	5	0
Decrease in the quantity of roads	6	1	0	0
Economic	9	7	0	0
Better integration of multiple use	1	3	3	0
Better social acceptability	4	0	0	0
Better visual integration	11	4	2	0
Better for fauna	6	4	9	0
Protection of forest massifs	9	0	0	0
Protection of woodland caribou	15	1	0	0
Faster recovery of the forest stand	0	3	0	0
Increased or sustained wood volume	0	4	0	0
Really ecosystemic	0	3	0	0
Easier management	0	0	1	0
Smaller size	0	1	2	0

During the interviews, participants commented on the advantages and disadvantages of the management strategies. Most comments were made in response to a question asking to identify these advantages and disadvantages with regard to the agglomerations and the partial cut, while other comments were also made spontaneously throughout the interviews. Table 3.6 lists the number of comments made according to the type of perceived advantage of one of the four alternative strategies. While many comments concerned the agglomeration strategy, none mentioned the traditional clearcut strategy with buffers, suggesting that this latter system is not much appreciated. Most comments were formulated in opposition to the patch cut system. Many quotes reveal that the protection of the forest-dwelling woodland caribou is important to the respondents, as is the protection of forest massifs. Furthermore, many comments concern the fact that the agglomeration allows to mitigate the visual impacts of the harvesting. Finally, some respondents talked about the

fact that the agglomerations are less expensive than the other strategies. Comments about partial cutting were mainly made at a later stage of the interview, and then more so in a comparative manner. Note that the first lines of tables 3.6 and 3.7 report the total number of comments made for that management strategy; however, those lines are not necessarily the sums of their respective columns, since one comment can be coded into more than one advantages or disadvantages category.

The following comments express the major advantages the participants perceived in the agglomerations:

R1: I think that for people, from a visual perception standpoint, in the kind of forests that we have here, this [agglomeration] would be a better bet than this [CMO]...When a harvest consisted only of little cutblocks with equivalent residual forest, we did the exercise with the forest licensee on the field, and when on the other side the regeneration was even due to an agglomerated clearcut, it looked more like a natural disturbance on the agglomeration side.

R2: But with the agglomerations, the guidelines, in the way they define the rules, at least we still have a residual forest that is representative of the original forest…I think that's more interesting.

R3: The advantages are of an economic nature. We have to move less, we maximize the harvest on the same territory. It's also easier for the logistics compared to the patch cut system. There is less need for forest roads on a short-term basis...so the advantages are economic.

R4: Despite the fact that it isn't ecosystemic, we can't say it doesn't benefit the caribou.

The disadvantages that the respondents attributed to each strategy were also coded, with Table 3.7 indicating that most of the criticisms made about the agglomerations were related to their large surface area, such as loss of habitat, the difficulty to mitigate the visual impacts, and the fact that other uses of the forest were hard to integrate. Furthermore, some respondents stated that they did not consider this strategy to be a real ecosystem management for their region.

As tables 3.6 and 3.7 show, while some respondents thought the agglomerations had some advantages in order to mitigate visual impacts, others were of the opposite opinion. While the last ones considered the big surface area of the agglomerations to be problematic, the first ones saw in variable retention and insular blocks and peninsulas, interesting ways to mitigate negative visual impacts.

Table 3.7: Disadvantages of the management strategies in number of references

TYPE OF STRATEGY	AGGLOMERATIONS	PARTIAL CUTTING	PATCH CUT	CLEARCUT WITH BUFFERS
DISADVANTAGES	**52**	**20**	**8**	**6**
Windthrow-prone	1	0	0	1
Surface area too large	13	0	1	0
Hard to regenerate	2	0	0	0
Firsts attempts were not successful	5	0	0	0
Easier access to the territory (more people can use it)	0	4	0	0
More expensive	0	8	0	0
Negative social perception	6	0	0	2
Is not suitable to multiple use	11	0	0	1
Harder visual integration	9	1	1	0
Environmental impacts	3	0	0	1
Impacts on wildlife (game) habitats	9	0	0	0
Facilitates wood harvest	2	0	0	0
Roads are not maintained	1	0	0	2
Workers' availability	0	1	0	0
Disturbs the woodland caribou	4	6	5	0
Incompatible with other ways of managing the territory	2	0	0	0
Is not ecosystemic	8	0	1	0

Here are some of the respondents' quotes used to describe the agglomerations' disadvantages:

> R1: That's why I was saying that it was one of the interesting solutions, but that it shouldn't be the only thing we do, without thinking. Because if we only implement this strategy, we will get a type of harvest that is very difficult to integrate visually.

R2: The disadvantage is at the social level...if you do outdoor activities in a sector that has been harvested in the agglomeration's fashion, there is a wide portion of the landscape that will be altered…that's a negative impact.

R3: We shouldn't think only about the caribou here. I know the caribou are important, but they aren't alone in the woods. I think that lots of species' habitats will be destroyed because of this type of harvest.

R4 : There are lots of different uses on the same territory and there are many management organizations controlling different things…I am thinking of the wildlife managers who apply fire-mimicking ecosystem management, which results in large clearcuts, like the one the ministry is putting forward. This will cause problems…because they sell moose hunting.

R5: You don't have the same wood volume, that means it's gone. The caribou is gone, because you just squeezed it out, and the place it goes to will be then overpopulated.

3.6.4 PERCEPTION OF THE IMPLEMENTATION GUIDELINES OF THE ECOSYSTEM MANAGEMENT STRATEGY

The participants were presented with the implementation guidelines of the ecosystem management strategy about residual forests and variable retention. In summary, the provisions require that 25% to 30% of one agglomeration be left untouched, in the form of residual forest that must be left following certain guidelines. Furthermore, they stipulate that 20% of the logging be done in variable retention. The participants were then asked about their perception of these provisions and their distribution over the terrain. Table 3.8 summarizes the respondents' opinion about the percentage of residual forest and variable retention. The ideal percentage category indicates what the respondents believed to be an ideal proportion.

Table 3.8: Participants' perception about the percentage of residual forest and variable retention in number of respondents

	RESIDUAL FOREST	VARIABLE RETENTION
PERCENTAGE	**10**	**9**
Actual is acceptable	7	3
--Because of complementary measures	2	0
Actual is not enough	2	5
Ideal percentage	5	7
Uncertain about it	1	4
Should vary according to the issues	3	1
--Aesthetic issue	1	0
--Wildlife issue	1	0
--Priority layers	1	0

3.6.4.1 Residual forest

3.6.4.1.1 Percentage

Some stakeholders argued that the actual percentage is acceptable considering that other measures would ensure that the residual forest is well distributed, as reflected in this quote:

> R: At first, I would say it is acceptable. The reason why is because this approach implies that a replacement forest block is left near this harvest block…there is the same amount, in terms of wood volume, that will be left close by...When this is added up with the 30% of residual forest inside the harvest, it represents quite good amounts of wood left standing. For different reasons...among them the OPMV, the salmon river provisions, and the Equivalent Clearcut Area (ECA)…With a strategy like this one, I think it is relatively safe. I don't think that more than 50% of a watershed could be harvested with the equivalent clearcut area provisions.

However, to some participants the actual percentage was not enough, mainly for wildlife or aesthetics concerns.

R : My concern for this sector is the landscape…if you have a landscape where 70% of your field of vision is harvested and 30% is not harvested, that landscape is certainly not going to be visually acceptable.

Others mentioned an ideal ratio, either in the form of a percentage or another comparison, to harvest the agglomeration:

R : I always come back to my ideal world. In a 60-year cycle, we could take one third of the forest, and 20 years later, when the first one will be regrown, another third, and in another 20 years we can go back and take the last third.

R2: The more they leave, the better it is. For the wildlife, the ideal would be 50-50. In a sense, it's a bit like what's done here, with 30% left and 20% altered...It's not total harvest.

Finally, some considered that the percentage should vary according to the specific issues of a territory, be it aesthetics, wildlife or mature volumes. In other words, the percentage should not be normative but allow for adaptation.

R: My perception is that the 30% could be acceptable sometimes and not sufficient at other times. It depends on the species that are on the terrain…so I keep thinking that this strategy really has to be adapted as much as possible to what is present on the ground…That being said, I think 30% is an interesting basis from which we can begin to modulate based on what we find on the terrain.

3.6.4.1.2 Layout and composition

Still with regard to the residual forest, some respondents feared that it would be left as inaccessible terrain or that it would be comprised of poor quality stands.

R : We all know very well that these spots will only be left as inaccessible terrain and things like that. The licensees, they don't leave wood they could have harvested. In the end, for us, all that will be left will be inaccessible and not really of a good quality…and it probably won't be interesting for the wildlife. But it's always this way.

R2: I saw a residual forest where the lumberjacks could not log.

Yet, others assured that the guidelines would not permit such a thing. Besides, some interviewees mentioned the possibility for the residual forest to mitigate some impacts of the agglomerations on other forest uses and on aesthetics:

R: If the residual forest is distributed, in having a rule about the spatial distribution, it forces you to locate your residual forest where it's best suited, in a certain way. And at the same time, the forest is better distributed, and it's also better for the visual aspect…It's a better start.

R2: Of course, the goal is to have the maximum of intact forest around cabins and chalets, that's for sure.

R3: The forest manager can leave forest blocks and put the block or the peninsula there for a while and during that time; it will enable multi-use harmonization.

3.6.4.1.3 Harvesting the residual forest

Although not addressed in the guidelines, the question of harvesting the residual forest at the occasion of a second pass is an issue. The respondents were asked about whether they felt this was acceptable or not, and if so under which conditions. Most participants were not opposed to a future harvest of the residual forest, however, only under the essential condition that the harvested sites had reached an acceptable height with substantial forest attributes.

R: An analysis is needed to know at which height it becomes acceptable, and if it's 20 years, 20 years it will be. If it's 80 years, then 80 years it should be!

R2: It's not necessarily a time period…on the Côte-Nord, sometimes it can take as much as 30 to 40 years before it becomes interesting again and that the forest has sufficiently regenerated. For sure, that regeneration then has to reach at least 4 to 5 meters in height.

R3: The point is that you need to have a "closed forest" of at least 7 metres in height where a harvest took place before you can go in there again to harvest the residual forest. If you plan to go back there in 20 or 15 years, forget it!

Among those who thought that a future harvest was acceptable, many argued that not all residual forests should be harvested, so that at least some of them could reach the old-growth stage.

R1: Would it be acceptable that we harvest some parts? Yes, but I think that it's important, for a given territory, to maintain old-growth forests.

R2: I think they should leave some anyway. Often, what they leave is what they can't harvest. They should consider leaving one fourth …that would be an acceptable number.

Nevertheless, for some interviewees, a future harvest of the residual forest did not seem acceptable. They maintained that the residual forest had an important role as a biological legacy in the agglomerated cuts and/or that such a harvest would compromise the protection of forest-dwelling woodland caribou.

R1: Personally, I'd say no for sure. We leave it as biological legacy, we don't harvest it.

R2: The way I see things, that block, eventually, should become the protection block. So, in theory we should not go back in there before we have another block nearby that is ready for the rotation.

3.6.4.1.4 Size

Some respondents talked about the size of the patches of the residual forest. It was important for them that those patches were big enough to recreate interior forest conditions and protect wildlife.

> R: I think that those residual forest patches should be big enough to serve a shelter function for wildlife.

3.6.4.2 Variable green tree retention

3.6.4.2.1 Percentage

As shown in Table 3.8, while some respondents considered 20% to be a sufficient retention percentage of the harvested part of the agglomerated cuts, others thought it should be higher. These participants maintained that mimicking natural disturbances would require more variable retention in order to truly imitate fires and small-scale disturbances. They felt that the objective should be higher and be based on a scientific study of natural disturbances. Here, some interviewees expressed an ideal percentage of variable retention in ratio form or simply stated that variable retention should be performed wherever possible. Others were uncertain about what the ideal percentage should be, conceding that they lacked the knowledge for making such a decision. And still others mentioned that the ratio should be adaptable according to the issues of a given territory.

> R: Off the top of my head, I think it was about 70% of the forest that could be suited for those types of treatments.[1]
>
> R2: I think it should be more than that (20%), as far as I'm concerned it could be all of it!
>
> R3: One third would be a good number for me.

[1] 70% is the percentage of irregular forest suitable for partial cutting in this region.

R4: The more they leave, the better it is. For wildlife, the ideal would be 50-50. It's a bit like what is done here with the 30% left and the 20% altered. It's not total harvest.

R5: Is it adapted? I don't know enough to tell.

R6: I can't say if it's too much or not enough. It's like I said earlier, it has to be adapted to the terrain. There are surely places where it's not enough and others where it's too much. Still, it's a good thing to start from in the discussions and analysis.

R7: You apply partial cut as much as possible, variable retention cuts…I mix them up.

The comments on the ideal percentage revealed that some respondents were not able to distinguish between variable retention and partial cutting, which are gradients of the quantity of commercial trees left on a harvested site.

R1: You apply partial cut as much as possible, variable retention cuts…I mix them up.

R2: Off the top of my head, I think it was about 70% of the forest that could be suited for those types of treatments. (which is the percentage of irregular forest suitable for partial cutting in this region)

3.6.4.2.2 Aggregated retention

Many comments about variable retention concerned its aggregated form. Some of the concerns were about windthrow. Respondents feared that if the aggregates were situated on shallow soils, they would fall because of the strong winds. Some felt that the aggregated retention had to be localized on suitable sites protected from the winds, with thick soils.

R1: As long as the clumps are well located…if you have clumps in a zone windthrow prone…

R2: Because it's windthrow-prone…in the black spruces forest, roots are shallow. Maybe it isn't well suited for this type of forest…it depends if the clumps are protected from the wind or not.

R3: It's not a good investment…we leave x% of the trees standing (and they will fall because of windthrow), finally, it would have been better to cut them and send them to the mill.

Windthrow seemed a problem for some respondents, while some did not bother because they considered that even lying on the ground, it still suited the purpose of variable retention:

R1: That's it. A big tree and a lot of small ones…maybe eventually the big one will break or be knocked down. But listen, that's the goal, that's the objective of variable retention…and at the same time, you protect the young ones.

Other interviewees mentioned the positive visual impact of variable retention, especially for the aggregates:

R1: You do variable retention and thereby you maintain structural patches in the landscape, so it's green. On the satellite images, you can see green instead of only pink.

R2: They did variable retention. I would say that, in the landscape, I could show you some pictures…from a distance, on a mountainside, when it's well done, you can see some greenery, even if it's a recent harvest.

Moreover, some respondents emphasized the fact that aggregated retention was easier for forest operators, compared to dispersed retention. Some also said that the difficulty to reach the objectives of dispersed retention, mainly in terms of vertical structure, often led to aggregated retention.

R: For now, I think it's easier for them (machine operators) to leave clumps of trees than scattered ones. It's not very complicated. The operator doesn't have too much trouble doing it.

R2: I saw some. The licensee was among the first to do some because they had trouble meeting the requirements of other types of harvests leaving trees, so they did variable retention in clumps.

Finally, some comments referred to the size of the aggregates, with some interviewees indicating they should be bigger in order to protect wildlife.

R: A small clump has more advantages on the forest regeneration side…Those left trees are going to spread their seeds… I think that the clumps should be bigger in order to serve as shelter.

3.6.4.2.3 Role of variable retention

Respondents saw many functions to variable retention. Some mentioned the ecological function of the trees as shelter, micro-climate regulators, biological legacies or water pumping systems. Others talked of it as a type of insurance for the recolonization of the harvested site; some made references to its aesthetic advantage; and some reported that it would decrease the return time for the next harvest.

R: Of course, the ecological function of the tree has its importance in terms of evapotranspiration for the forest, shelter for wildlife and a perch for birds. I also think of all the water retention issue.

R2: At the level of the ecosystem, it has to imitate what a fire does and, at the same time, it will create a stand with an irregular structure.

R3: Well, as for the aesthetics, it's surely more acceptable…for wildlife, it's also more interesting…there are still mature trees scattered everywhere on the territory. It also provides more shelter for wildlife, especially for the moose.

R4: Having seen the differences between a clearcut and a CPPTM on the field, there surely is an advantage, at the landscape level at least.

R5: It shortens the return.

3.6.4.3 Spacing of aggregated cuts

The guidelines about the juxtaposition of the agglomerations state that there must be a 1.5 km buffer between two agglomerations. The interviewees were asked whether they considered this distance to be sufficient or not.

Table 3.9: Participants' perception of the juxtaposition requirements in number of respondents

TYPE OF RESPONDENT	Wildlife harvest (3)	Forest operator (1)	Government (environment) (1)	Government (forest) (1)	Government (fauna) (1)	Environmental (2)	Muncipal (1)	Forest user (1)
JUXTAPOSITION	**3**	**1**	**1**	**0**	**1**	**2**	**1**	**0**
Should vary according to the issues	0	0	1	0	0	1	0	0
Uncertain	2	0	1	0	0	1	0	0
Actual distance inacceptable	0	0	0	0	1	0	1	0
Actual distance acceptable	0	1	0	0	0	1	0	0

As Table 3.9 shows, for those who made a comment, opinions vary between all the possible options. While some respondents are completely satisfied with this distance, others believed it was not sufficient for harvests as big as the agglomerations. A few felt they did not have the knowledge to decide if it was enough or not, and others thought that it could vary according to the issues of a particular terrain, especially in the case of multiple-use terrains. Here are some of the comments received:

R1: It's been a while since I read on the subject…1.5 km seems valid.

R2: It doesn't make sense…what's the point? This, for me, is not ecosystemic at all.

R3: I don't know enough…I don't know what is acceptable for the forest licensee or not.

R: I don't think I can answer that. It depends on so many things. If it's a territory suitable for this, then it might be better to place a few close to one another. And if it's a zone where there are concerns about landscape aesthetics or other activities, I would say 20 km…It isn't a question of how many kilometres but a question of distributing the agglomerations intelligently on the basis of the other uses of the forest. I'm not totally opposed to the idea that there could be two of them close to one another if there's a reason that justifies it…we have to do it this way because, farther away, there is tourism, caribou, landscape, you name it….

Some respondents expressed the idea that the proportion of forest left standing should be equivalent to the forest harvested, while others proposed a minimum distance.

R1: Maybe there should be as much wood harvested as left standing.

R2: I'm thinking that, in an ideal world, there would be a residual block practically as big as what was harvested…it represents such immense areas, it's unbelievable.

R2: I have a hard time answering that one…it's should be the distance necessary to forget that there was a harvest when you're sitting in a moving vehicle…about 50–60 km.

For other interviewees, even if the distance between the agglomerations was short, it was acceptable because there was another requirement asking for a forest massif of 30 km^2 to be situated at less than 10 km of any point of the agglomeration's perimeter—a measure ensuring that not as many agglomerations can be put close to one another.

R: Yes, that's it. You have 1.5 km to keep in-between as a buffer, but it could be 1 km…anyways, you always have to have your 30 km^2 massif at less than 10 km from your agglomerations' borders. So you can't juxtapose that much of them because soon enough, you won't have any massifs left. See, there are many provisions complementing each other.

3.6.5 PERCEPTION OF LARGE FOREST BLOCKS

Forest massifs are part of the agglomeration strategy in two ways. First, in the case where the agglomerations are intended to protect the habitat of the forest-dwelling woodland caribou, a protection massif roughly equivalent to the size of the agglomeration is set aside, to be left untouched until the cut agglomeration is ready to serve as habitat. This massif must not be disturbed in any way. But when the agglomerations are made somewhere else than a recognized caribou's habitat, the forest massif could be altered with partial cutting. The respondents were questioned about this possibility to alter the massifs; Table 3.10 summarizes their positions.

Table 3.10: Participants' perception of altered massifs in number of respondents

TYPE OF RESPONDENT	Wildlife harvest (3)	Forest operator (1)	Government (environment) (1)	Government (forest) (1)	Government (fauna) (1)	Environmental (2)	Muncipal (1)	Forest user (1)
ALTERED MASSIFS	2	1	1	1	1	2	1	0
Acceptable	1	1	0	0	1	0	0	0
Conditions under which it would be acceptable	2	0	0	1	1	0	0	0
Unacceptable	1	0	1	0	1	2	1	0

Partial harvest in massifs that are not included in a caribou's management plan was acceptable to some respondents because it offered another way to harvest the territory without completely removing the forest structure. Some had special conditions under which it would be acceptable, such as harvesting only the exterior part of the massifs or leaving a high percentage of the stand's volume standing.

R1: I think it's worth exploring…but it needs further research and experimentation. But yes, it could be acceptable if we maintain structures. I think that we can harvest a given proportion without impacting biodiversity…I think it has to be explored, but not everywhere. But we could have a few altered massifs.

R2: If you partially harvest in a class-B density strata, then it will stay closed, even if you convert it to a class-C density class.

R3: Yes, it's acceptable, but it has to be with a percentage and harvest types that are really interesting. I was talking about partial cut with 40% of the volume harvested, now that's interesting!

R4: Maybe just on the edge, a fringe, a narrow strip around the massif.

But for others, it remained unacceptable, mostly because they feared it would compromise the caribou conservation. These respondents did not make a difference between the protection massifs and the other massifs:

R: For the caribou, no, the problem is not about the number of trees left, it's about being disturbed. And, for the caribou, whether the disturbance comes from harvesting or any other type activities, a disturbance is a disturbance. The problem is not forest harvesting in and of itself, it's human activity.

R2: I'm not sure, I think we could disturb the caribou.

The interviewees also had other concerns about the massifs, for example regarding their size and their opportunity to reach old-growth stage.

R1: Quite apart from that we also have to preserve old-growth massifs for the fisher, which is a valued species in this region, because we have many trappers.

R2: For a massif to be worth it, if you don't have enough woodlands, you can't recreate the conditions of an interior forest. The border effect can be felt up to 80 metres inside…I mean that if the massifs are too small, then you'll have a border effect inside it, and for biodiversity it won't be as good as it can be in bigger massifs.

3.6.6 PREFERRED STRATEGY

Asked to choose between the agglomeration strategy, the patch cut strategy or the traditional clearcut strategy with buffers, which are the strategies currently implemented in the black spruce ecosystem, most respondents chose the agglomeration, as shows Table 3.11.

Table 3.11: Participants' preferred strategy in number of respondents

Strategy	Agglomeration	Patch cut CMO	Traditional clearcut with buffers
Nb. of respondents	7	4	0

3.6.6.1 Agglomeration

Many participants preferred the agglomeration. They considered it was an improvement compared to the traditional strategy, believed that its residual forest and massifs were better for wildlife, thought it offered more liberty to the forest manager, especially for multiple-use concerns such as aesthetics, and recognized that it was economically efficient.

R1: When I see it like that on the map, it looks like we're making progress, it's better than traditional clearcut.

R2: I think that for people, from a visual perception standpoint, in the kinds of forests we have here, this [agglomeration] would be a better bet than this [CMO]...When the regeneration is all even is looks more like a natural disturbance than when a harvest is comprised of little patches of forests.

R3: For big wildlife, having refuges, like the ones the agglomerated clearcut create and protect in the form of large forest blocks, enables species such as caribou and moose to establish yards.

R4: Because it gives the planner a lot more freedom about where he is going to leave the residual forest. When balancing forest uses, it's easier to work with agglomerations than with traditional clearcuts. The planner can leave blocks or peninsulas, and put them where he sees fit in order to address certain concerns for a while.

R5: It has a more natural look in terms of landscape aesthetics, it gives a more natural look. And also, the economic aspect…less roads, interventions are concentrated. It's way easier for logistics.

3.6.6.2 Patch cut system

Other participants had a preference for the patch cut strategy (CMO), considering this strategy to be better suited for game wildlife and to provide for a better mitigation of the visual impacts of logging. Table 3.12 shows which participants saw advantages in the patch cut system according to their type. All are related to wildlife management, be it because this type of management creates a good habitat for moose, thereby increasing its population, or because its dispersion increased access to the territory for hunting and fishing purposes.

Table 3.12: Patch cut system advantages according to the respondent types in number of comments

TYPE OF RESPONDENT	Wildlife harvest (2)	Forest operator (1)	Government (environment) (1)	Government (forest) (1)	Government (fauna) (1)	Environmental (2)	Municipal (1)	Forest user (1)
Advantages	5	0	0	0	0	0	3	0

R1: Talking about hunting and fishing…it gives more accessibility to water bodies and it also distributes the wildlife harvest.

R2: It diversifies the forest…For moose and small game, the habitat should ideally be a mix of young broadleaf stands and mature softwood stands...harvests of small areas.

R3: Less visual impacts, and for wildlife it's really interesting, especially for moose.

R4: That would be ideal, it would benefit moose.

R5: I'm sure that for wildlife it's excellent. You have the dormitory and the dining room next to it.

R6: They don't want to do patch cut anymore because of the caribou, because it doesn't suit the caribou…but for the wildlife reserve, patch cut is important because it's suitable for moose.

3.6.6.3 Traditional clearcut with buffers

None of the interviewees preferred the traditional management strategy. Many of the comments made about this strategy concerned the buffers, which were disliked either for their visual aspect or their susceptibility to windthrow. Other respondents mentioned that these kinds of harvests remove all the forest cover from the ground. Some comments concerned the fact that, like the agglomeration strategy, roads are often abandoned after this type of intervention, restraining access to the territory for other purposes.

R1: Yeah, they grant you access to the territory, but as soon as they're done harvesting, the road is abandoned.

R2: The problem with those damned buffers is that they are knocked over by the wind.

R3: It looked like this: big squares with nothing left.

R4: For the moment, the problem, when you're on a plane, is that all you see is the little strip, the other little strip, and so on…it's all regular, it jumps out at you.

3.6.7 PERCEPTION OF PARTIAL CUTTING

As presented in Table 3.6, the interviewees saw many advantages to partial cutting. Among these are: a better visual integration of harvesting; advantages for wildlife; a better integration of multiple uses; economically efficient; opens access to the territory; promotes a rapid recovery of the forest stand; maintains or increases wood volumes; and ecosystemic for the region. Here are some of the respondents' comments about partial cutting:

R1: For visual integration, it's certainly an advantage…As a forest user, I only see advantages to partial cutting.

R2: From what I've heard about the theoretical aspect, it can maintain the forest canopy, visual screening, structured forests as well as uneven-aged forests like the ones we have in the natural environment…So it can be argued that for wildlife that has evolved in these old-growth forests, if we could find those old-growth attributes while implementing partial cutting, I think we should continue to look into it.

R3: I can tell you that it's far more interesting with partial cutting because they'll have to come back, so they'll maintain the roads.

R4: Partial cuts are probably more ecosystemic and we would probably obtain the same benefits for the caribou, because it would favour a faster return of the ecosystem.

R5: Yeah, if we want to go that way, we must acknowledge that we want to produce large logs in the future, compared to what we are doing with clearcuts. It's not a bad societal choice.

Some interviewees also saw downsides to partial cutting, as presented in Table 3.7. Among their arguments were that partial cutting could provide easier access to the territory, in turn leading to

unwanted visitors; be more expensive; disturb the woodland caribou; and encounter problems with regard to recruiting sufficient workers. Here are some of the comments made about the disadvantages of partial cutting:

R1: It's going to be a serious problem here because of the forest workers' availability. It's going to be hard to recruit.

R2: When…you have to do a partial cut, the problem is that there are no incentives for implementing this type of harvest, which is more expensive…that's the problem.

R3: More roads, more this and that ...The operational cost is higher.

R4: That would mean foresters have to open more territory...in a broader context, let's say that that could be a disadvantage…It's a fact that more and more people come here now. There are more vacation leases [permits to build cottage or cabin on public land]… For us, that's bothersome because some sectors are only accessible by snowmobiles, which is valued by the customers. For other sectors, we use the pickup, and then we need the road to be in good condition. So, depending on the lakes we're working with, more access could be good or bad for our objectives.

R5: And the other issue, the one of the caribou. It doesn't like the opening up of the territory, well it's bad for it…that's proven, demonstrated.

Finally, some respondents mixed up partial cutting with patch cutting:

R1: It diversifies the forest…ideally for the moose and small game, the habitat should be a mix of young broadleaf stands and mature softwoods stands…harvests on small areas.

Interviewer: If there was partial cutting, would you see any advantages?

R2: Hum…for sure, is it a patch cut?

3.6.8 PERCEPTION OF A STRATEGY COMBINING AGGLOMERATION AND PARTIAL CUTTING

With the possibility to partly harvest large forest blocks between the agglomerations, the actual agglomeration strategy would shift to a combined strategy allowing for partial cutting to take place along the agglomerated cuts. The interviewees were well aware of the natural disturbance pattern for their region and many of them mentioned that the agglomerations were not that ecosystemic because they overrepresented fires. Indeed, for the participants, it was obvious that ecosystem management should include micro-scale disturbances to emulate windthrow and insect outbreaks in order to maintain uneven-aged stands. Therefore, they were all in favour of partial cutting being included in the strategy.

The respondents were asked about a combined strategy using aggregated cutting and partial cutting and the ideal ratio between these two types of cutting. While some suggested a precise ratio, others recommended that it should emulate the natural disturbance pattern. As already reflected in some of the responses, this was a question of adaptation to the territory's issues in terms of multiple-use.

R1: It's ok to think like that in a TRIAD context. If we do intensive forestry, then there's another 60% we have to leave in extended management and softer management such as partial cuts, and another percentage to be left in protected areas. It's ok to do intensive harvesting in a global process that also enables the protection of the territory, the partial cut side.

R2: I'd say half and half…it would still be acceptable.

R3: So, in the black spruce forest, we should aim to have as much as possible...Even though, like we said, both strategies could be good for the caribou. At this moment I'd say to make 60% partial cuts.

R4: The history of fires in the region should be traced. That would give us an idea of our maximum threshold.

R4: You have to leave twice of what you harvest.

3.6.9 IMPROVEMENTS SUGGESTED BY THE PARTICIPANTS

All throughout the interviews, the participants mentioned their thoughts about what could be improved in the different strategies, forest treatment or forest management in general. Table 3.13 summarizes the number of comments per category.

Table 3.13: Improvements suggested by the participants in number of comments

STRATEGY	AGGLOMERATION	PARTIAL CUT	RESIDUAL FOREST	MASSIFS	COMBINED STRATEGY	FOREST MANAGEMENT
IMPROVEMENTS	**20**	**3**	**6**	**3**	**2**	**11**
More adaptability	3	0	0	0	0	0
Admit decreases in annual allowable cut	1	0	0	0	0	0
Take the clearcut equivalent area into account	2	0	0	0	0	0
Have public consultations more often	0	0	0	0	0	1
Give credits for partial cuts	0	1	0	1	0	0
Decrease forest harvest	1	0	0	0	0	2
Improve aesthetics	5	0	0	0	0	0
Have better targeted interventions	0	0	0	0	0	2
Develop a new strategy	2	0	0	0	2	0
Perform forest operation in winter only	0	0	0	0	0	0
Switch to manual forest operations	1	0	0	0	0	3
Divide forest territory into zones (TRIAD)	2	0	0	0	0	0
Preserve old-growth and intact ecosystems	0	1	4	1	0	1
Improve regionalization	1	0	0	0	0	1
Give the wildlife reserves a special status regarding forestry	0	0	0	0	1	0
Arbitration by a third party	0	0	0	0	0	1

No comments were made on the patch cut system, variable retention or the traditional clearcut strategy.

3.6.9.1 Agglomerations

Many comments concerned the agglomeration strategy and advocated the following: more flexibility; decreases in the annual allowable harvest cuts; improvements of the aesthetic aspect; consideration of other management tools (such as watershed management); improvements to the strategy; and different zoning and greater regionalization.

R1: What's interesting with the TRIAD approach is that you can do intensive forest management and that's the agglomerations' part…they're near the mills. Agglomerations 400 km far from the mills, can we think about it twice?

R2:I think we should address this on a case-by-case basis...We can't set a basic uniform rule. It depends whether you're dealing with a threatened species or if it's only at the general biodiversity level…it's important to be able to approach the management from a wider angle in order to take social needs into account.

R3: Maybe involve the regional people more, the ones that have knowledge about the territory. After that, I mean after the local people, be it from the ministry or the industry, you'll also need money to develop this.

R4: There's one very simple thing to diminish the visual impacts of human disturbances: instead of harvesting like a clearcut around the residual forest's blocks, you could feather the edge…I don't think this has been done here.

3.6.9.2 Partial cutting

Some of the remarks about partial cutting expressed the fear that this practice would be implemented everywhere where there were no agglomerations, leaving no untouched areas. Another respondent argued that given the high cost of this practice, it should be subsidized by the government in the form of financial credits to forest licensees. Finally, one comment was made about the nature of partial cutting, insisting that it leaves a suitable forest cover.

R1: Well it should not be done everywhere…We have to keep some ecosystems untouched and let them evolve naturally to their old-growth stage.

R2: There's a higher operational cost to partial cutting and that's why there should be credits as a form of compensation. This would also contribute to the good management of the forest.

R3: And partial cuts, real ones, really partial...What I saw was harvesting where they could take 40%, but in the end, it didn't really show. There are now some new harvesting methods that are really interesting.

3.6.9.3 Residual forest

As demonstrated in Table 3.13, the comments made about the residual forest insisted on the importance to preserve old-growth and some intact ecosystems.

> R1: I think that for biodiversity, it's important to let it grow old…I don't know enough to determine which percentage of the forest should be left though.
>
> R2: Yes, but I think that it's important, in any given territory, to maintain some old-growth forests.

Other comments indicate that residual forests could mitigate the visual and social impacts of forest harvests, especially in the agglomeration strategy, leaving them more suitable for other uses.

> R: Of course, the goal is to have most of the intact forest around cabins and chalets, that's for sure.

3.6.9.4 Forest massifs

Remarks about forest massifs pointed to the need for old-growth massifs, the fact that caribou's massifs should not be disturbed in any way, not even for recreational use, and that some massifs should be managed with partial cutting.

> R1: Not to mention that there also has to be old-growth massifs.
>
> R2: The people who issue the leases [for tourism] must be careful about the forest massifs.

3.6.9.5 Combined strategy

The comments about the combined strategy concerned how this strategy should be designed as a new way of managing the forest matrix, and that it should take into account the special status of wildlife reserves or other wildlife territories.

R1: But the forest matrix should be managed differently.

R2: I think that there are territories where some testing should be done, so that forest treatments are based on the sustainable development for the Wildlife Reserve.

3.6.9.6 Forest Management

A number of comments were also made about forest management in general. They concerned the desire to have more public consultation; to see the harvest rate diminish; to have treatments better adapted to the forest conditions; to return to manual operations; preserve more old-growth; to regionalize the forest management; and to have a third party, and not the government, mediate conflicts.

R1: The loggers, they would harvest less than the machinery, but, listen, they will log the real need…He is going to be more selective, he won't harm his territory, and he won't pollute…only the pollution of his chainsaw. He won't spill oil; he won't make a mess.

R2: There should be a party other than the Ministry, because they are the ones imposing the rules. And the licensees comply with those and do the minimum. Even the Ministry succeeds in doing less than should be…For this reason, I think it's a shame…There should be a third party.

R3 : Even with regard to efficiency, the workers and environmental protection, this should all be more regional.

3.7 DISCUSSION

The 11 participants who participated in this study were from the wildlife harvesting, forest operations, environmental, biological, municipal, governmental, and forest users sectors. Whilst the number of participants was limited, the study nevertheless represented a relatively diverse range of opinions. Indeed the interviewees had a diversity of connections to forest management, covering many of uses and interests. Apart from the forest user, the respondents had an overall moderate stance toward forest management. Even though most of them could see downsides to forest management, they were not opposed to it, but rather asked for improvements. Future research could delve deeper into the reason why the forest user met in this study had a very negative perception of forestry in order to identify what makes him different from the other stakeholders met and verify if this trend is present among other forest users. We think that a lack of influence over decisions taken in forest management planning could be a possible explanation, since in Québec, Nadeau et al.(2004) reported that forest advisory committees' participants were concerned about the effective power of their committees over forest management decisions.

Some of the interviewees involved in the issue table with the logging company showed a lack of understanding about what ecosystem management really is and what it can include. The same is true for partial cutting, the mosaic patch cut system or variable retention. Results from Oregon show a similar trend with member of the attentive public involved in participations processes were shown to be unfamiliar with ecosystem management's terms and concepts (Olsen et al., 2012). If future research revealed that this is prevalent elsewhere in Québec in issue tables dealing with ecosystem management, providing information about these topics could possibly help to dispel this confusion, prevent misunderstandings and increase public support (Brunson, 1993; Hansen et al., 2003 *in* Olsen et al., 2012; Kellstedt et al., 2008 *in* Olsen et al., 2012). In the present study, this is especially appropriate since the implementation of a forest management strategy based on the natural disturbances regime was essentially welcomed by the participants, who were fairly knowledgeable about their territory. Indeed, information can modify people's perception of forest management, especially when given on topics that people consider to be important (Bernigner et al., 2009; Meitner

et al., 2005; Ribe, 2006; Shindler, 2004). However, Olsen et al. (2012) found no correlation between knowledge and support for ecosystem based management.

This being said, it is not surprising to observe that the agglomeration strategy is accepted by most of the respondents. In previous studies, ecosystem management was also well received (Brunson and Shelby, 1992 ; Clausen and Schroeder, 2004; Manning et al., 1999 ; Ribe et Matteson, 2002). However, the strategy is considered as being overrepresented across the territory which echoes Degrandpré and al. (2008) ecological recommendation that agglomerations should no be the major component of an ecosystem management strategy for the eastern black spruce forest, and that no more than 30% of the territory should be maintained in an even-aged structure.

The acceptability of the agglomerated clearcuts strategy was shown to develop in opposition to the patch cut system, whose negative impacts on ecosystems are recognized by the interviewees. Participants adhered to the argument stating that the patch cut system had detrimental effects on ecosystems and therefore, the agglomeration seemed to be a better alternative. Indeed, social acceptability often evolves in comparison to existing alternatives of a management action or strategy (Brunson, 1996) and depends on the context (Shindler, 2000). While this is a good thing at the moment for the agglomeration strategy, it also means that its acceptability could change, given that new ways to managing forests are continually developed and proposed. As stated by Shindler (2004) public acceptance is evolutive and of a dynamic nature thus it has to be constantly monitored. Adaptive management at the social level is therefore a sine qua non condition of ecosystem management. At the time of the interviews, participants saw the agglomeration strategy as a suitable way to protect the woodland caribou, because it protects the forest massifs this animal needs and reduces the amount of roads. On the other hand, this approach seems to lack credibility when, as perceived by the respondents, roads are being built in places where the caribou is supposed to be left undisturbed. Some respondents questioned this practice that seemed contradictory to the agglomerations' principles. In another part of this research project (Yelle et al., *to be published*), the acceptability of the agglomeration strategy was also strongly linked to its credibility as an ecosystemic management strategy that fully mimics nature. Here, credibility is can be associated to the perceived intention behind the strategy's implementation. Indeed, Brunson (1996) states that the perceived intention of a practice can influence its social acceptability, where a practice is judge on its

perceived objectives. Therefore, is the agglomeration strategy is perceived as infringing on its officially stated goals, it could suffer a lack of public support.

The agglomeration strategy, in its actual form, revealed itself to be hardly compatible with nature-based tourism such as wildlife resources management and harvest, tourism and aesthetic concerns. In this regard, this strategy surely calls for adaptation. As a matter of fact the agglomeration's versatility has been mentioned by our participants, because its residual forest and variable retention allow for a better visual integration enabling to take into account the multiple uses of the forest. This concern for aesthetics and multiple use of the forest is consistent with previous literature (Manning et al., 1999; Ribe, 2002; Robinson et al., 2001; Roy, 2008; Tarrant et al., 2003). For the moment, the major criticisms made about the agglomeration strategy relate to its large surface area, which leads to the fact that, without mitigation measures, multiple use is extremely difficult in those areas. Here, participants wish that the percentage of variable retention were higher. Actually, many studies have documented the positive impact of an increase in variable retention on judgement (CALP, 2003; Ford et al., 2009b; Ribe, 2005; 2006; Yelle et al., 2008), and according to Meitner et al. (2005), large aggregated cutblocks's acceptability could be linked to the amount of residual vegetation. We thus feel that increasing the quantity of variable retention would be an effective means to lessen the agglomeration's impacts on nature-based tourism. Furthermore, the fact that variable retention was mistaken with partial cutting suggests that some participants did not make a clear distinction between these forest treatments since they both leave mature trees, which might in turn lead to the identification of these treatment as being in the same "family". Further research could clarify this by identifying where the conceptual distinction lies for stakeholders, if there is one, and if it is different from a visual assessment.

As for the residual forest inside the cutblock, its actual proportion seems satisfying to our participants, though it could certainly vary according to the specific issues of a territory, thereby serving mitigation purposes.. In this study, the acceptability of the residual forest strongly depended on its forest species composition, surface and location, as it was feared that it could be left as a low quality forest, in patches too small to provide interior forest conditions, and on inaccessible grounds. Our participants' concerns about the ecological impacts of the harvest on the residual forest is consistent with previous literature reporting that the environmental impacts of a practice is important in people's attitudes (Ford et al., 2009; Olsen et al., 2012; Tarrant et al., 2003; Wyatt et al., 2011). The question

of a future harvest of the residual forest leads to divided opinions, especially if this harvest could compromise the woodland caribou. Even those who were not opposed to a future harvest hold that a residual forest should not be harvested in its entirety in order to leave old-growth and biological legacy. Old-growth protection was identified in other studies as a concern related to the implementation of ecosystem management (Ford et al., 2009c; Olsen et al., 2012). The spacing in between agglomerations also led to diverging attitudes, indicating that this is a weak point of this strategy's acceptability.

In between the agglomerations are the forest massifs. Though participants were opposed to their alteration by partial cutting when they are part of a protection plan for the caribou, they were comfortable with the idea in other cases provided that an appropriate forest cover is left and that some massifs are allowed to reach old-growth stages. Indeed, the perception of partial cutting is quite good, mainly because it maintains the forest cover, which is considered better for wildlife, visual integration, multiple uses and ecosystem recovery and which is part of an ecosystemic management adapted to the territory. This positive perception of partial cutting is also reported by other authors (Benson and Ulrich, 1981; Ford et al., 2009b; Robson et al., 2000). Given this positive perception of partial cutting and since many interviewees reported that they did not consider the agglomeration strategy on its own to be completely ecosystemic, its combination with partial cutting, according to the region's prevailing rate of insects and windthrow disturbances, could contribute to a better acceptance of the strategy and help develop new mitigation measures for tourism and wildlife harvest sectors. Nevertheless, even though partial cutting enjoys an overall good acceptability, participants understand that it could disturb the woodland caribou because it involves multiple returns and maintained roads. They are also aware that this practice, because it implies harvesting on wider surfaces, is more expensive. Further research should investigate how a combined strategy would be perceived over time since the overall positive perception of partial cutting compared to other types of more severe treatments have been shown to decrease over time as people understand that this practice implies multiple returns into the forest stand whereas more severe treatments involving variable retention are seen more positively as time goes by, allowing the stand's regeneration to grow back (Ford and al., 2009a).

The agglomerations were the actual preferred strategy of the majority of respondents, while the patch cut system was chosen by interviewees with wildlife harvest and management concerns. The

preference for small dispersed clearcut harvest with regard to wildlife and wildlife harvest has been documented before (Hansis, 1995; Boxall and Macnab, 2000). This seems to indicate that the agglomeration strategy, as actually implemented, is incompatible with territories facing these kinds of issues. None of the respondents had a preference for the traditional strategy with buffers. These results are in agreement with previous studies where large clearcuts, close to one another, were disliked whereas small and scattered clearcuts, such as the patch cut system, were preferred (Pâquet and Bélanger, 1997; Ribe, 1989; Sheppard, 1999).

Using qualitative interviews with a few stakeholders as a means to explore ecosystem management's acceptability for the black spruce forest as given us the opportunity to fully explain and popularize the strategy during the discussion. As such, it enabled us to obtain rich data about these people's perceptions. The fact that not all contacted stakeholders agreed to participate in the study could induce bias into our results since these people could have a totally different point of view on the strategy than those expressed by our participants. Anyhow, as this is a case study, results are not generalizable to other stakeholders of the black spruce forest. However, our results provide insights about how stakeholders might receive ecosystem management, which parts of the strategy are difficult to grasp, which elements of the agglomeration strategy are acceptable or not and which ones could need mitigation and how. A next step would be to investigate more issue tables dealing with ecosystem management in the black spruce forest, building on this study's insights, in a more quantitative way.

3.8 CONCLUSION

Overall, this study's methodology proved to be efficient in obtaining the opinion of participants involved in a participatory forest management planning process of an ecosystem management strategy that is likely to encounter acceptability challenges. At the time this study was conducted, the agglomeration strategy was at the pilot project stage, and therefore not all participants involved in planning processes were familiar with it in the province of Quebec. Since only a small number of people were concerned by these pilot projects, quantitative methods were not suitable. Furthermore, as we sought detail and depth in the data provided by the participants about their individual perception in relation to their field of practice, individual interviews were the most appropriate method of investigation. It enables to uncover the information from the participant's perspective rather than predefined categories, as is the case in quantitative surveys. As a matter of fact, since the concepts of ecosystem management and its implementation in the black spruce forest are rather new and still evolving, people involved in the planning processes contribute to define how the concept can be implemented. In doing so, they use their own representations, experiences and opinions, which can be better understood with qualitative methods such as individual interviews. As for ethical concerns, participants in the planning process were not obliged to contribute to the study, and some of them refused to be interviewed, mostly because, as they explained, they did not feel they knew enough about forest management or had interest in the topic. These people represented organizations that were not linked to forest management, such as labour unions, hydroelectric or mining exploration company. For this reason, the study may not have covered all points of view about this particular form of ecosystem management. It can be argued, however, that these people did not have a strong opinion about the management strategies but participated in the process for other reasons. Knowing the perception of stakeholders involved in forest management planning through official participation processes is important, since their input into the final decisions made about forest management on their territory can be significant. Nowadays, many participatory processes, as is the case in Quebec with the implementation of a new forest regime, require that members work with a consensus based approach in order to participate in forest management planning. Therefore, even though these participants constitute a small group, they have a significant influence on decisions made about forestry in their region.

As this is a case study, the results presented cannot be generalized to a larger population; however, it can give insight into the challenges of ecosystem management based on fire emulation in the black spruce forest. Our findings could be used to design a quantitative research that could generate results that are representative of the population under study. Our main finding was that people involved in the planning process were willing to accept the fire-mimicking ecosystem management strategy provided that it could be adapted to the territory's biophysical and socio-economic particularities. In this study, adaptability is an important component of the strategy's acceptability and came up often in the interviews with the participants. This suggests that adaptability to regional biophysical or social particularities could be a keystone in the strategy's social acceptability and future research could verify this at a larger scale. This is especially true for nature-based tourism area since our participants having a stake in this sector preferred the patch cut system to the agglomeration strategy .Of course, the participants of this study, as members of the local planning process, were also members of the local community. Therefore, their perception is very much shaped by the fact that they live in the territory where the management strategy is implemented. Indeed, place attachment and the spatial context can influence social acceptability (Kakoyannis et al., 2001; Shindler, 2000) Consequently, it is most probable that the fire-mimicking ecosystem management strategy could be perceived otherwise by people with a different relationship to the boreal black spruce forest, for example urban people or forest users coming from other regions. Further research should address this.

In conclusion, even though stakeholders participating to forest management advisory committees form an important group of stakeholders with regard to the acceptability of forest practices, the opinion of other groups must also be elicited in order to draw a global picture. For instance, social acceptance of ecosystem management should also be investigated among recreational forest users, aboriginal communities and the uninformed public.

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4 PUBLIC PERCEPTION OF THE ECOSYSTEM MANAGEMENT STRATEGY: A CASE STUDY OF QUEBEC'S BOREAL BLACK SPRUCE FOREST WITH MEMBERS OF THE UNINFORMED PUBLIC

4.1 ABSTRACT

Ecosystem management in the black spruce forest has recently been implemented in Quebec, Canada, in the form of very large harvests that emulate wildfires. Given the size of the clearcuts this implies, this form of ecosystem management could meet social acceptability challenges. This paper presents the results of three focus groups held in Quebec with uninformed participants in order to document their perception of this strategy. Participants were basically open to try this form of ecosystem management, although they remained cautious and skeptical. They based their judgment of the strategy on its perceived risk and their knowledge of the anticipated environmental impacts. Their judgments were also influenced by the prevailing social context with regard to forestry in Quebec, wherein trust toward managers and decision-makers stands out as an important issue. Overall, participants believed that the ecosystem management strategy was an improvement but also that its credibility has yet to be established. The strategy's acceptability was more controversial on multiple use territories.

4.2 RÉSUMÉ

Dans la pessière noire à mousses du Québec, un aménagement forestier écosystémique imitant le régime des feux, a récemment été mis en œuvre. Vu la taille des coupes en résultant, l'acceptabilité sociale de cette stratégie pourrait se révéler problématique. Cet article présente les résultats de trois groupes de discussion tenus à Québec avec des participants non familiers avec la foresterie. Cette étude démontre une certaine ouverture des participants teintée de scepticisme et de prudence. Les participants jugeaient la stratégie, et ses alternatives, en fonction des risques perçus et de leurs connaissances des impacts environnementaux. Leur jugement était aussi influencé par le contexte social relatif au milieu forestier, où la confiance envers les aménagistes et les décideurs demeurent une préoccupation. La stratégie d'aménagement écosystémique était vue comme une amélioration, quoique sa crédibilité doive être améliorée. L'acceptabilité de la stratégie était plus controversée pour les territoires dédiés aux usages multiples de la forêt.

4.3 INTRODUCTION

In North America, the general public has complained many times that its opinions and values about forests and forest management are not sufficiently taken into account, and that foresters should be more receptive to them (Beckley et al., 1999; Nadeau et al., 2007; Robinson et al., 2001; Robson et al., 2000). It follows that, given that we live in a democratic society in which the public can influence policy- and decision-making, consideration of the public's opinions and perceptions with regard to forestry is important, even if most people are not familiar with forestry (Burstein, 1999 *in* Tindall, 2003). In a province like Quebec, where 90% of the forests are Crown land, the population's perception of forest management is highly important since the implementation of forest management policies comes from the government.

Three key factors have been indentified (Firey 1960 *in* Kakoyannis et al., 2001) as necessary for forest practices to be compatible with society's expectations. First, forest practices have to be physically feasible; second, they have to be economically possible; and third, they have to be culturally adoptable, that is to say, accepted by the community and corresponding to the prevailing norms and values, or socially acceptable. Vaske et al. (2001) warn that if this third condition is missing, even in the presence of economic and physical success, the forest practice will eventually fail. This echoes Clawson's (1975 in Shindler et al., 2004) five criteria for the success of forest policies: biological and physical feasibility, economic profitability, economic well-being and equity, social or cultural acceptability, and operational or administrative practicability. Thus, the social acceptability of a forest practice or policy is a sine qua non condition of its long-term viability, especially in the case of public forests. As social acceptability is evolutive and can be influence by a variety of factors, among which temporal, social and geographical contexts (Shindler, 2000), its constant monitoring is essential (Shindler and Toman, 2003 *in* Shindler, 2004), especially when introducing new policies or practices.

As it stands, in Quebec's boreal black spruce forest, a new fire-mimicking ecosystem management strategy has begun to be implemented on public land. By emulating natural disturbances particular to a given ecosystem in intensity, frequency and spatial distribution, ecosystem management aims at keeping the ecosystem within its limits of natural variability, thereby mitigating the negative impacts of harvesting on the environment (Seymour and Hunter, 1999). For the boreal black spruce forest, where the most important agent of the natural dynamic is fire, this results in the implementation of

immense forest cuts called agglomerations. Since the size of a forest harvest and the fact that it is a clearcut are the two main factors explaining public dislike for clearcuts (Boxall and Macnab, 2000; CALP, 2003; Hansis, 1995; Pâquet and Bélanger, 1997; Ribe 2006; Robson et al., 2000; Sheppard, 1999; Yelle et al., 2008), this new strategy's social acceptability could be challenged when the general public becomes aware of its implementation. As many studies have reported, people's values about forests have changed over the last decades toward more biocentric and environmental values (Bengston, 1994; Bengston et al., 2004; Brown and Reed, 2000; Lee and Kant, 2006; Manning et al., 1999; McFarlane and Boxall, 2000; Nadeau et al., 2007; Robinson et al., 2001; Robson et al., 2000; Tarrant et al., 2003). In Quebec, a recent survey (Roy, 2008) conducted in two of the province's regions showed that environmental and ecological values ranked top among all other values. In that context, these new, more ecological forest cuts, although big in size, have the potential to respond to a rising concern within the population. Indeed, ecosystem management has been shown to be well received by the population in the United States (Brunson and Shelby, 1992; Manning et al., 1999; Ribe and Matteson, 2002; Shindler et al., 1993;) where it was adopted in response to the shift in forest values (Clausen and Schroeder, 2004). However, it is not know how ecosystem management emulating fire is perceived in Québec. Since ecosystem management relies on an ecological basis and most often includes sustainable development principles, among them the multiple use of the forest (Salwasser, 1994 *in* Brunson, 1998), and since the paradigm shift in forest values observed in the United States has also been documented in Canada (Lee and Kant, 2006; McFarlane and Boxall, 2000; Nadeau et al., 2007; Robson et al., 2001; Robinson et al., 2001), ecosystem management could correspond better to the public's values than traditional forest management (Clausen and Schroeder, 2004; Manning et al., 1999). However, Robson et al. (2000) reported that people did not think clearcuts imitated fire, thus cautioning against taking the agglomerations' acceptability for granted. In this paper, we will first present the concept of social acceptability and the forest ecosystem management strategy implemented in Quebec's boreal forest. We will then explain why and how we used focus groups as our research method. Next, we will present and discuss the themes that resulted from the group interviews and our participants' overall perception of the fire-emulating ecosystem management strategy used in the black spruce forest. Finally, we will conclude stating which insights our study suggest to increase this strategy's social acceptability and make recommendations about how future research could address this.

4.3.1 SOCIAL ACCEPTABILITY

Social acceptability, also referred to as cultural adoptability, public acceptance or public support (Olsen et al., 2012) is defined as some aggregate form of public consent whereby judgments are shared and articulated by an identifiable and politically relevant segment of the citizenry (Shindler et al., 2002; Stankey and Shindler, 2006). According to the Values-Beliefs and Attitudes cognitive hierarchy model (Rockeach, 1968; 1973 *in* Allen et al., 2009), acceptability judgments are an attitude that individuals develop toward an object. This attitude relies on their personal values and beliefs about forests and forest management. Brunson (1996) specifies that in the process leading to the acceptability judgment about a practice or a condition, the individual will compare this practice or condition to its possible alternatives and decide whether it is superior or not.

During the formation of the judging process, the individual resorts to many cognitive, affective and contextual beliefs (Stankey and Shindler, 2006). These beliefs interact with the individual's value system and the society's normative influences (Brunson and Shindler, 2004). Allen et al. (2009) affirm that taking social acceptability in account implies to know about people's attitude toward a given object.

Several factors can come to influence acceptability judgments about forest practices besides values and beliefs with regard to non-familiar individuals. Contexts, be they temporal, geographical, social or pre-intervention, can all have an influence on the outcome of the judgment process (Brunson, 1993; Kakoyannis et al., 2001; Shindler, 2000). Furthermore, trust in the information provided or toward those in charge of managing the forests and the institutions employing them is also an important factor nowadays (Kakoyannis et al., 2001; Olsen et al., 2012; Shindler and Collson, 1998 *in* Shindler et al., 2004; Wondolleck and Yafee, 2000 *in* Stankey and Shindler, 2006). Perceived risks associated with the practice are another factor identified by the literature (Brunson, 1993; Kakoyannis et al., 2001; Wagner et al., 1998). Slovic (1997 *in* Kakoyannis et al., 2001) specifies that the variables used by the public to evaluate risk are uncertainty, perceived costs and benefits inequities, unwilled exposition, risks for future generations, lack of control, lack of confidence and the possibility for disastrous consequences. The possibility to take part in the planning process (Olsen et al., 2012; Shindler and Collson, 1998 *in* Shindler et al., 2004; Shindler, 2004; Shindler et al., 2004) and the way in which the environment's natural characteristics, including aesthetics, are affected can also influence social acceptability (Bliss, 2000; Shindler and Collson, 1998 *in* Shindler et al. 2004; Stankey

and Shindler, 2006). Lastly, a practice's social acceptability can only be questioned if there are possible alternatives. When this is the case, social acceptability depends on the perceived desirability of a condition and the equity and feasibility of the alternatives (Brunson, 1993). Therefore, in this study we compare the l acceptability of the ecosystem management strategy for the black spruce forest with its current alternatives, namely the patch cut system and the traditional clearcuts with buffers.

When it comes to taking the population's attitudes in account, Marchak (1983 *in* Tindall, 2003) and Hoberg (2000 *in* Tindall, 2003) state that the views of the local communities must be completed with those of other groups, especially in the case of state-owned forests. Moreover, Horne et al. (2005) claim that participatory approaches must be supplemented by the values and attitudes of the general public. Certainly, those involved in forestry in one way or another, or stakeholders, or those using the forest for recreation in this ecosystem, or forest users, will come to experiment this type of harvest in a very tangible way. But what will people and who are not familiar with forestry, i.e., the uninformed public type, think of this ecosystem management strategy without experiencing it directly? As this strategy is quite new in the province of Quebec, very little is known about how the uninformed public perceives it.

4.3.2 THE ECOSYSTEM MANAGEMENT STRATEGY FOR THE BOREAL BLACK SPRUCE FOREST

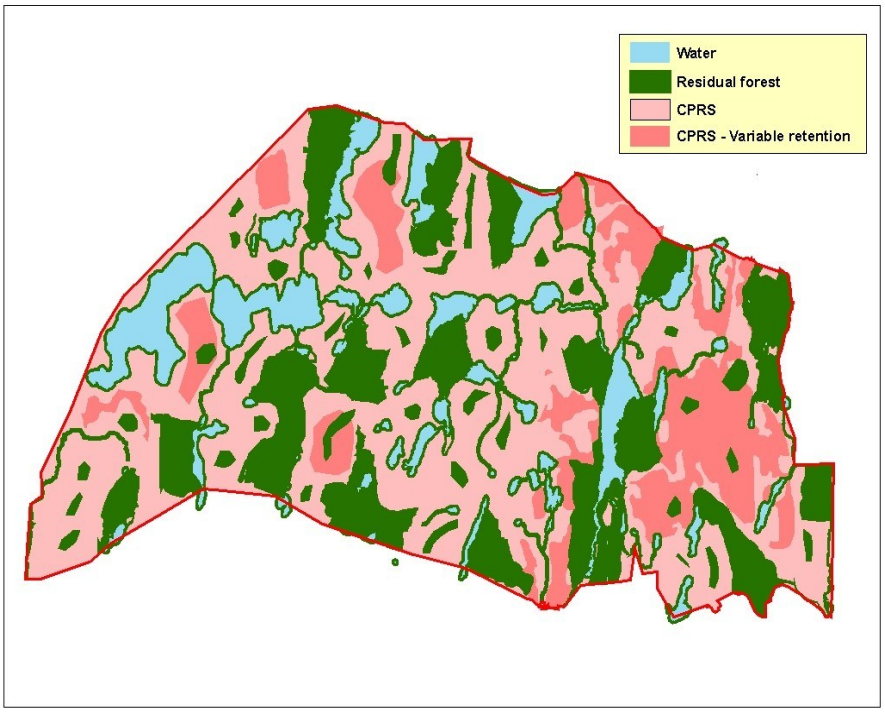
The ecosystem management strategy based on the emulation of natural fires implemented in Quebec's black spruce forest was developed and implemented by Quebec's Ministry of Natural Resources (MRNFP) (Jetté, 2007) and consists of agglomerated clearcuts (agglomeration) belonging to four size classes including the caribou management plan: 30–70 km^2, 70–110 km^2, 110–150 km^2 and 100–250 km^2. The agglomerations include residual intact forest stands where no intervention is planned, and these must account for at least 25% of the agglomeration's area. Of these 25%, 5–8% should be consumed by riparian buffers, at least 10% by insular blocks of 50–200 ha, and the remaining percentage by peninsulas and corridors connected to the forest matrix and of a width of least 500 m. Likewise, small unharvested forest patches, arising due to operational constraints, comprising 1 ha or more are added to the 25% of intact residual forest.

As well, variable retention must account for a minimum of 20% of the harvested area, which represents 15% (20% of 75%) of the agglomeration's total area. Variable retention, as understood in

Quebec, comprises three different kinds of harvests in which, even though they involve harvesting most of the mature forest cover, ensure that some merchantable trees are left alive and standing in the cut. These treatments are CPPTM (Cut with protection of small merchantable stems), CPTDV (Cut with protection of stems of varying diameter) and CRB (Cut with retention of aggregated stems). CRB is a harvest where soils and regeneration are protected and where aggregated clumps of green trees are left intact in order to create a structural irregularity in the upcoming stand and with the objective to provide a constant supply of dead wood during the rotation period. Actually, this treatment retains clumps of green trees of 150–300 m^2, each on approximately 5% of the harvested area. No harvest can be done inside those clumps. Each clump must have at least 5 merchantable stems (> 10 cm) (MRNF, 2011). CPPTM is a tree harvest where 70 to 90% of the merchantable wood volume is harvested and where established regeneration is protected, i.e., saplings of 2–8 cm at BHD (diameter at breast height) as well as the small merchantable stems from 10–14 cm at DBH. Finally, CPTDV is a tree harvest similar to CPPTM and aiming at preserving a portion of the saplings and merchantable stems from 10–14 cm DBH. This treatment is used whenever stems are unevenly distributed, preventing from meeting the ratio requirements of number of stems/ha for a CPPTM.

The remaining area of the agglomeration is harvested through clearcut (CPRS) or Clearcut with protection of high regeneration (CPHRS) wherever possible. CPHRS is a method whereby all trees equal to or greater than 10 cm DBH are harvested while preserving high regeneration, i.e., the 2–8 cm dbh saplings (MRNFP, 2003). In the field, this cutting method presented high and abundant regeneration. Figure 4.1 shows how these specifications are translated on the ground.

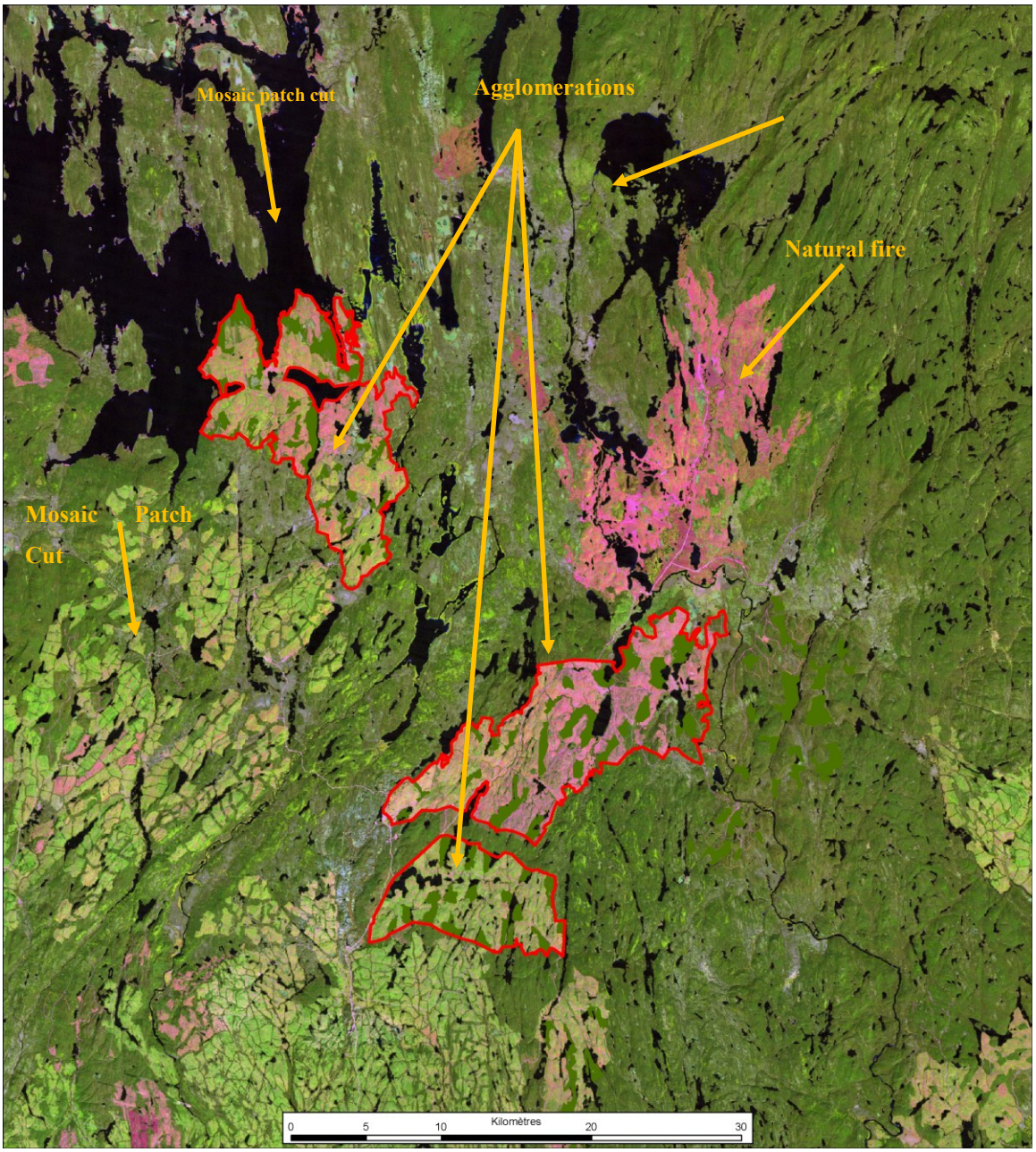
Fig. 4.1 Spatial representation of an agglomeration



The agglomerations must not be juxtaposed to one another. The minimal distance in between two agglomerations is 1.5 km. Every harvested sector of an agglomeration must be 10 km or less from a forested massif having a 30 km^2 minimal surface area.

Current alternatives to this ecosystem management strategy in the black spruce forest are the mosaic patch cut system and the traditional clearcuts with buffers. Both of these methods apply CPRS (harvesting of all mature trees while protecting established regeneration and minimizing soil disturbances) and span areas between 50 and 150 ha. However, they differ in the way the harvest blocks are distributed in the forest matrix. For the mosaic patch cut system, an even distribution of harvest blocks varying in size aims at maintaining a residual forest whose area equals that of the harvested patch. By contrast, the traditional clearcuts with buffer consists of harvest blocks laid out side by side and separated by buffers measuring 60–100 m in width (RNI, 2004). Figure 4.2 shows the three alternatives for a satellite perspective.

Fig. 4.2 Satellite picture of agglomerations, patch cut system, traditional clearcut with buffers and natural fire



4.4 OBJECTIVES

The main objective of this study is to determine how people without any particular interest in forestry or another closely related sector come to understand ecosystem management principles and how they perceive the agglomeration strategy emulating fire in terms of acceptability. In particular, we were interested to know if the examination of the agglomeration strategy would enable members of the uninformed public to understand the theoretical basis of ecosystem management, if they would considered it acceptable, and what would they identify as acceptability factors for a specific implementation. We also wanted to uncover if people would agree that mimicking natural disturbances is a better way to manage forests that the actual alternatives (patch cut system and traditional clearcut with buffers). Furthermore, we sough to explore how members of the uninformed public, who learn about the actual scale of the fire-mimicking harvests, would judge this particular form of ecosystem management in terms of acceptability. We were also interested to see whether some of the agglomerations' characteristics, namely the presence of variable retention and intact forest, could modify the perception of the uninformed public. Finally, we were interested to see how the uninformed public perceived the partial cuts that are currently being proposed for some parts of the boreal forest as a means to achieve ecosystem management, in particular in comparison to the agglomerations.

4.5 METHODS: FOCUS GROUPS

Ecosystem management is a concept which popularization is challenging. Olsen et al. (2012) state that communication about ecosystem management can be difficult to achieve. Indeed, some authors report that even knowledgeable members of the public or stakeholders are not familiar with its terminology (Olsen et al., 2012; Yelle, 2012). Because of the specific vocabulary linked to ecosystem management and the possible need to explain many aspects of the strategy, we ruled out the opinion survey at this stage and opted for focus groups as a first means to explore the uninformed public's perception of the ecosystem management strategy emulating fire.

4.5.1 WHY USE FOCUS GROUPS?

Focus groups are well suited for exploratory purposes, as is the case in the present study. As an inductive qualitative research instrument, they enable to understand a phenomenon based on the outcomes of a discussion instead of trying to confirm or infirm prior hypotheses (Krueger, 1988). Focus groups are different from other qualitative research instruments since the interactions between the participants produce a type of information otherwise inaccessible (Duchesne and Haegel, 2005). Indeed, this method allows to take into account that, often, in order to form an opinion on a given topic, people need to hear others talk about it and participate in those discussions. As such, focus groups are a good tool to investigate the attitudes and opinions about topics such as ecosystem management which people do not necessarily think about in daily situations. As the discussions evolve, these people may modify their judgment, enabling the researcher to observe how changes take place, something individual interviews or surveys do not permit (Krueger, 1988). As well, the group effect might decrease the participants' shyness to speak and encourage them to share their opinion (Duchesne and Haegel, 2005). Most importantly, the group dynamic has the advantage to potentially bring out aspects unanticipated by the researcher (Babbie, 2005). This was important since, even if we had clues on the general perception of forest management, we did not want to confine participant responses to only those aspects that we thought were important. We wanted to make sure that any related topic would come out. Indeed, unlike a survey, focus groups do not restrict answers to pre-determined choices made by the researcher. In this way, the topic is addressed from the participants' standpoint and not the other way around (Krueger, 1988). One of the greatest advantages for the purposes of our study is that focus groups, because of the

interactions between participants, enable the emergence of social representations in the participants' own words and allow for spontaneous responses (Morgan, 1988), something that is much less likely to occur in individual interviews. This unique potential of focus groups is quite interesting in light of the fact that ecosystem management has yet to be popularized. Lastly, focus groups are not very costly to implement and enable to gather a lot of information in a rather short time period (Krueger, 1988). Despite all these positive aspects, focus groups have some disadvantages. For one, the interactions between participants may be somewhat artificial or contrived (Morgan, 1988) given that they are facilitated by a group moderator. (It should be noted, though, this would most likely be the case for most discussions about ecosystem management strategy among non-experts.) Further, with interactions, there is a greater risk that the discussions stray from the topic, something the moderator has to manage. Group thinking, domination of the conversation by one or few individuals and conformation of the rest of the group to their opinion (Babbie, 2005), and consequently the non intervention of some participants may also take place during focus groups, and that is likewise the moderator's role to prevent them. The analysis of the data is also more complex, since the context in which each comment is raised has to be taken into account (Krueger, 1988). Finally, because of the limited number of participants and the fact that there is no random selection, the results of focus groups cannot be assumed to represent the general population.

4.5.2 GROUP FORMATION

Focus groups are usually composed of 6 to 12 participants (Babbie, 2005; Krueger, 1998). We wished to have approximately 8 to 10 participants since this group size is known to prevent having one or two individuals dominating the conversation, as often occurs in small groups, and to prevent sub-conversations from taking place, as often occurs in larger groups (Morgan, 1988; Krueger, 1988). In focus groups the criteria for selecting participants is their capacity to provide the desired information (Babbie, 2005), and as thus we were looking for people representative of the uninformed public with regard to forestry, or in other words, for people who were not involved in forest industry or a related field. Therefore, the goal was not heterogeneity in order to represent the diversity of the total population, but homogeneity within the participant group with regard to a given criterion (Krueger, 1988). In this study, this criterion was the non-interest in or non-familiarity with the forestry sector.

Since aboriginal communities are often involved with the forest industry and the government about forest management planning and territorial negotiation, they could not meet the unfamiliarity criterion. We nevertheless recognize that this in no way means that they are not concerned by this strategy. On the contrary, the fact that they live on the territory would probably result in their engaging in a particularly close examination of the strategy. Yet, the perception of First Nation people was not in the scope of this study and, given its complexity, should be done separately in order to fully document the strategy's social acceptability.

An invitation to participate in our focus groups was published in a local newspaper of Quebec City in April 2010. The ad was asking for people having no link to the forest industry sector. After advertising it twice with very few responses, we turned to a pre-organized group, the Knights of Columbus, and to University Laval's email list of students and staff. Given the lack of success of finding participants through the newspaper, the advertisement sent by email offered participants a $20 compensation in exchange for their participation. Monetary compensation is often used to encourage people's participation in focus groups, especially when targeting ordinary people (Duschene and Hagel, 2005). Three focus groups were then set up with the volunteering subjects, on the basis of approximately 12 participants per group. Eleven showed up for the first focus group, 10 for the second one and 11 for the third one. Inviting one to two more participants than desired is common in order to ensure a sufficient number of participants (Morgan, 1988; Krueger, 1998). Three focus groups are an adequate amount, since it is generally recommended to realize a minimum of two focus groups (Duchesne and Haegel, 2005), whereas, Morgan (1988) and Kruger (1988) recommend conducting at least three to four.

4.5.3 MODERATING THE FOCUS GROUPS

The first focus group was moderated by the co-researcher and two subsequent ones by the main researcher. Aside from skills in moderating discussions, these moderators had to have comprehensive knowledge of the topic (Henderson, 2006), in this case ecosystem management and its implementation in the black spruce forest. The discussions were held as follows. The moderator greeted the participants as they arrived; and once everybody had arrived and taken a seat around the table, the moderator, sitting at the end of the table, introduced themselves as well as their assistant, who was tasked to take informal notes. The moderator then presented the research project and

explained the rules of the focus groups, i.e., that there were no good or bad answers, that participants had to take turns to speak, that respect was expected among the group and that anonymity was ensured. Then the discussion began, audio-recorded, proceeding from the general to the specific. As the discussion ensued, the moderator gave the participants information about the ecosystem management principles and the application of the strategy in the boreal black spruce forest, as presented in Section 1.2. Satellite pictures of the ecosystem management strategy, the traditional clearcut strategy and the patch cut system, similar to Figure 4.2, were also used to give the participants a better understanding of the spatial distribution of the three strategies.

Throughout, the moderator followed a semi-structured interview schedule, intended as an overall guideline only and which could be spontaneously adapted depending on how the discussion unfolded. The sequence of the themes could also be changed. The focus groups were planned to last about 1.5 to 2 hours (Morgan, 1988) and the anticipated duration of each theme was determined, allowing the moderator to know when to introduce a new question. Focus groups are conventionally limited to about 6 to 10 questions (Krueger, 1998). We had 11 questions, although the first two essentially served to introduce the topic and did not require much time. Table 4.1 shows the interview schedule.

At the end of the focus group, participants were asked to fill out a paper questionnaire with socio-demographic questions and questions about their relationship with the forest (see Appendix 1). Participants had to rank six values associated with forests adapted from Tarrant et al. (2003), by adding the economical value, and give their opinion about timber harvesting on regular public land and multiple use territories where hunting and fishing are management objectives answering a question and indicating their level of agreement with one statement on Likert scales. In this way, the respondents' values and attitudes toward forest management was obtained as a contextual element. Data from the paper questionnaire have been inserted in this study where most relevant to the topics covered.

Table 4.1. Focus group interview schedule

THEME	SUGGESTED QUESTION	TIME
Knowledge and use of the forest environment	Do you go to the forest, and if yes, where do you go most often and for what purpose?	5 min
Opinion on forest harvests	a) Have you ever seen a forest harvest? What did you think of it? b) What should be done to improve forest harvests?	10 min 10 min
Opinion on ecosystem management	Do you think that imitating nature is a good way to manage the forest?	10 min
Knowledge of natural disturbances	How do you think nature disturbs the boreal black spruce forest?	5 min
Social acceptability of agglomerations	Do you think it is acceptable to do harvests that emulate fire? (begin by informing about the strategy)	20 min
Mitigation measures for the agglomerations	Given the large size of the agglomerations emulating fire, what do you think could be done to mitigate the impact of those harvests?	20 min
Trade-offs for environmental values	If you were sure that emulating fires is better for the environment than small and scattered harvests, would you be willing to accept larger clearcuts? (info about the caribou and theory of evolution)	15 min
Harmonization of multiple uses	Do you think it is acceptable to do large fire-emulating harvests in parts of the forest that are used for tourism or recreation, for example in wildlife reserves?	10 min
Spatial distribution of the agglomerations	What amount of intact forest should be left in between two agglomerations?	10 min
Preference for partial cuts vs clearcuts	In order to harvest a given quantity of wood, would it be better to implement partial cuts, which consume twice the area of the wood harvested, or to proceed with clearcuts, which consume only half the overall area of partial cuts?	10 min

4.5.4 DATA

The focus group interviews were audio-recorded and transcribed. These transcripts, serving as rough data, were then imported to QSR's NVivo 8. A first open coding (Babbie, 2005; Patton, 2002) was performed for each focus group on the basis of the themes of the respective questions. Categories were defined as they emerged during the reading of the data, and were then re-examined to verify if more coding was necessary or if some quotes should be coded into other categories. These categories were then examined in an axial coding process in order to identify central concepts (Babbie, 2005). At the end of this process of open and axial coding, memos were generated that listed the categories. In all, a coding tree of 26 hierarchical nodes and 45 sub-nodes was created (see Appendix 4). The data from the paper questionnaire, for its part, only had to be counted.

4.5.5 PARTICIPANTS' PROFILE

Thirty-two people participated to the three focus groups held in May 2010. Twenty-two resided in Quebec City and 10 came from the nearby town of Lévis. Six were women and 26 men. The participants belonged to a variety of age and educational classes as shown in tables 4.2 and 4.3. Even though the ad clearly stated that participants should not have any background in forestry or any related sector, seven participants out of 32 did have some connection to the forestry sector. However, these links were considered to be weak since in answering our ad, the participants self-reported having no particular link to the forest industry. They specified that these links consisted of past summer jobs or the ownership of a forest woodlot.

Table 4.2. Participants' age group

Age class (years)	Number of participants
18–24	4
25–34	3
35–44	5
45–54	3
56–64	10
65–74	6
75 and older	1
Total	**32**

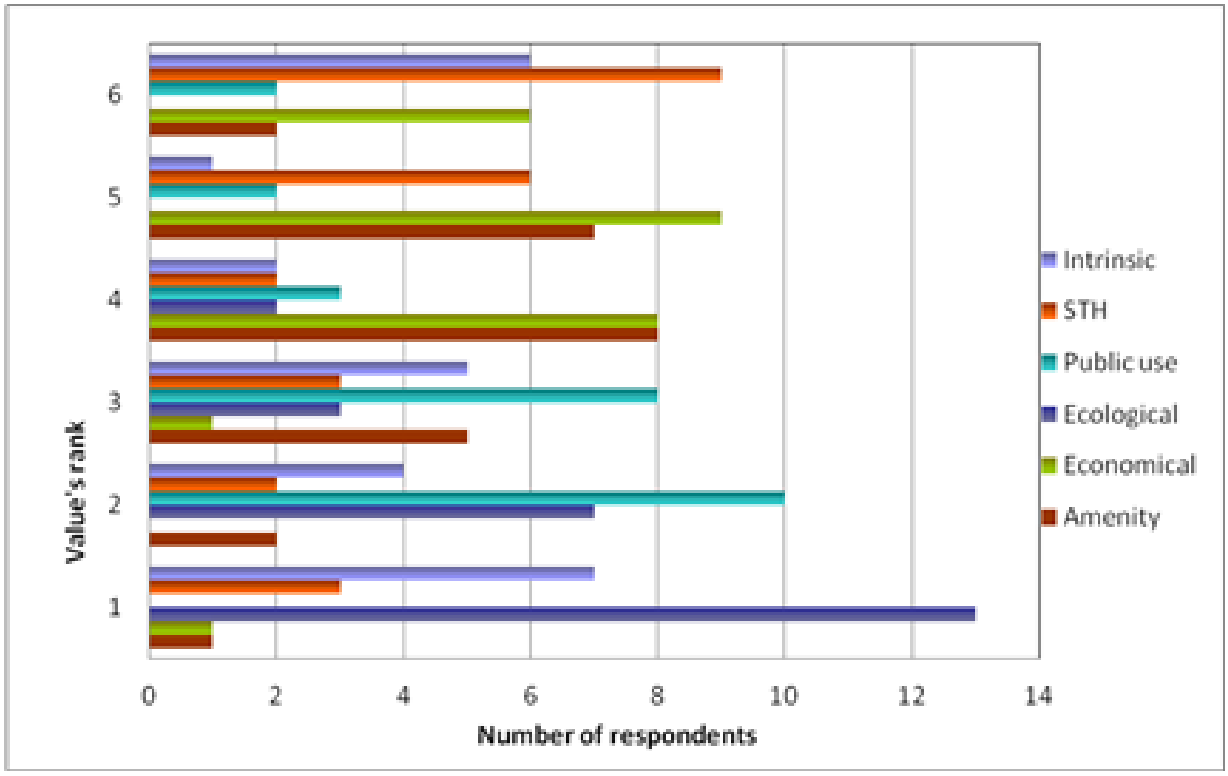
Table 4.3. Participants' education

Level of education	Number of participants
Elementary	1 (3,1%)
High School	5 (15,6%)
College	9 (28,1%)
Bachelor's degree	9 (28,1%)
Master's or PhD	8 (25%)
Total	**32 (100%)**

At the end of the paper questionnaire, participants were asked to rank six forest values. While such a ranking could not provide comprehensive insight into a person's forest values, it did allow to contextualize where our participants came from. The six values, which were based on Tarrant et al.'s (2003) classification of non-economic forest values (adapted from Rolston and Coufal 1991 *in* Tarrant et al., 2003), were: amenity value; economic value; ecological/environmental value; public use value; spiritual, traditional and historical value; and intrinsic value. To this classification, we added the economic values. As can be seen in Figure 4.1, the ecological value was very important to the participants. Indeed, 20 out of 25 people (the total number of people who answered this part of the questionnaire) indicated that this value was of first or second priority to them. Intrinsic value and public use value ranked second and third, with 11 and 10 people choosing them as their first or second priority, while spiritual, historical and traditional value came in fourth and amenity value fifth.

Of all values, economic value was the least often identified by the participants as being of first or second priority.

Figure 4.1. Ranking of participants' forest values (25 participants over 32)



4.6 RESULTS

4.6.1 KNOWLEDGE AND USE OF THE FOREST ENVIRONMENT

The majority of the participants to the focus groups used the forest for recreational purposes such as fishing, hunting, hiking, snowshoeing, cross-country skiing and camping. They mentioned using forest areas designated for these types of uses such as parks and wildlife reserves.[1] Some had grown up on farms, which are usually close to private forests. As mentioned before, others had had summer jobs in forestry, such as tree planting.

> It's an amateur relationship…with regard to the kind of hobbies you can do in the forest. I mostly do cross-country skiing in the winter and in the summer I do canoe-camping and wilderness survival. (P18)

> I used to be a trapper. I'm still a hunter and an angler. I spend a lot of time in the wilderness doing wildlife observation. I do a lot of observation. (P1)

Many participants talked about how the forest environment was important to them, describing how they found it relaxing and peaceful and appreciated it as a place to enjoy solitude. The forest also proved to be associated with many childhood recollections, and as such shaped the participants' identity. It was expressed that the forest fuels our collective identity whether we visit it or not. In this way, the forest was seen as a collective heritage that should be well taken care of.

> I like to walk in the forest. I love it. I think it's a source of peace and a way to recharge your batteries. (P35)

> My relationship to the forest is to enjoy it and to realize how lucky we are to have all that. (P22)

[1]Wildlife reserves are forest areas designated for the conservation, appreciation and use of wildlife and nature-based recreational activities. These territories are subjected to forest harvesting.

Indeed, the conviction that the forest needed to be protected from development was emphasized. There was a feeling that the exploitation rhythm was too rapid and a fear that the forest, as a resource, could soon be exhausted.

> If they have to go get the trees up north, it's because they logged a lot down there. (P9)
>
> That's because there were no trees left close by. (P26)

As Section 4.6.2 shows, participants had strong views about forest exploitation.

4.6.2 OPINIONS ON TIMBER HARVESTS

In the paper questionnaire, participants had to indicate their position on a five-point Likert scale. Table 4.4 presents the participants' positions on forest management in public forests. As can be seen, most participants were either neutral or somewhat opposed to harvests in public forests.

Table 4.4. Participants' positions toward forest management in public forests

Participants' position	**Number of participants**
Totally in favour	0
Somewhat in favour	2
Neutral	11
Somewhat against	13
Totally against	6
Total	**32**

On the whole, people in the focus groups were very talkative on the subject and an enormous number of comments and references to related topics was made. This was somewhat unexpected, as we had intended this part of the focus group to serve more as an introduction and a way of getting to know the participants' orientation toward forest management. In all, a somewhat negative perception of forest management was uncovered by the focus groups. Even though a majority was

not completely opposed to forest harvests, it was claimed that the current industrial way of managing forests was abusive, comparing clearcut harvests to deserts or disasters. Clearcut was linked it to extreme capitalism.

> You don't exploit a forest like this; you don't do it without any respect. (P9)
>
> All that matters is profit, money…for the companies, it's the money. (P35)

Overall, the observation that forest products were consumer goods in our society was taken into account during the focus groups. However, it was nevertheless wished that a better balance could be achieved between exploitation and protection.

> It's too much. There should be a better balance. It's ok to log some wood but the forest shouldn't be totally devastated. (P19)
>
> I think that the real problem comes from society…Paper consumption. If people would consume less paper and use the resource more carefully, then only half of the wood would have to be logged and a big part of the problem would be solved. (P28)

It was felt that forest management did not take the environment into account and comments about the environmental impacts of forestry on soils and wildlife were made.

> We used to walk in that forest and then they came and cut all the mountains. On foot you'd have a hard time to walk now. Before you'd have the moss, everything was beautiful. Now, there is no more moss, they've cut all the spruces. (P1)
>
> I saw some harvests, and it is not a pretty picture…it was only big ruts. I told myself that this same kind of thing should be done in the backyard of those who did that…because it was genocide, what I saw made no sense. (P29)

It was thought that industrial harvests compromised or even prevented natural regeneration of the harvested stands. The size of the machinery used was denounced repeatedly and was seen as one of the major causes of destruction and environmental disturbance. Indeed, a return to previous harvests methods was favoured, which were seen as softer on the environment, such as smaller machinery or horses and lumberjacks.

> I don't like to see the way it's logged today. We saw big machines ripping off the mountains, and when they get out of there, they only leave ruts four feet wide…I have a hard time with that…the machinery could be smaller! (P26)

> The size of the machinery should be reviewed…I don't think that we need to have machines that big and to harvest that fast if we want to protect. (P34)

Finally, some participants had never seen forest harvests, given that they usually went to protected areas such as parks for their forest recreational activities. Others had seen forest harvests, namely in wildlife reserves or other designated wildlife management areas, yet were shocked to see that such harvests took place in what were supposed to be protected areas in their point of view. Evidently they did not know that wildlife reserves were initially created for the management of big game hunting, and apart from this aspect, they are managed like any other forest territory. Still, it was argued that forest harvests, especially clearcuts, should not be done in wildlife reserves and territories at all or, if so, that they should be done in a different way than is done in the rest of the Crown land forest. There thus seems to be confusion about the stated objectives of those reserves with regard to wildlife management, wildlife conservation and forestry.

> We used to go on family vacations to the Portneuf Wildlife Reserve. It was shocking to see that in a reserve that was supposed to protect wildlife there were a lot of clearcuts. (P36)

> I was stunned to find out that forest licensees were authorized inside wildlife reserves. I know reserves aren't the same as a natural preserve, but…if they do those kinds of harvests in wildlife reserves, where there are more restrictions, then I don't want to know how it is done outside the wildlife reserves. (P32)

4.6.3 *OPINIONS ON ECOSYSTEM MANAGEMENT AND THE EMULATION OF NATURAL DISTURBANCES*

The focus groups revealed that the emulation of natural disturbances as a guidance for forestry intuitively made sense. It seemed logical and referred to as the "nature knows best" argument. A participant made a parallel to the human body and the effect of medication to illustrate the rationale.

> It makes sense to imitate nature. When you go to the doctor's, what do they do? They study the human body to understand how it works, and the medication will try to imitate nature, the way the body normally functions. Because nature is capable of managing itself and of maintaining its longevity. So, if we want to maintain the forest resource, it only makes sense that we refer to nature. We should have done that a long time ago. (P18)

In the focus groups, the idea that the emulation of natural disturbances should be applied to all aspects of harvesting, especially with regard to frequency and impacts on soils came up. Thus, restricting the emulation to the mimicking of fire with regard to the size or form of the harvest seemed deceptive..

> With regard to nature, is it only a matter of area percentage? For example, when a fire occurs in nature, there are some places more affected than others, because of their location or humidity content. Is this taken into account or is it only a percentage? If it's only a percentage, then I don't see the advantage of this strategy. (P36)

> It depends on how fast they'll do it…If they emulate nature in taking this model but implement it three times faster than nature does and exploit it to the maximum, then there's no point. If they want to emulate nature, then they have to do it at 100%, in which case they might have to reduce the flow. (P13)

Moreover, it was believed that a real imitation of natural disturbances would be difficult to realize. There was skepticism about the implementation of this strategy, associated with a fear that it was already too late to do so and that ecosystems are already beyond their natural range of variability. Some doubt regarding the fact that it was possible to really emulate natural disturbances given the extensive knowledge this requires about ecosystems were expressed—a requirement that seemed

even more challenging given that ecosystems have changed extensively since the arrival of the first Europeans and that there is a lot of uncertainty about the way forest ecosystems will evolve. In that context, it was argued that forest managers would have to decide which nature to mimic, i.e., which point in time to take as a reference. Besides, it was dreaded that the time it would take to reach a consensus about how to emulate natural disturbances would be too long, thus preventing from saving the ecosystems from traditional forest management.

> Will the studies allow implementing this fast enough to avoid this disaster, that might already be happening? I'm starting to think, when I hear others talk about it, that my vision of things is probably urban and naive. (P16)

The idea that humans could perhaps do better than emulating natural disturbances in order to control the type and quality of a forest stand also came up during the focus groups.

> Imitating nature…for sure we can leave it some room, but you know, when I make a garden at home, if I let nature take its course, I won't get much in the way of results. I have to intervene to limit some things and to push others along the way. And I guess it would be similar with the forest. (P31)

Moreover, comments were made that pointed to the impossibility of a true emulation of natural disturbances with forest harvests since their effect on soils are too different. The fact that clearcuts remove all mature trees whereas natural disturbances would leave some was also stressed.

> You cannot compare a wildfire with a harvest; no…I don't see the point. (P6)

> I understand the idea…mimicking nature…but you cannot do like nature, you'll never be able to get close to it because you kill your soil. (P1)

Even though there was a general agreement that it was impossible to completely emulate nature, there was also a recognition that an emulation of natural disturbances had its place and that it had to start somewhere, even if fine tuning had to be done later on.

> Let's say that, yes, they are making some mistakes, but at least they are trying to make things better. And, when you look at this over the centuries, 50 years is a short period. We've just now woken up and started trying to fix things, so obviously we're making mistakes. But we have to take the leadership and do something! (P28)

> Human beings are not perfect…now we say let's imitate nature…but that could be a mistake. So maybe we won't imitate nature, but we have to start somewhere, which means taking the risk of making mistakes. There will always be some forest if we act carefully. (P33)

4.6.3.1 Knowledge of natural disturbances

During the focus groups, some disagreement about what emulating natural disturbances meant was revealed. For some, it meant harvesting when the trees are mature yet before they reach the senescent phase. As this differs among species or individual trees, it would imply selective cutting. Nevertheless, some people advised against this, arguing that old trees still perform important tasks in the forest ecosystem and that valuing them as only good for harvest is only seeing them as fibre.

> Waiting until trees are mature. It means to let it grow and to harvest at the right time. (P3)

> Why? Because he's old, because I'm old, then at 60 years of age we are too old so just harvest? (P1)

Aside from individual tree mortality, s insect outbreaks and windthrow were mentioned as the main natural disturbances, followed by lightning, flooding, acid rain and climate change. It was also stated that in forest management, the variations in growth rate from south to north had to be taken into account if emulating nature was the intent. Moreover, it was also expressed that emulating natural disturbances should involve leaving the forest residues on the forest floor instead of piling them up elsewhere and also to leave big standing trees to protect the small ones from snow and ice during winter. Finally, fire was identified as an agent of the natural dynamic, often with reference to the large scale of these disturbances.

> Fire enables forest regeneration. It burns and afterwards there are some saplings. I think that an uncontrolled fire is different…but a controlled fire can clean the woods. (P19)
>
> It doesn't have to be that big. You can apply the same idea, though. (P30)

4.6.3.2 The emulation of fire

The focus groups exposed that the emulation of fire made sense. . As one participant puts it, it is a way to measure the offense that the forest can absorb.

> [Imitating fire is] a way to measure the extent of the changes a forest can handle in size and intensity. Since fire is natural, we can assume that it won't harm the ecosystem too much and that the forest can endure this kind of change. (P18)

The comments also revealed that there was a direct link between the emulation of fire and prescribed burning. Indeed, it was claimed that a true emulation of fire must include the burning of organic matter, which allows for the germination of seeds. Fires were known to be important in the boreal black spruce forests and as well as the that the spruce's seeds are adapted to fire, thus fire was seen as enabling the regeneration of the forest. Furthermore, there was a strong association between the emulation of fire with prescribed burning, with the assertion that the fire had to be controlled. As for the harvests' spatial distribution implied by the emulation of fire, there were concerns about the extra costs caused by this strategy.

> I think that a real imitation of fire would be to leave the branches and to burn them afterwards…But, is that really what they are trying to do? Or do they only imitate fire with regard to the number of hectares or square kilometres without imitating the process of the fire? (P21)
>
> Compared to the unharvested part of the forest, is it that big? In terms of the total forest in percentage…if 10% of the forest burns, then 90% is left. This wouldn't be a big deal. (P30)

Additionally, as emulating fire implies large harvests, the industry's real motive was questioned, with a suspicion that the environmental argument in favour of fire emulation was over-emphasized in order to allow for bigger clearcuts and thereby more profits. This lack of trust also concerned other forest professionals, such as researchers and other specialists.

> I've heard that before the fire, there is a harvest. Is the fire a pretext to increase the size? (P34)

> The real question is "Who paid for the study? And what were his interests?" I come back to this: What are the studies that supported this choice and what were the real goals? Slick marketing and then when they cut it, they don't leave anything. (P29)

Lastly, there was some fear that real fires could occur in the boreal forest while the emulation of fire was being implemented, resulting in too much mature forest removal and the loss of the equilibrium between old and young forests. it was suggested that real forest fires should be suppressed in the zones where fire emulation is implemented.

> What first comes to my mind is that we already have natural fires, and now we are about to add fire simulations. How will we manage all this? If all the forest licensees emulate fires, at some point the balance between what should be a fire or a harvest, the proportion, will be disturbed. Who will set this proportion? (P16)

The emulation of fires was recognized as helping to maintain the woodland caribou, which depends on large forest blocks, since this type of harvest limits fragmentation of the large mature forest blocks. However, there was nevertheless a concern that emulating fires might not benefit the caribou, since fire burns lichens, the caribou's main source of food. It was thus feared that with this strategy, the caribou would be pushed away toward the north, where it would be an easier prey to its predators.

4.6.4 CONCERNS INFLUENCING THE SOCIAL ACCEPTABILITY OF AGGLOMERATIONS

A review of the comments of the focus groups reveals that there is confusion between fire emulation strategy and prescribed burning. Some believed that the fire-emulating strategy consisted of setting a real fire, without any harvesting, and thereby lacked a full understanding of the usefulness of this strategy. In other words, they mistakenly thought that the strategy was about setting the forest on fire and the deliberate burning down of trees. For this reason, the moderator had to carefully explain what the ecosystem management strategy for the boreal spruce forest was about, in other words, that there was no real fire to be set and that the harvest, and not prescribed fire, was meant to emulate fire.

> They would identify the potential area where the fire would be set after…but, could protected areas be included in such burned areas? (P34)

> We often see wildfires that start naturally and which firefighters have a hard time putting out. I think that if we set fires intentionally on top of this, well, even if we think we'll control them…well you see what's happening now in the Gulf of Mexico. The company was saying "we control everything" and now we have this oil slick coming up to the shores. (P13)

Thus, there remained skepticism about the approach and, although acknowledging its good intentions, people feared that it could be ill implemented, with the negative consequences left to society.

> The road to hell is paved with good intentions! They always have good ideas, but when it comes to applying them, it gets out of hand. Unfortunately, we, the people, are the ones who have to put up with and fix the mistakes they made. (P13)

On the other hand, confidence in the agglomeration's approach appears strongly linked to how carefully the emulation of natural fires was to be performed. Indeed, the argument that fire emulation can reduce impacts on the environment was trusted, and as such it was expected that the strategy would mimic natural fires in every single way, not only in form or in spatial distribution. For example, it

was argued that the agglomeration strategy should also replicate the frequency of fire, the varying intensities of the fires and the fact that fire does leave some trees after burning a forest, even if this meant a decrease in the volume of wood harvested. Furthermore, the idea that harvest should leave the same kind of features behind it as fires with regard to quantity and type of vegetation as well as type of terrain and its location came up during the focus groups.

> If we want to imitate a fire, well fire would only take what there is to take and would leave everything that has to be left. It would leave the soil in good condition. (P9)

> Some seeds need the fire to burn the ground to open. The fire also enriches the soil and everything…But if we were to look only at the area a fire would normally burn, and to then imitate fire on that patch of land, that might be better than doing a clearcut. But this is not really emulating fire. I doubt that it is possible to imitate fire only with regard to the area without there being a real fire. (P21)

Finally, the focus groups revealed concerns about the regeneration of the agglomerations given their size. It seemed that if with the assurance that these harvested areas were well regenerated, either naturally or by tree planting, they would be viewed the agglomerations as less problematic. Finally, it was mentioned that even if the strategy seemed fair it should come from a consensus between industry, government and the scientists.

> When they do this type of harvest, do they plant afterwards? (P36)

> Is it easier for natural regeneration to take place with strip cutting, since there are more mature trees all around? (P6)

4.6.4.1 Fire vs harvest

The agglomeration strategy was criticized during the focus groups because it was thought that forest harvesting could not mimic fire. It was even said that it was an impossible task. It was often pointed out that forest harvests disturbed the soil too much and deeply, especially through ruts, whereas fire affected the soil only superficially and regenerated it. It was also indicated that forest harvest

compacts the soil and does not enable cones to open. Indeed, forest harvests were associated with destruction, while fires were related to regeneration. It was suggested that prescribed burning be performed after the harvest in order to allow for the natural processes related to fire and for the regeneration of the boreal forest. Similarly, it was mentioned that residues such as branches and tree tops should be left on the forest floor and not be removed and piled on the road side.

A fire doesn't leave any trace. (P36)

In my opinion, it's good. It brings nutrient, brings down the big trees, leaves some room for the small ones that survived and it grows again…Whereas a harvest doesn't do the same. A harvest creates big ditches, compacts the soil. It's not the same, not at all. If it was, I would say yes. (P6)

4.6.4.2 Type of harvest

The fact that most of the harvests implemented in the agglomeration strategy are clearcuts is negatively perceived. Conversely, it was thought that intelligent harvests should leave some trees.

> These harvests, are they clearcuts? If we want to act in an intelligent manner, we should cut trees but also leave some. (P9)

> A harvest busts everything…you've all said it, a clearcut is a disgrace! (P24)

4.6.4.3 Size of harvest

During the focus groups, the size of the agglomeration was associated with unsustainable exploitation. For example, there were concerns with soil erosion. It was thought that the areas harvested in the agglomeration strategy might be more erosion-prone than those harvested in the traditional clearcut with buffers strategy. Moreover, it was questioned whether the residual forest would be sufficient to prevent such a negative impact. Furthermore, great concern about the capacity of wildlife to return and inhabit those large harvested areas was expressed. A further fear was that because of the harvest size, winds would be too strong for the regeneration to adequately settle.

> With this one, it creates deserts when you clearcut like this, at large. When does the desert come back to life? If it is exposed to strong winds, it can take years before regeneration can come to this height! (P31)

> It's a huge scale…I'm worried about the wildlife in both cases. What will happen with the animals? In the case of a fire or a harvest, the animals, will they move, will they come back? (P3)

Albeit participants the agglomeration's size was considered too big, there was a genuine effort to first try to estimate what proportion of the landscape those harvests represented compared to the remaining forest before forming an opinion on whether it was acceptable or not. Thus it was difficult

to make a judgment without knowing what this ratio is for the rest of the public forests of the province of Quebec.

> It would have been interesting to know what proportion of the productive forest is dedicated to this strategy. If you take all the productive forest and remove the private lands, you'll have all the Crown land. So what's left and what proportion would it take? (P32)

4.6.4.4 Residual forest and connectivity

It was feared in the focus groups that the residual forest left would be unsuitable for wildlife, because composed of uninteresting stands either inaccessible or unfit for the forest industry, but is was also mentioned that the agglomeration's way of leaving residual forest was better since it would not be as windthrow-prone as the traditional buffers left in between traditional clearcuts.

> If there is one thing that I'm against, this is it. I'll tell you why. If I leave you 25% of the territory, I'll leave you a bog or a swamp where there is no merchantable tree, this is what we leave, and it's a gift! No! That's not a forest. (P1)

> The wind will put them down, whereas with this type of patch, the impact of the wind will be less. Some trees might fall on the border, but the core will stay and the animals will still be able to travel from one patch to another. (P29)

Generally, in the focus groups, the forest patches approach was liked mainly for its utility for wildlife. In that context, it was mentioned that these patches had to be interconnected, in order to enable wildlife movement, and large enough to serve as shelter and habitat for wildlife. It was also important that the residual forest enabled wildlife to reach the forest matrix. It was suggested that biologists should indicate where to leave corridors and patches in order to best suit wildlife's need for migration or other type of movement.

The focus groups revealed a great concern about regeneration. It was feared that without evenly scattered buffers, the tree seeds would not be able to adequately colonize the forest floor given the

size of the harvests. As mentioned earlier, it seemed important that the residual forest be left where a fire would have left it in terms of topography and type of soil.

> In a general manner, if we want the animals to be able to live on and reproduce, each agglomeration should be linked to wooded areas where the animals can continue to live in security, and this interlinking should be done with their interest in mind. (P31)

When the participants were informed that government provisions did exist that stipulate that the residual forest be representative of the previous stands, the perception of the residual forest positively improved and there was less skepticism about it. A general comment was that the residual forest should be greater than 25% and that patches should be closer to one another.

Moreover, even though the participants were informed that the riparian buffers would still be implemented with the agglomeration strategy, there nevertheless remained concern about the protection of streams and lakes, since this approach involves the removal of more vegetation from a watershed.

> I would say to the scientists working on this program: “Prove that the riparian buffers are not good for the forest.” (P36)

4.6.4.5 Variable retention

It was mentioned in the focus groups that human activity and fires were quite different on variable retention, since human activity removed the best specimen from a commercial point of view, whereas fire leaves the ones best fitted genetically to resist. As such, it seemed important that the trees left were not only those that are the least interesting for the forest industry. As well, it was said that the proportion of variable retention in the harvested area should be higher than the prescribed 25%. Finally, there was some worry that the trees left standing in the harvested area would fall because of windthrow.

> When we, humans, harvest, we go against nature. If you look at nature, the strongest survive whereas with harvests, humans take the strongest. It’s in our

human nature to always take the best, the lure of money! We take the best and leave the worst. When we leave trees here, we should make sure their roots are strong otherwise, they will fall. (P29)

25% isn't much (P13)

4.6.4.6 Agglomerations versus traditional harvests and mosaic cuts

There was disagreement in the focus groups about which strategy is better. On the one hand, the smaller and scattered harvest patches were preferred, while on the other, participants did not see the point of going into a patch cut forest, and consequently they thought that the mosaic was of no interest for wildlife. It was also mentioned that if the emulation of fire was really better for the ecosystem and its associated wildlife, then it should be done even if humans had to live with the unpleasant aesthetic impacts for a while. Furthermore, the decreased windthrow was a good reason to prefer agglomerations.

For the population, this is of no interest [traditional clearcut]. Who wants to walk in a forest that's been so clinically cut up and segmented? (P18)

I think that if you do lots of small harvests, you'll lose lots of wood because of windthrow. Everywhere you'll have a hole in the forest, all the trees will break around it once you're gone. (P30)

I remember that around small ponds, they used to leave a strip of trees...but it's not worth it, they all fall when there is a blast. When we arrived all the trees were leaning, so the buffers, they're not very good. The agglomerations seem better. (P5)

I would prefer the traditional way, because I think that with a fire, when the seeds are released, if the area without trees is not too big, then the regeneration will be better. (P22)

I think that we should take whichever strategy that has the fewest impacts on wildlife. (P11)

The participants were asked to indicate which of the three strategies—traditional clearcut, mosaic cuts and agglomerations, for an equal amount of wood harvested—was more acceptable for them. The feeling that there was a lack of real choices emerged from the focus groups. It was claimed that, an acceptable way of harvesting forests should also involve the opportunity to decide on the quantity of wood to be harvested and not only on the type of harvest. Furthermore, some participants criticized the exercise given the fact that the agglomeration strategy was presented as ecosystemic and more adapted to the forest environment, i.e., better compared to the other strategies. They felt that they had to choose the agglomerations since it was presented as the best choice. Therefore, they considered that there was no real choice.

> I don't know, if you're going to cut it anyway, then go ahead, cut it! Especially since you're telling me that it's scientifically proven to be better. But in the end, the people weren't asked about their preferences ahead of time. (P21)

> When we say it's the best strategy, it's because it relies on our values, on what is important to us and what not…There should be a public debate about which values are important and when we'll have a consensus, then we'll be able to make a decision. (P18)

4.6.5 MITIGATION MEASURES FOR THE AGGLOMERATIONS

The participants were asked about how the agglomerations could be improved in order to make them more acceptable. The following sub-sections will report the comments related to the agglomeration strategy.

4.6.5.1 Regeneration and stand formation

The issue of regeneration was the first mentioned during the focus groups and it was not obvious that the forest could reoccupy areas as large as the agglomerations. As such, the proper regeneration of the agglomeration was an important mitigation measure and it was wished to be as natural as possible. Indeed, single species tree plantations were denounced. If planting had to be done, it was mentioned that it should be adapted to the type of forest and be representative of the previous stands. As well, there was some concerned about pre-commercial thinning, since in this practice, where broadleaves trees are removed in order to favour conifer's growth, was considered harmful for

the wildlife species that feed on broadleaves. Therefore, it was suggested that pre-commercial thinning should not be done everywhere in the agglomerations. A 50-50 ratio of thinning and non-thinning surfaces was suggested.

> I'm not a scientist, but if there was a study made afterwards, we could certainly rebuild the soil in the same way a fire would leave it and then the regeneration would be better. (P30)

> That means that if they don't want the softwood, they'll plant the species they want. I would like to see a 50-50 ratio. 50% planting and 50% natural regeneration. (P1)

> I wouldn't mind it if they had to re-plant after a harvest. We also have to think about the water and prevent the soil from being washed out. (P22)

4.6.5.2 Aesthetic concerns

Even though it was acknowledge in the focus groups that the agglomerations were extremely large harvests, the question of their visual impacts did not come up often. When about aesthetic impacts were mentioned, it was argued that humans' visual preferences should not prevail over environmental consideration, especially the needs of wildlife. Nevertheless, in the case of wildlife management in designated areas such as wildlife reserves, the question of visual impacts gave rise to more disagreement (see Section 4.7).

> If it enables regeneration and if it's better for wildlife…visually, it might be less attractive, but if we cut everything concentrated, then I guess that there are lots of other places where we won't have to harvest or harvest less. (P 6)

> I think that our visual comfort comes after the life of other species. (P15)

> If we can prove it's better for wildlife, even if less aesthetic, then the decision is easy to make. (P15)

4.6.5.3 Remaining forest vegetation

As a general comment about the improvement of the agglomeration strategy it was often mentioned that the area of the residual forest, and of the variable retention, should be greater. The size of the residual forest patches was often seen as insignificant compared to the size of the agglomeration, and as such there was a feeling that those residual forest patches should be larger. Again, it was frequently said in the focus groups that the residual vegetation should be suitable for wildlife and that it should facilitate the mobility of the wildlife. Furthermore, it was argued that the amount and size of forests in-between agglomerations should be higher in order to benefit wildlife.

> I would have left more forest patches than this. I think that it's a good thing to leave big patches because, from my own experience, I know that when they leave buffers, often the trees fall because of the wind. So with such a forest patch, the wind will have fewer negative impacts. If we want to harvest up to 350 square kilometres, well, we should leave as many patches as possible, according to the terrain, the natural obstacles and wildlife movement. (P29)

> The harvest shouldn't be uniform but designed according to the winds, wildlife circulation, rivers and all that. The point is to decrease as much as possible the negative impacts for the same harvested area. (P18)

4.6.5.4 Type of forest and trees harvested

Some disagreement show through in the focus groups about the type of harvest. While it was considered it to be more acceptable to implement agglomerations in areas where the forest was mature, over-mature or unhealthy for some, for others, the agglomeration strategy was clearly unacceptable since it was felt that it did not enable to perform a selection of the trees ready to be harvested or not.

> For me, it's a mature forest, not a young one or a very healthy one. It should be really mature with lots of old trees, then you can cut. (P35)

> Whatever the strategy, if you go in there with the big machinery and harvest trees that shouldn't have been harvested because they weren't mature enough or, on the contrary, if you only want this big tree over there and you break all the surrounding ones, then it's excessive exploitation. (P13)

4.6.5.5 Size of harvests and machinery

It was mentioned during the focus groups that even when emulating fire, the size of the harvest could be reduced in order to generate harvests at the human scale. Interestingly, the idea of reducing the harvest size was linked to job creation since there would be more harvest patches. As well, it was expressed that emulating fire should be done, yet not at the largest scales at which real fires take place. A trade-off between the actual size of the agglomeration and the size of the traditional clearcuts was proposed, as it was perceived to be better for wildlife and regeneration. Furthermore, a shared belief was that emulating nature meant decreasing the machinery's size. Finally, some opposition to very large harvests in general were revealed in the focus groups, which brought the argument that the prices of wood products should be higher in order to increase public awareness about the consequences of their consumption.

> This idea of ecosystem management is interesting if we did it with less intense machinery. We've talk about horses with lighter equipment. (P27)

> Emulating nature may mean excluding big machinery. It supposes that we have to be more modest. (P32)

> Couldn't we decrease the harvest size? Such a large territory …instead of letting one guy harvest it all, we could make it, let's say, 18 harvests and hire more people who would make a living out of it. (P19)

4.6.6 TRADE-OFFS FOR ENVIRONMENTAL VALUES

Participants were asked if they were willing to accept agglomerations despite their large size if they were convinced that this type of harvest was better than its counterparts for the environment. They were given the example of the woodland caribou for which small scattered clearcuts are harmful since it needs large forest blocks. A feeling of doubt resulted from this exercise and it was suggested that constant monitoring and feedback should be given to the population to prove that the agglomeration strategy was better at the environmental level.

> Ok, but with controls over time and in quick succession. We shouldn't do acts of faith anymore. I don't want to be overly suspicious…but if they, the scientists,

> tell us that the expected results will be this and that, then we have to follow up on that and check whether it's true. (P22)

In any event, the focus groups revealed a willingness to accept large fire-emulating harvests and their visual impacts in exchange for decreased impacts on wildlife and the protection of forest massifs that would act as habitat for wildlife. Here, it was suggested that biologists should indicate how large the massif should be so that the caribou can inhabit it.

> We should check with biologists who could tell us what is the area needed by a caribou herd of x individuals…the forest area needed and where to put the corridors in-between…personally, I can't tell what distance is the best, but we should verify with experts. (P5)

Finally, it was mentioned that this kind of trade-off was rather easy for the participants to accept since this type of harvest would be implemented in relatively inhabited zones quite removed from the communities the participants were from. It was also thought that since the majority of the population of Quebec lives in the south, there would be less overall public opposition.

> When I'm in my backyard, that harvest up north, I don't see it. It doesn't bother me. If I hadn't come here tonight, I wouldn't even know it existed, and it wouldn't bother me. (P19)

4.6.7 SKEPTICISM TOWARDS SCIENCE

Furthermore, participants believed that they themselves had sufficient ecological knowledge to judge the strategy, yet that more information should be given to the population about it. As well, skepticism about the scientific knowledge that could maintain such a "truth" was expressed. Many examples of previous scientific facts that proved to be wrong with time were given, such as cow's milk for infants or the management of cod in the Atlantic Provinces. As seen earlier, the focus groups revealed a lack of trust of the experts and scientific studies affirming that agglomerations are better for the environment, with a claim saying that studies often confirm the funding agency's expectations.

> This may be the best solution, I'm not a specialist. But I'm skeptical. I would tell them that they have to explain the outline of the strategy so that I can understand what it's all about. We have a basic understanding of ecology and all that. (P18)

> I'm a disciple of Hume, I'm a skeptic, and I'd like to remind everybody here that in the 60s there was a scientific consensus about the fact that cow's milk was better for infants than human milk…all scientists were convinced of it…So, as for the certainty of science, I'm not convinced. (P5)

4.6.8 MULTIPLE USE HARMONIZATION

During the focus groups, some discordance arose with regard to multiple-use harmonization. One argument was that large-scale harvests such as agglomerations should not be done in wildlife reserves or other wildlife-controlled territories at all, and instead only in sectors that have no wildlife territories. On the other hand, it was thought that forest management in these wildlife territories should be tolerated under the condition that it follows ecosystemic principles as much as possible. A general belief was that wildlife reserves are better managed in terms of forestry than other non-organized public territories. When it was clarified that forest management on wildlife reserves and other wildlife territories is not different in terms of forest exploitation than the rest of the public forest, feeling of stupefaction and outrage were expressed. It was even feared that the agglomeration strategy could reach protected areas such as parks. Participants with an interest in fishing and hunting were of the view that agglomerations should not be implemented in wildlife territories, arguing that the resulting clearcuts would greatly compromise the hunting, fishing or other recreational experience for which they are paying great amounts of money. Furthermore, adding to the decreased opportunity to observe and hunt wildlife, agglomerations were perceived as disrupting the visual experience sought for by visitors of wildlife territories. By contrast, other participants thought that wildlife reserves or other frequented public forests could serve as forestry showcases in order to familiarize the population with forest management and ecosystem management.

> The goal of ZECs and wildlife reserves is to enable the population to benefit from the forest. If you destroy this environment, what is the point in visiting a ZEC if it's clearcut? What's the point? (P36)

> A certain degree of harvesting is allowed in wildlife reserves…So, given that it's permitted, I prefer to have a type of harvest that is ecosystemic…People can go to another reserve while it grows back. (P11)

4.6.9 SPATIAL DISTRIBUTION OF THE AGGLOMERATIONS

The focus groups showed that it was difficult task to estimate the number of kilometres that should be left in between agglomerations. Instead, it seemed easier to propose proportions of agglomerations and mature forest. Usually, a common sense approach of 50-50 was adopted, or similarly, the idea that the equivalent of an agglomeration be left in mature forest before another agglomeration could be harvested was also mentioned. An approach close to the sustainable yield forestry approach was also mentioned. The idea that the right amount of mature forest to leave should be based on the area required to sustain one woodland caribou herd also came up. It was also said that the agglomerations should not represent more than one tenth of the boreal black spruce forest. Still, it was hard to estimate the distances implied by the agglomeration approach, and as a result it was suggested that the agglomerations should be smaller and greatly dispersed. The fire emulation basis of the approach was understood to mean that the distance in between agglomerations should be based on the fire regime and not on an apparently random number. Moreover, it was feared that with the agglomeration strategy, the entire black spruce ecosystem could be harvested within a short time period.

> Well if this strategy emulates fire, then we should check the frequency of real fires and imitate it for real. (P21)

> [We should leave] as much [distance] as possible, I don't have anything to compare it to. (P13)

4.6.10 PREFERENCE FOR PARTIAL CUTS VS CLEARCUTS

4.6.10.1 Disadvantages of partial cuts

First of all, as it was not known exactly what proportion of the forest cover was to be harvested through partial cutting, some difficulty in judging partial cutting arose.. A main concern was that, since

partial cutting has to be implemented on more land in order to harvest an equal amount of wood, more damage would be done, especially with regard to the impacts of machinery. Furthermore, there was a preoccupation about the risk of windthrow for the trees left standing. Since partial cuts open the forest, it was feared that this would favour large carnivores, thereby creating an imbalance in the wildlife populations. Likewise, it was wondered to what extent wildlife could make use of partially harvested forests. Finally, it was thought that partial cutting would be too expensive and non-profitable. There was also some doubt about the actual resolve of industry to implement partial cuts, as these are more expensive, and as such the conclusion that this was an impossible strategy Emerged. Furthermore, it was pointed out that partial cutting needs to be implemented in the context of a long-term management perspective and would thus be incompatible with the, at present, short-term way of operating of industry.

> What I mean is that if you take the same volume of wood but all from the same place, your trucks will be rolling over that single place, thereby harming less of an area than if you were harvesting over an extended area, as is the case with partial cutting, for the same volume. (P30)
>
> If the harvest was done this way [partial cut], then the forest would always be the same or almost the same, but licensees would make less money because it's very expensive to build the roads. (P26)
>
> Partial cutting, which reduces the density of the forest, will benefit predators at the expense of the more vulnerable species. (P5)

4.6.10.2 Advantages of partial cuts

Wildlife reasons were important in the preference for partial cuts. Indeed, the mature cover left was thought to enable the establishment of broadleaf regeneration, something beneficial to many species. In general, there was a belief that partial cut had less environmental impacts than its counterparts. Also, partial cutting was associated with better regeneration since more seed trees are left. The fact that mature trees are left is also associated to less erosion and more wildlife suitability. Partial cutting was linked to the way grandfathers used to manage the forest. With partial cutting, it was argued that the forest would always yield wood. Likewise, partial cutting was perceived as a good way to manage the visual impacts, since with partial cuts the forest always looks pretty much the same. It was also

believed that partial cuts would be implemented with smaller machinery, and thus be less damaging. The idea that by performing partial cuts, the forest operators would come to better know the territory and observe the consequences of the harvests, especially the ruts, came up in the focus groups. It was also mentioned that the infrastructure, especially roads, would be permanent. Finally, partial cutting was seen to allow for the growing of larger trees, which was well perceived as this was associated with the natural forest before the arrival of the first settlers.

> I prefer partial cutting for two reasons…First, partial cutting leaves more seed trees standing that will help regenerate the cutblock, and second, it's easier on the environment, the animals…we protect more and there is less erosion. (P29)

> My father used to say "Look, if we leave some big ones, they will protect the small ones while they grow." (P9)

> I prefer partial cutting because it would oblige the licensees to see the results of their harvests and the ruts…and then they'll have to develop the necessary technology in order to stop doing this. They would also be forced to discover their whole territory by themselves instead of delegating everything to employees, who just fell the trees one after the other. They would have to walk around in the forest in search of the trees to harvest. (P21)

4.6.10.3 How to choose between both?

One criterion that emerged from the focus group as to how to make a choice between the two strategies was their benefits for wildlife. A further criterion was the extent to which a strategy enabled regeneration. As discussed, it was said that aesthetic concerns should, if at all, come second after environmental concerns as a decisional factor.

> It's like in agriculture, a good cheese starts in the field. So a good forest must start with a good soil. If our methods harm the soil, even if we use the best species, we won't have a good yield. (P29)

> I come back to the same question of whether animals can adapt to a 50% harvested forest when they are used to a 100% unharvested forest…How much does this reduce their quality of life? And about the visual aspect, I think we shouldn't care too much about it. (P15)

When partial cuts were preferred to agglomerations it was on the basis that they are less intense, even if they are implemented on larger areas. On the other hand, when the agglomeration strategy was preferred, it was because it affects less territory for a same harvested volume. One participant compared it to a small but deep wound, which he thought was preferable to an injury that was superficial but all over the body. The main reasons why agglomerations were preferred were linked to soil erosion and water quality, the impacts of which were concentrated on one distinct territory rather than being spread out all over the forest. The same is true for roads and industrial type damage, which were sought to be minimized and concentrated. It was argue that the agglomerations could minimize the loss of wood from windthrow.

> I prefer the agglomerated strategy. Of course it depends on the intensity. If it's agglomerated, it will be more intense, but the idea is that by doing so, some forest will remain untouched and this forest will increase the overall part of unharvested forest. And I also think that because it is concentrated, fewer water bodies will be impacted by the forest activities. (P18)

It was important however that both strategies be managed from a global perspective. For example, there was concern about the implementation of such strategies on small areas without knowledge of what is done elsewhere.

> I'm torn between the two because with the agglomerations, it's more intense, localized and human damages will be concentrated, so it seems limited. You won't have 20 ruts, instead you'll have 4, because it's concentrated. But with partial cutting, regeneration will be easier because of the seed trees…see, I have two opinions. But with partial cutting, you need a bigger area for the same volume, so you'll generate more human-made damages. And the other thing that prevents me from making a choice is the whole question of size…Ok there's a limit to the harvest size, let's say that you can't harvest more than 25,000 ha in this 100,000 ha patch…but what happens in the next 100,000 ha patch? (P16)

> The only thing that bothers me is that if we do it in the intense way, more localized, then we use and exploit one territory…but at some point, we'll have to let it rest in order to regenerate…so, we'll have to go to the next territory and do

> the same…So in the end we will have harvested the whole forest in this way, intensely. (P13)

Finally, the focus groups showed some concern about whether the natural importance of insect outbreaks and fires were taken into account before determining the quantity of forest that could be harvested through mimicking nature.

4.7 DISCUSSION

The main objective of this study was to uncover how people uninformed about forestry understand ecosystem management principles and judge the fire-mimicking ecosystem management strategy. Our focus groups uncovered support for ecosystem management principles of mimicking nature in order to reduce environmental impacts of logging where fire was seen as beneficial for the forest, with some doubts that ecosystem management could really imitate its positive impacts on the environment. Grumbine (1994), Manning et al. (1999) and Shindler et al. (1993) also claim that ecosystem management' principles are supported by the public. The support for ecosystem management principles seems to support Brunson's (1996) statement that the acceptability ecosystem management relies on its perceived objectives and its perception as an honest attempt at protecting biodiversity and maintaining sustainability of forest ecosystems in comparison to its alternatives. However, the skepticism about whether harvest can emulate fire echoes Robson et al. (2000) findings that people did not think clearcut can imitate fire.

With regard to the implementation of the strategy in the boreal black spruce forest, the results obtained from the focus groups suggest that there is neither a strong support nor a strong opposition to the agglomeration strategy. What stands out instead is that participants from Quebec City, Canada, judged the strategy on many criteria. Burchfield et al. (2003 *in* Ford et al., 2009a) also found that people make complex assessment of forestry practices when comparing them with their alternatives. The criteria that emerged from our focus groups fit the model proposed by Stankey and Shindler (2006) where social acceptability judgments are constructed through technical and personal knowledge, risks and uncertainties, aesthetics, institutional and personal trust, and spatial, temporal and social contexts.

4.7.1 KNOWLEDGE AND BELIEFS

First, environmental impacts were revealed to be important to the participants in this study, and they also represent the core of Stankey and Shindler's (2006) technical and personal knowledge category, to which we include personal beliefs. As our results show, forest harvest is associated with destruction while fire is associated with regeneration of the forest. These kinds of beliefs are also

reported frequently in the literature (Bliss, 2000; Ford and al., 2009a; Ribe, 2005; Robson et al., 2000). This might explain why, throughout the focus groups, impacts on wildlife, regeneration and soils emerged as important aspects for the participants when judging the fire-emulating strategy, whereas fire impacts were not even questioned. Nature's doing was assumed to be good. The importance of environmental concerns and wildlife value in the acceptability of forestry alternatives and management activities was also observed in the USA Pacific Northwest (Olsen et al., 2012; Ribe, 2006), in Australia (Ford et al., 2009a) and Canada (Nadeau et al., 2007; Wyatt et al., 2011). Furthermore, Brunson (1993) explains that natural disturbances are usually not questioned since they do not imply a choice between possible alternatives. As such, they are not in the realm of acceptability judgments. In our focus groups, the evaluations made by the participants about the strategy itself, the residual forest, variable retention and partial cutting were often based on these three important themes. This insight suggests that any forest management strategy could be judged in those terms, especially since previous studies found similar results. Furthermore, as we observed confusion between fire emulation on the one hand and prescribed burning on the other, it is probable that information about these issues could change the perception of the agglomeration strategy acceptability. Indeed, information can influence the values and attitudes of stakeholders (Bernigner et al., 2009; Ford et al., 2009b; Kearney, 2001) and consequently the social acceptability of forest management (Brunson and Reiter, 1996), among them agglomerated clearcuts (Meitner et al., 2005).

This importance of the environmental impacts on acceptability judgement is congruent with our finding that environmental values are very important to our participants. Indeed, the principles of ecosystem management, namely the emulation of nature, were well accepted by the participants, probably because it matched their forest values. As a result, this forest management paradigm found good support during the focus groups, as did the emulation of natural disturbances like fire. This importance of environmental forest values corresponds to findings from previous studies performed in Australia (Ford et al., 2009a; Williamson et al., 2012) and North America (Bengston et al., 2004; Lee and Kant, 2006; McFarlane et al., 2011; Nadeau et al., 2008; Robinson et al., 2001; Roy, 2008). Our participants thus seem to resemble many other people in terms of their forest values. Since forest values are a good predictor of attitudes toward forestry (Allen et al., 2009; Brown and Reed, 2000; Tindall, 2003), this suggests similar reaction to ecosystem management from the rest of the population, however further research should look deeper into public forest values and support for ecosystem management mimicking fire.

4.7.2 *PERCEIVED RISKS AND UNCERTAINTIES*

In concordance with Stankey and Shindler's model, our study highlights the importance that perceived risks and uncertainties play on acceptability judgments. Indeed, in our focus groups, even though the size of the harvests implied by this fire-emulating ecosystem management strategy did not have the strong negative effect we anticipated on its social acceptability, it did however raise concerns about the strategy's sustainability and its impacts on the environment, such as wildlife use, water protection, soil erosion, windthrow and regeneration hazard. Environmental concerns are nowadays high in the population (Wyatt et al., 2011) and our findings echo those of Cavanagh et al. (2000 *in* Wyatt, 2011) who found that environmental factors explained 50% of the variance observed in judgements of risk for water supply related to the forest industry. Even if the participants to our focus groups by and large supported the emulation of natural fires, they thought that an emulation of the biggest natural fires would be too risky. Controllability is indeed a strong component of risk perception (Slovic, 1987 *in* Kakoyannis et al., 2001). Some participants even preferred the agglomeration strategy because they felt that this approach concentrated the "damages" rather than spreading them like a partial cutting approach does. As well, the portion of the landscape consumed by this strategy contributed to participants' indecisiveness, and the cumulative impacts of both the strategy and real fires on the forest landscape also worried them, which indicates, as stated by Wyatt et al. (2011) that the extent and seriousness of potential effects are considered when assessing risk Furthermore, it was feared that in spite of good intentions, the strategy could be ill-implemented, that it would not yield the expected benefits and that the negative impacts would be left to society to deal with. This aspect relates to the fact that risk perception is inversely related to the assessment of perceived benefits (Cavanagh et al., 2006 *in* Wyatt et al., 2011). The novelty of the strategy probably contributed to this general uncertainty. Indeed, Olsen et al. (2012) found that a majority of their respondent thought that time before the results of a practice are known is an important factor in ecosystem management acceptability.

4.7.3 *AESTHETICS*

As for aesthetics, another element proposed by Stankey and Shindler (2006), in this study the strategy was judged as a whole, whereby its ecological benefits were gauged against its visual

drawbacks. This complex set of tradeoffs between aesthetics and other forest values was also noted by Burchfield et al. 2003 *(in* Ford et al., 2009a). Of course, the methodology of this study oriented the participants to consider the whole strategy and not only its visual aspects. This was also the case in Olsen et al. (2012) survey in Oregon about the social acceptability of fire based ecosystem management, and similarly, in a list of concerns about the strategy, visual impacts were among the least important ones, though important for 45% of the respondents. Thus, if participants were to be presented with the visual results of the strategy only, such a study may well have generated different reactions. Indeed, other studies on the visual perception of forest landscapes reported that clearcuts were clearly unacceptable (CALP, 2003; Ribe, 2006; Yelle et al., 2008; Ford et al., 2009c). Those studies were mainly focused on the visual aspects of forest management and did not ask respondents to position themselves with regard to a strategy as a whole, which may explain the differences. In addition, in these studies variable retention was found to increase visual acceptability, which is why we expected this element of the strategy to increase its acceptability. And it did—but again, more for its ecological advantages than its visual quality. Indeed, in our focus groups variable retention, and as a matter of fact residual forest, were primarily judged for their ecological value. Participants evaluated them with regard to their value for wildlife and their mitigation potential on erosion and regeneration. According to our participants' personal knowledge and beliefs, leaving trees was an intelligent way to manage the forest. In this regard, they evaluated the quantity of residual forest and variable retention, which they felt could be higher, but also the quality of the forest and trees left behind. This echoes Meitner et al. (2005), who also conclude that the social acceptability of agglomerated clearcuts depends on the amount of variable retention. The fact that our participants were urban residents could also have made them feel rather distant from the visual impacts of the strategy, and this could possibly have led them to a different prioritization of undesired impacts than people having different relationship to the forest and the forest industry. Indeed, geographical context, and in particular place attachment, or where a given practice is implemented, can play a significant role in acceptability judgments (Olsen et al., 2012; Shindler, 2000).

4.7.4 TRUST AND SOCIAL CONTEXT

Moreover, our focus groups also uncovered a rather negative perception of forestry as a whole, which we interpret with reference to Stankey and Shindler's notion of trust. In this specific case, we

view trust as a manifestation of the social context, another component of the Stankey and Shindler's model. Social context has also been identified by Kakoyannis et al. (2001) as an important factor of social acceptability of resource management practices. We believe that, to some extent, our participants' suspicion of this new management strategy results from the currently prevailing social context in Quebec's forestry and government. Indeed, in Quebec, the population has been undergoing a crisis of trust with regard to the forest industry ever since the release of the forest documentary *L'Erreur Boréale*. The reasons explaining public suspicion of forest management and its link to the social crisis in forestry are a possible subject for further research. Lack of trust and confidence is well documented in Canada and North America (Nadeau et al., 2007; Ribe and Matteson, 2002; Robinson et al., 2001) and is identified to be a key factor in social acceptability judgments (Kakoyannis et al., 2001; Shindler et al., 2004). As such, the main opinions expressed during the focus groups were linked to the forest practices unsustainability and a disbelief that forests were well managed, thus pointing to a lack of trust in forest managers and policy makers. A lack of trust into forest managers and governmental agencies has been reported to have a negative impact on the acceptability of forest practices and ecosystem management in previous studies (Brunson, 2008; McCaffrey, 2006; Vaske et al., 2007; Winter et al., 2004- *in* Olsen et al., 2012). Moreover, trust into forest managers and agencies is also negatively related to perceived risks and uncertainties (Winter et al., 2004 *in* Olsen et al., 2012) et positively associated with support for disturbance base management (Olsen et al., 2012).

Yet, it should be noted that this crisis is part and parcel of a general climate of distrust in Quebec concerning the integrity of elected officials across all public sectors. Our participants were not only somewhat distrustful of scientific information and forest managers, they also feared that this new strategy could be presented as ecologically beneficial only for the purpose of achieving bigger clearcuts. Olsen and al. (2012) also reported that concerns about the fact that disturbance base management could be an excuse to harvest more. This goes in the trend suggested by Nadeau et al., (2007) who conclude to public disillusion about the forest sector. People are thus doubtful and, even though our focus groups revealed a willingness to test this new approach, the need for monitoring and feedback to the population through serious accountability also emerged from our results.

Interestingly, this suspicion also resulted in greater awareness among the participants. Indeed, they agreed with the fire emulation principles and goals, yet tended to feel short changed if the strategy didn't achieve a perfect emulation of fires. Also It was feared that it might already be too late to implement an ecosystemic strategy due to overcutting. Similarity in fire size was clearly not the only parameter they looked at in fire-emulating harvests. They also examined the effects of fire emulation on soils and regeneration, residual forest, variable retention, harvest design, frequency of harvest and spatial distribution within the forest matrix. Clearly, our focus groups indicate that in this study, the credibility and ability of the fire-emulating strategy to nurture public trust relies on an integrative way to emulate fire. As the absence of real fire effects on soils seemed a major flaw in the strategy's credibility, future research could address if prescribed burning could possibly be well received in the context of a fire emulation strategy. Generating a consensus on the implementation of the strategy among the government, the forest industry and the scientific community was also pointed out as another way to build public trust during our focus groups. This is similar to Olsen et al. (2012) results indicating that 76% of their respondents in Oregon would support disturbance based management if forest managers' plans were reviewed by scientists. While some would argue that this consensus exists already, this is not so clear for the public. A broad consensus about the strategy could also be achieved by, as suggested by participants and in concordance to their great concern about environmental impacts, getting biologists to identify ways to implement the strategy, especially with regard to residual forest. In addition, involving the population in the design and implementation of the strategy would benefit its perception, as our participants criticized not having a real choice, arguing that choosing among the three featured alternatives for the boreal black spruce forest was not enough. They wanted to, more than just choosing the strategy, choose the management paradigm, intended here as sustained yield. Public participation and involvement are known to influence social acceptability (Shindler and Collson,1998 *in* Shindler et al. 2004). More precisely, public participation involving meaningful interactions could be an avenue to rebuild public trust into forest management and forest management agencies (Olsen and Shindler, 2010 *in* Olsen et al. 2012).

Social context also played a role in our participants' notion of forest-based tourism. Indeed, when it came to multiple-use territories common in Quebec, such as wildlife reserves, other wildlife-designated territories including ZECs and outfitters where nature-based tourism is popular, the fire-emulating ecosystem management strategy became more controversial, with the claim that this strategy might not be best suited for this type of territory. This concern for wildlife management

territories might be partly explained by our participants' profile, as most had used public forests for recreational purposes. Public use values of forest were in fact important to our participants, in coherence with earlier studies (Brown and Reed, 2000; Lee and Kant, 2006; Manning et al., 1999; Roy, 2008). Our results suggests that partial cutting would probably be better received in such situations, since it had received good support in our focus groups for its visual advantages, environmental benefits and the fact that it enables to select which trees to harvest or leave, suggesting another topic for future research. Social context arose when it was claimed that smaller harvests would contribute to create jobs. The current forestry crisis and the shutting down of many mills throughout Quebec may have contributed to enhance this aspect for our participants. Indeed, benefits for the population are known to influence social acceptability of forest practices (Shindler and Collson,1998 *in* Shindle et al.. 2004; Shindler et al., 2002).

Focus groups revealed to be an appropriate method to elicit public perception of this ecosystem management strategy since it enabled to approach the topic from the participants' point of view and to uncover multiple aspects of their perception of the agglomeration strategy. However, focus group results cannot be generalized and as such, this case study's results cannot be transposed to the population of Quebec. Since we recruited two thirds of our participants through University Laval's email list, our participants were more educated than the general population for Québec's region (Institut de la statistique du Québec, 2013). Education is known to influence attitudes toward forestry (McFarlane and Boxall 2000; Silvennoinen et al., 2002; Tarrant et al., 2003; Tyrvainen et al., 2003). Men were also overrepresented within our participants, and gender is another factor that has been shown to strongly shape the perception of forestry (McFarlane and Boxall, 2000; Silvennoinen et al., 2002; Tindall, 2003). Lastly, our participants were urban residents, whose perceptions, values, and attitudes about the environment and forest management have been shown to differ from rural or forest dependent communities' residents in some studies, though the most recent ones indicate that this trend is diminishing and differences are now more nuanced (Huddart-Kennedy et al;., 2009; Nadeau et al., 2008; Silvennoinen et al., 2002; Tarrant et al., 2003; Tindall, 2003). As mentioned earlier, given the importance of forest values in the judgments made about forest practices, knowing that participants of this study had similar forest values to those identified by other studies (Brown and Reed, 2000; Lee and Kant, 2006; Manning et al., 1999; Roy, 2008) suggests that the general population could judge the fire-mimicking ecosystem management strategy in a similar way that it was in our focus groups. Future research should verify this in a quantitative manner, building upon

our results. With regard to our participants forest values however, the fact that seven out of 32 participants didn't answer this question might have biased our evaluation. Since this question was the last one and the most intricate one in our questionnaire, we assume that this non response is probably due to questionnaire fatigue. Finally, the people who decided to participate in this study probably had a greater interest or curiosity in forest management than those who did not. In this way, they may differ from the rest of the population and form an interested though uninformed public subgroup. However, given that the ecosystem management strategy in the black spruce forest had only been implemented recently, people had hardly had the opportunity to form a perception about it. Thus, even if they might have been interested in forestry, they probably had not been initiated to this type of cut.

4.8 CONCLUSION

The focus groups held on the perception of the fire-emulating ecosystem management strategy in Quebec's black spruce forest show that its social acceptability relies on a multifactorial assessment of the strategy by the participants involving knowledge and beliefs, aesthetics, trust, risks and uncertainties, and context. Our participants understood the strategy's ecological basis and identified obstacles that could influence the construction of its social acceptability. Even though there was no clear opposition to the fire-emulating strategy, many aspects could be improved according to our participants' comments.

In the knowledge and beliefs category, participants paid much attention to soil disturbances, erosion, regeneration and wildlife and how this new strategy would impact or not on these aspects. These aspects were also linked to the perceived environmental risks of the strategy. Residual forest and variable retention were seen as positive, with many participants advocating that these be increased. Moreover, given that participants valued a complete emulation of fire, they proposed that the proportions of the residual forest and the variable retention could be based on natural fires. This also holds for spatial distribution and size, though caution is advised for size, which seemed to account for a good part of the strategy's perceived risks and uncertainties. Indeed, it was suggested that the agglomerations' size remains below that of extreme natural fires as a means to manage the strategy's perceived risks. The trust issue was revealed important as well in the focus groups, as was the question of having a real choice, a societal debate about how and how much forestry is implemented-with participants demanding for more input in planning and implementing the strategy. The issue of trust is also related to the accountability of the strategy in order to demonstrate responsibility and good stewardship of the public forest, which was identify in the focus groups as an expectation of the participants. The focus groups results also suggest that, in order to promote a facilitating social context for the implementation of the fire-emulating strategy, the strategy could be adapted to multiple-use territories. Furthermore, despite a relatively fair perception of the fire-emulating strategy, the strategy's perception was nevertheless tainted by the strongly negative perception of forest management as a whole that still prevails. In other words, the overall perception of forestry in our focus groups influenced specific implementations, and these perceptions are intimately intertwined. In this sense, we suggest that research enabling a better understanding of the

social perception of forestry in general could help to refine the ecosystem management strategy's acceptability.

Finally, as social acceptability is dependent on context, be it social, temporal or geographical, it should be regularly validated and tested, especially in the case of public forests and new practices such as ecosystem management. Though the results of this study cannot be generalized to the general population, they provided the foundation on which a quantitative tool could be built and used to verify the general population's social acceptability judgment on this particular ecosystem management strategy. Results from this study could also serve to provide information about ecosystem management to the population in order to build people's knowledge and awareness of this type of forest management. This type of study could also be replicated with different groups of the population, among which First Nations since many communities live directly in the black spruce forest, in order to document their perception of the ecosystem management strategy.

As mentioned earlier, for the moment, the fire-emulation strategy is largely unknown by the population; however, this may change quickly with Web 2.0. Yet, if the strategy is poorly reported to the population, it could be doomed regardless of any good economic and scientific foundations. Indeed, in recent years, many major projects such as the natural gas Suroît power plant, shale gas exploration or changes to Orford Park have had to be abandoned in Quebec because of public opposition relating to environmental concerns. Forest policy and decision-makers must address this new dynamic and develop the social aspects of their environmental projects alongside the economic and environmental aspects. In doing so, sustainable development can be achieved through ecosystem management.

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5 CONCLUSION

À travers les trois études de cas composant ce projet de recherche, la stratégie d'aménagement écosystémique en pessière noire à mousses ne s'est pas révélée aussi controversée qu'anticipé initialement. En effet, ce projet a démontré qu'il n'y avait ni forte opposition, ni support clair envers la stratégie de la part d'utilisateurs du milieu forestier, de parties prenantes à l'aménagement forestier et de membres du public non familier, mais intéressé, et plusieurs conditions permettant de construire son acceptabilité sociale ont pu être identifiées. Ainsi, les participants aux trois études ont jugé la stratégie en fonction de plusieurs facteurs dont l'aspect visuel, la gestion intégrée des ressources, les risques perçus et les retombées environnementales en relation avec la taille des coupes avec beaucoup de cohérence et de constance. Les perturbations du sol, la régénération et la faune étaient au cœur des préoccupations environnementales du public non familier, préoccupations que les répondants ont fréquemment utilisées comme facteurs pour juger les stratégies utilisées en forêt boréale.

En ce qui concerne l'aspect visuel de la stratégie, plusieurs des options soumises aux répondants étaient des traitements sylvicoles écosystémiques hypothétiques, encore non réalisés sur le terrain. Ce volet du projet de recherche suggère qu'il est possible de réaliser des traitements sylvicoles écosystémiques émulant les feux dont les conditions visuelles soient acceptables pour divers groupes de citoyens ayant des relations différentes avec la forêt boréale. Cette étude de cas suggère donc qu'il soit possible, du moins dans le cas de la pessière noire, de réunir les points de vue divergents et résoudre le débat écologique-esthétique, permettant ainsi de mettre en œuvre un aménagement forestier mieux adapté à l'écosystème tout en se souciant de l'aspect paysager et des attentes sociales. Des recherches plus approfondies auprès de plus de répondants permettraient d'établir cela avec certitude

Une forte opposition aux coupes à blanc a une fois de plus été réitérée dans cette étude, les conditions visuelles des coupes totales étant clairement jugées inacceptables. Les options visuelles les plus appréciées étaient celles présentant le plus d'arbres verts résiduels. De plus, la rétention dispersée et les petits bouquets étaient plus acceptables que les options présentant de faibles volumes de rétention ou de gros bouquets. Il semble que ces préférences soient le plus opposées

possible à l'effet visuel des coupes totales où le sol est très exposé. Une piste d'explication pourrait être que ces préférences visuelles soient la transposition de valeurs environnementales puisque plus il y a d'arbres et plus ces derniers couvrent la superficie récoltée, moins les impacts environnementaux, tels l'érosion et les modifications hydrologiques, sont censés être intenses. Cela concorderait avec le fait que les valeurs environnementales forestières étaient les plus importantes pour les participants au projet de recherche. De futures recherches pourraient valider cette hypothèse.

Cette importance des valeurs environnementales explique peut-être aussi pourquoi, d'un point de vue perceptuel, les fondements écologiques de l'aménagement écosystémique sont bien acceptés des parties prenantes et du public non familier. Puisque l'AÉ correspondrait à leurs valeurs forestières, il bénéficierait d'une bonne perception générale, ce qui résulterait en une ouverture d'esprit face à sa mise en œuvre. Ainsi, lorsque les fondements de l'AÉ se traduisent en l'émulation de très grands feux dans la pessière noire, les répondants issus du public non familier et des parties prenantes à l'aménagement adhèrent aux principes sous-tendant la stratégie. En fait, les répondants ont fait preuve d'une très grande logique dans leurs raisonnements, faisant plusieurs liens entre les conséquences des feux et ce que la stratégie devrait émuler. En conséquence, pour nos participants, une bonne part de l'acceptabilité de la stratégie repose sur sa capacité à réellement imiter les feux. L'échelle des feux n'était clairement pas la seule composante du régime des feux dont devrait s'inspirer la stratégie selon les répondants. Ces derniers accordaient de l'importance à l'action du feu sur les sols, leur répartition spatiale, leur représentation dans le grand paysage, leur fréquence et la manière dont les arbres et la forêt résiduelle sont épargnés par le feu. Il y a donc lieu de croire qu'une stratégie n'incorporant pas ces aspects pourrait être perçue comme fallacieuse, un élément que de futures recherches pourraient investiguer. Qui plus est, les participants connaissaient les autres perturbations naturelles caractéristiques de la pessière noire à mousse et croyaient que la stratégie devait être améliorée par l'inclusion de leur émulation, particulièrement par la coupe partielle. En effet, la coupe partielle était perçue comme moins dommageable pour l'environnement et mieux adaptée pour les territoires aux usages multiples dans nos études de cas.

De toute évidence, selon les participants sondés, dans les territoires où les usages multiples sont une importante caractéristique du territoire, par exemple pour les territoires fauniques structurés, la stratégie d'aménagement écosystémique actuelle devrait être ajustée. Tout d'abord, l'échelle des

coupes résultant de la stratégie pourrait selon eux rendre l'utilisation des ces territoires à des fins récréatives basées sur la nature pratiquement impossible. De plus, pour la pessière, les objectifs de l'aménagement écosystémique et ceux des territoires fauniques structurés semblent conflictuels. Alors que les premiers visent la réhabilitation du caribou forestier, les seconds visent quant à eux l'augmentation du nombre d'orignaux disponibles pour la chasse, en concordance avec leur mission de mise en valeur de la faune. Effectivement, alors que la coupe mosaïque désavantage le caribou, elle avantage généralement l'orignal. Ainsi, sur les territoires fauniques structurés, la stratégie écosystémique pourrait devoir être adaptée afin de produire un flux constant de bénéfices sociaux et économiques pour la population et atteindre l'acceptabilité sociale, tout en assurant l'intégrité écologique de l'écosystème. De futures recherches pourraient proposer une nouvelle stratégie écosystémique et en mesurer l'acceptabilité.

De fait, l'adaptabilité s'est révélée être une composante importante de l'acceptabilité sociale de la stratégie d'AÉ lors de nos études. Les répondants étaient conscients du fait que la stratégie était récente et ils souhaitaient la voir implantée et améliorée avec le temps et l'acquisition de connaissances et les résultats du suivi. De plus, l'adaptabilité de la stratégie aux caractéristiques régionales, territoriales et sociales s'est aussi révélée cruciale. En effet, les participants concevaient la stratégie d'AÉ comme étant le meilleur outil d'aménagement actuellement disponible afin de diminuer les impacts environnementaux de l'aménagement forestier sur l'écosystème, raison pour laquelle ils étaient ouverts à la voir s'appliquer sur le territoire. On constate donc que la préférence des participants pour cette stratégie est conditionnelle à ce qu'elle engendre de meilleurs résultats environnementaux que ses alternatives. L'avènement de nouvelles pratiques pourrait donc chambouler cette acceptabilité.

Aussi, bien que bénéficiant d'une perception générale assez positive et d'une ouverture envers sa mise en œuvre, les participants ont aussi démontré un manque de confiance envers l'industrie forestière et le gouvernement et un certain scepticisme face aux données scientifiques. Manifestation du contexte social prévalent dans le milieu forestier au Québec actuellement, la problématique de la confiance n'est pas spécifique à l'aménagement écosystémique, mais elle teinte bel et bien la perception qu'ont les gens de tout ce qui touche à la foresterie. De futures recherches pourraient documenter si des stratégies de communication visant à renverser cette tendance et utilisant les facteurs influençant l'acceptabilité ressortissant de nos trois études de cas comme sujets à

vulgariser, pourraient éviter que la stratégie d'AÉ en pessière soit mal interprétée par le public. La nouveauté de la stratégie écosystémique ainsi que l'ampleur des travaux de récolte forestière qu'elle suppose a contribué à ce que les répondants aux enquêtes soient préoccupés des risques engendrés. Les risques perçus, particulièrement les risques environnementaux et sociaux, ont teinté les jugements des répondants, les incitant à la prudence, parfois même à l'indécision. Par ailleurs, c'est bien souvent en comparant la stratégie avec ses alternatives actuelles que les répondants l'acceptaient, lui donnant la chance de faire ses preuves par rapport à la coupe totale traditionnelle ou la coupe mosaïque. L'évolution des connaissances forestières et des pratiques d'aménagement écosystémique sont donc dans cette étude, un intrant dans le jugement d'acceptabilité sociale qui fait ressortir l'importance de valider celle-ci fréquemment dans de futures recherches.

En effet, pour le moment, tout en émulant les feux, l'aménagement écosystémique a indéniablement le potentiel de correspondre aux valeurs de la population en ce qui concerne l'aménagement des forêts publiques, mais, du côté de l'acceptabilité sociale, son sort réside inévitablement dans la manière dont il est mis en application et dont ses objectifs sont compris par la population. Puisque la perception sociale de l'aménagement forestier et les valeurs forestières évoluent avec le temps, le contexte social et l'apport d'information nouvelle, l'adéquation de la stratégie avec les valeurs et attentes de la société doit être assurée constamment. Effectivement, tout comme les connaissances écologiques se rapportant à l'aménagement forestier sont continuellement mises à jour et bonifiées, les connaissances sur la perception sociale relative au domaine forestier doivent aussi être renouvelées, particulièrement dans le contexte d'un aménagement forestier durable et de gestion adaptative. Finalement, ce projet de recherche contribue aux connaissances sur les aspects sociaux de l'aménagement écosystémique dans le contexte de la pessière noire, qui à ce jour, n'avaient pas été prises en compte alors que les aspects écologiques l'étaient fortement. Les différentes échelles de perception utilisées ont permis de sonder trois différents types de publics ayant diverses relations à la forêt boréale au moyen de trois approches complémentaires adaptées à ces relations. Comme trois types de lunettes différentes, ayant pour objectif différentes visions des relations à la forêt, les trois études de cas composant ce projet de recherche mettent en lumière la construction de l'acceptabilité sociale de l'aménagement écosystémique en pessière noire à mousses, suggérant des pistes quant aux aspects qui permettent l'acceptabilité de cette stratégie et son amélioration afin qu'elle réponde mieux aux attentes sociales. Les méthodes qualitatives utilisées dans les chapitres 3 et 4 ont permis de comprendre comment plusieurs des facteurs identifiés dans des études

quantitatives, comme intervenant dans les jugements d'acceptabilité sociale, jouent un rôle dans la formation des jugements d'acceptabilité. La richesse des données mises au jour par ces études de cas ont donc permis d'identifier les écueils possibles ainsi que les éléments susceptibles de construire l'acceptabilité sociale de l'aménagement écosystémique en pessière noire à mousses au Québec. Toutefois, la perception des communautés autochtones doit aussi contribuer à l'évaluation de l'acceptabilité sociale de l'aménagement écosystémique et des méthodes d'enquête appropriées à leur culture doivent être utilisées pour ce faire.

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7 APPENDIX 1: QUESTIONNAIRE

The questionnaire is available at:

http://www.cef-cfr.ca/index.php?n=Membres.VeroniqueYelle

8 APPENDIX 2: DETAILED INTERVIEW GRID

Introduction *Questions de routine pour démarrer la conversation*	• Lieu de résidence • Lien à la forêt • Motivation de la participation à la Table - Groupe représenté - Nombres d'années - Lien avec le territoire de la RF ou forêt en général et études - Intérêt à représenter ce groupe/vocation du groupe
Appropriation de la notion d'AÉF	• Perception de l'aménagement forestier en général • Connaissance du concept d'AFÉ/définition personnelle – Accord ou non avec le fait de s'inspirer des perturbations naturelles
Compréhension et perception de l'AÉF pour la pessière	• Connaissance des perturbations naturelles (feu, TBE) • Connaissance des implications de l'AÉF • Avantages et inconvénients des coupes agglomérées/Enjeux • Avantages et inconvénients des coupes partielles/Enjeux • Acceptabilité (coupes agglomérées, coupes partielles) – La pratique est-elle acceptable selon le répondant? – Qu'est-ce qui pourrait la rendre acceptable si non? – Combien de temps pour que ça redevienne acceptable?
Appréciation coupes agglomérées vs autres stratégies	• Coupes agglomérées et traitements sylvicoles *Présenter au répondant les traitements appliqués dans les agglomérations de coupe (simulations VNS)* – pourcentage et type de rétention variable – Rôle de la rétention variable (brûlis partiel?) – les proportions sont-elles acceptables – si non, de combien devraient-elles être? • Végétation résiduelle *Présenter au répondant les types et la quantité de VR dans les agglomérations et voir si la proportion est acceptable… si non, quelle serait la proportion idéale? (Schémas)* – pourcentage et type de la forêt résiduelle – Récolte ultérieure? Combien et quand? • Coupes agglomérées et coupe partielle – ratio idéal entre les deux types de coupes – pourcentage de prélèvement ? – explorer scénarios SÉPAQ *(à discuter avec ME Desmarais)* • coupe traditionnelle/CMO et coupes agglomérées *À partir de schémas, présenter les 2 types de chantiers et vérifier la préférence du répondant*

	- règles de juxtaposition/distance entre chantiers - présence de massifs/massifs altérés en CP - quantité de chemins • Autres éléments à apporter ou modifier qui pourraient rendre cette pratique acceptable?	**Végétation résiduelle dans la coupe selon dérogation au RNI**
Sondage et talon socio-démographique	Même sondage avec simulations visuelles qu'au volet 1 aussi distribué aux répondants des entrevues	

Présenter au répondant les types et la quantité de VR dans les agglomérations et voir si la proportion est acceptable… si non, quelle serait la proportion idéale? (Schémas)

- pourcentage de rétention variable :
  - minimum de 20% des superficies coupées
  - CPPTM, CPTDV, CRB (illustration des traitements)

- disposition de la forêt résiduelle

Forêt résiduelle : 30% de l'agglomération de coupes

25%

- Bloc insulaire : 50-200 ha (10% minimum de la forêt résiduelle);
- Péninsule : ≥ 500 m de large, ratio H/L = entre 1 et 4, connecté à la matrice, 25-200ha;
- Corridor : ≥ 500 m de large, connecté à la matrice;
- Bandes riveraines : 20 m de large (6-8% de la forêt résiduelle).

5%

- Fragment : minimum 1ha pour être comptabilisé.

***Au moins 80 %** de la superficie de l'agglomération de coupes doit se trouver à **600 m ou moins** de la limite d'une forêt résiduelle contenant une forêt d'intérieur et **moins de 2 % doit se situer à plus de 900 m**.

***La **récolte de la forêt résiduelle** au cours d'une deuxième entrée ne pourra se faire que s'il est possible de maintenir une quantité de **forêts fermées de plus de 7 m** équivalente à celle laissée lors de la première entrée.

Infos trouvées sur le site Web du MRNF

Qu'est-ce que l'aménagement écosystémique

L'aménagement écosystémique se définit comme une approche écologique appliquée à l'aménagement forestier. Sa mise en œuvre vise à assurer le maintien de la biodiversité et la viabilité de l'ensemble des écosystèmes forestiers tout en répondant à des besoins socioéconomiques dans le respect des valeurs sociales liées au milieu forestier.

Concrètement, l'aménagement écosystémique consiste à réaliser des interventions forestières en vue de reproduire toute la variété et l'irrégularité des forêts naturelles. Cette approche offre la meilleure garantie pour préserver toute la gamme des espèces et des écosystèmes présents dans le milieu forestier. Elle correspond aussi à des valeurs importantes attribuées aux forêts naturelles du Québec par la population.

Coupes à rétention variable (CRV)

Les coupes à rétention variable consistent à récolter le bois, tout en maintenant de manière éparse ou regroupée des arbres vivants de différents diamètres, des chicots, des débris ligneux, des espèces de sous-bois et des portions de litière forestière intacte, et ce, pour au moins la durée de vie du prochain peuplement. Ces traitements permettent donc, comme le font les perturbations naturelles, de conserver intacts des éléments qui agiront comme legs biologiques dans le futur peuplement.

Coupe avec protection de la régénération et des sols avec rétention de bouquets (CPRSRBOU) **

Coupe avec protection de la régénération et des sols au cours de laquelle des bouquets d'arbres sont laissés intacts dans le but de favoriser une certaine irrégularité dans le peuplement à venir et fournir un apport plus constant de bois mort tout au long de la période de révolution du peuplement. Ce traitement sylvicole vise la rétention, sur environ 5 % de la superficie récoltée, de bouquets d'une superficie d'environ 150 à 300 m² chacun et à l'intérieur desquels aucun prélèvement ne doit être fait. Chaque bouquet doit contenir au moins cinq tiges commerciales (> 10 cm).

Coupe avec protection des petites tiges marchandes (CPPTM) **

Récolte d'arbres qui consiste à prélever entre 70 et 90 % du volume de bois marchand d'un peuplement et qui vise à préserver la régénération en place, c'est-à-dire les gaules de 2 à 8 cm de diamètre à hauteur de poitrine (DHP) et les petites tiges marchandes de 10 à 14 cm de DHP.

Coupe avec protection des tiges à diamètre variable (CPTDV) **

Récolte d'arbres, dérivée de la CPPTM, visant à protéger une partie des gaules et des tiges commerciales de 10 à 14 cm. Ce traitement est utilisé lorsque les gaules et les petites tiges marchandes sont réparties de façon discontinue dans le peuplement, ce qui ne permet pas d'atteindre le nombre de tiges protégées par hectare normalement désirées dans une CPPTM.

Coupes partielles (CP)

Les coupes partielles, qui consistent à prélever une partie seulement des arbres du peuplement, visent à maintenir un couvert forestier fermé et des arbres d'au moins 7 m de hauteur. Plusieurs pratiques font partie des coupes partielles, comme la coupe de jardinage, la coupe progressive irrégulière, la coupe progressive d'ensemencement, la coupe progressive à sélection rapprochée et l'éclaircie commerciale.

Coupe progressive à sélection rapprochée

Récolte d'arbres en deux étapes d'intervention qui vise à maintenir dans le temps un couvert partiel dans le peuplement et à favoriser la régénération naturelle à partir des semences provenant des arbres résiduels. Le territoire traité comprend des bandes où le prélèvement est partiel, des bandes où le prélèvement est total (dans les sentiers) et des zones boisées intactes. La première étape de récolte consiste à prélever une partie des arbres (prélèvement partiel) – selon certains critères de sélection – dans les premiers mètres de chaque côté des sentiers de débardage. La deuxième étape consiste à récolter les arbres laissés sur place à la première intervention, en utilisant de nouveaux sentiers établis dans les zones intactes préservées au moment de la première récolte.

Coupe progressive irrégulière **

Coupe partielle où la récolte des arbres est effectuée de façon à maintenir ou à créer des peuplements de structure irrégulière en utilisant de préférence l'ensemencement naturel.

Coupe progressive d'ensemencement (CPE)

Récolte d'arbres visant à amener des conditions favorables à la régénération des essences résineuses dans les peuplements susceptibles à l'enfeuillement après coupe.

Éclaircie commerciale

Récolte d'arbres – dans un peuplement de structure régulière qui n'a pas atteint l'âge d'exploitabilité – destinée à accélérer l'accroissement en diamètre des arbres restants et aussi, par une sélection convenable, à améliorer la qualité du peuplement d'arbres.

Coupe de jardinage (résineux**)

Récolte d'arbres individuels ou de petits groupes d'arbres dans un peuplement irrégulier ou inéquienne pour en récolter la production et amener ou maintenir ce peuplement dans une structure inéquienne, tout en assurant les soins culturaux nécessaires aux arbres en croissance et l'installation de semis.

9 APPENDIX 3: INDIVIDUAL INTERVIEWS CODING CATEGORIES

Type	Nom		
Nœud hiérarchique	**AGGLOMÉRATIONS DE COUPES**		
	Nœud hiérarchique	acceptables	
		Nœud hiérarchique	à comparer les autres outils disponibles
		Nœud hiérarchique	à condition que
	Nœud hiérarchique	pas acceptable	
	Nœud hiérarchique	Perception par le public	
	Nœud hiérarchique	Retour à l'acceptabilité	
Nœud hiérarchique	**AMÉLIORATIONS**		
	Nœud hiérarchique	Adaptabilité	
	Nœud hiérarchique	Admettre les baisses de possibilité	
	Nœud hiérarchique	AÉC	
	Nœud hiérarchique	Consultations plus fréquentes	
	Nœud hiérarchique	Crédits sylvicoles pour la CP	
	Nœud hiérarchique	Diminuer la récolte	
	Nœud hiérarchique	Esthétique	
	Nœud hiérarchique	interventions mieux ciblées	
	Nœud hiérarchique	Nouvelle stratégie	
	Nœud hiérarchique	Opérations hivernales seulement	
	Nœud hiérarchique	Opérations manuelles	
	Nœud hiérarchique	Partialisation du territoire	
	Nœud hiérarchique	Préserver vieilles forêts et autres écosystèmes intacts	
	Nœud hiérarchique	Régionalisation	
	Nœud hiérarchique	Statut particulier au réserves fauniques	
	Nœud hiérarchique	Tierce partie	
Nœud hiérarchique	**AMÉNAGEMENT ÉCOSYSTÉMIQUE**		
	Nœud hiérarchique	Définition confuse	
		Nœud hiérarchique	Aménagement faunique
		Nœud hiérarchique	bassin versant
		Nœud hiérarchique	développement durable
		Nœud hiérarchique	GIR
	Nœud hiérarchique	Imiter les perturbations naturelles est bien	

		Nœud hiérarchique	La nature fait bien les choses
	Nœud hiérarchique	Perturbations naturelles mentionnées	
	Nœud hiérarchique	Réticences envers l'aménagement écosystémique	
		Nœud hiérarchique	autres intrants dans le choix de stratégie
		Nœud hiérarchique	Difficile à réaliser
		Nœud hiérarchique	imitation en partie seulement
Nœud hiérarchique	**AVANTAGES**		
	Nœud hiérarchique	Accès au territoire	
	Nœud hiérarchique	Diminution de la quantité de chemins	
	Nœud hiérarchique	économique	
	Nœud hiérarchique	Gestion plus facile	
	Nœud hiérarchique	Harmonisation des usages	
	Nœud hiérarchique	Meilleure acceptabilité sociale	
	Nœud hiérarchique	Meilleure intégration visuelle	
	Nœud hiérarchique	Mieux pour la faune	
	Nœud hiérarchique	Plus adapté au territoire	
	Nœud hiérarchique	Protection de massifs	
	Nœud hiérarchique	Protection du caribou	
	Nœud hiérarchique	Retour du peuplement plus rapide	
	Nœud hiérarchique	Superficie plus petite	
	Nœud hiérarchique	Volume plus élevé ou maintenu	
	Nœud hiérarchique	Vraiment écosystémique	
Nœud hiérarchique	**CHANTIER PRÉFÉRÉ**		
	Nœud hiérarchique	Raison	
Nœud hiérarchique	**CHEMINS**		
	Nœud hiérarchique	Fermeture	
	Nœud hiérarchique	Subventions	
Nœud hiérarchique	**CMO**		
	Nœud hiérarchique	Vision faunique (prélèvement)	

Nœud hiérarchique	**COUPES CPRS SÉPARATEURS**		
Nœud hiérarchique	**COUPES PARTIELLES**		
	Nœud hiérarchique	Acceptable	
	Nœud hiérarchique	Confusion avec CMO	
Nœud hiérarchique	**DIVERS**		
	Nœud hiérarchique	Formation	
		Nœud hiérarchique	autre
		Nœud hiérarchique	biologie
		Nœud hiérarchique	faunique (prélèvement)
		Nœud hiérarchique	foresterie
		Nœud hiérarchique	territoire
	Nœud hiérarchique	Lien à la forêt	
	Nœud hiérarchique	Origine	
		Nœud hiérarchique	Natif de la région
		Nœud hiérarchique	Non natif de la région
	Nœud hiérarchique	Relation avec la forestière	
	Nœud hiérarchique	Travail	
Nœud hiérarchique	**FORÊT RÉSIDUELLE**		
	Nœud hiérarchique	Composition	
	Nœud hiérarchique	Disposition	
	Nœud hiérarchique	Retour	
		Nœud hiérarchique	Acceptable
		Nœud hiérarchique	Forêt mature
		Nœud hiérarchique	Hauteur du peuplement
		Nœud hiérarchique	Inacceptable
		Nœud hiérarchique	Mitigation des impacts visuels
		Nœud hiérarchique	Peu probable
		Nœud hiérarchique	Selon enjeux et compromis
	Nœud hiérarchique	Superficie	
Nœud hiérarchique	**INCONVÉNIENTS**		

	Nœud hiérarchique	Compatibilité avec autres prises en compte du territoire	
	Nœud hiérarchique	Dérangement du caribou	
	Nœud hiérarchique	Disponibilité des travailleurs	
	Nœud hiérarchique	Entretien des chemins	
	Nœud hiérarchique	Facilite la coupe	
	Nœud hiérarchique	Habitats fauniques	
	Nœud hiérarchique	Impacts environnementaux	
	Nœud hiérarchique	Intégration visuelle des coupes	
	Nœud hiérarchique	Obligation de récolter	
	Nœud hiérarchique	pas écosystémiques	
	Nœud hiérarchique	pas GIR	
	Nœud hiérarchique	Perception sociale	
	Nœud hiérarchique	Plus coûteux	
	Nœud hiérarchique	Plus grand accès au territoire	
	Nœud hiérarchique	Premiers essais mitigés	
	Nœud hiérarchique	Régénération	
	Nœud hiérarchique	Superficie trop grande	
	Nœud hiérarchique	Susceptibilité au chablis	
Nœud hiérarchique	**JUXTAPOSITION**		
	Nœud hiérarchique	Distance actuelle acceptable	
	Nœud hiérarchique	Distance actuelle inacceptable	
	Nœud hiérarchique	Distance souhaitée	
	Nœud hiérarchique	Incertain	
	Nœud hiérarchique	Variable selon les enjeux	
Nœud hiérarchique	**MASSIFS**		
	Nœud hiérarchique	altérés	
		Nœud hiérarchique	Acceptable
		Nœud hiérarchique	Conditions pour massif altéré
		Nœud hiérarchique	Inacceptable
	Nœud hiérarchique	de protection	
	Nœud hiérarchique	superficie	
Nœud hiérarchique	**POURCENTAGE**		
	Nœud hiérarchique	Actuel acceptable	

		Nœud hiérarchique	Pcq mesures complémentaires
	Nœud hiérarchique	Actuel n'est pas assez	
	Nœud hiérarchique	idéal	
	Nœud hiérarchique	Incertain	
	Nœud hiérarchique	Variable selon les enjeux	
		Nœud hiérarchique	Enjeu paysager
		Nœud hiérarchique	Faunique
		Nœud hiérarchique	Strates prioritaires
Nœud hiérarchique	**RÉTENTION VARIABLE**		
	Nœud hiérarchique	Bouquets	
	Nœud hiérarchique	Confusion avec coupes partielles	
	Nœud hiérarchique	Difficulté à atteindre la cible	
	Nœud hiérarchique	Méthode d'inventaire	
	Nœud hiérarchique	Rôle	
Nœud hiérarchique	**STRATÉGIE COMBINÉE**		
	Nœud hiérarchique	Accord	
	Nœud hiérarchique	Désaccord	
	Nœud hiérarchique	Ratio suggéré	
		Nœud hiérarchique	Adaptable selon...
		Nœud hiérarchique	Incertain
Nœud hiérarchique	**THÈMES entrevue**		
	Nœud hiérarchique	Acceptabilité de la coupe partielle	
	Nœud hiérarchique	Acceptabilité des agglomérations	
	Nœud hiérarchique	Autres	
	Nœud hiérarchique	Avantages et inconvénients des agglomérations	
	Nœud hiérarchique	Avantages et inconvénients des coupes partielles	
	Nœud hiérarchique	Chemins	
	Nœud hiérarchique	Connaissance du concept d'aménagement écosystémique	
		Nœud hiérarchique	Accord avec imitation des perturbations naturelles

		Nœud hiérarchique	Définition personnelle
		Nœud hiérarchique	Implications de l'AFÉ
		Nœud hiérarchique	Perturbations naturelles pour la région
	Nœud hiérarchique	Délai pour retour à l'acceptabilité d'une agglomération	
	Nœud hiérarchique	Forêt résiduelle	
		Nœud hiérarchique	Pourcentage
		Nœud hiérarchique	Retour pour récolte dans la forêt résiduelle
	Nœud hiérarchique	Groupe représenté	
	Nœud hiérarchique	Juxtaposition des coupes agglomérées	
	Nœud hiérarchique	Massifs altérés	
	Nœud hiérarchique	Origine et Background	
	Nœud hiérarchique	Perception de l'aménagement forestier	
	Nœud hiérarchique	Préférence entre les types de chantiers	
	Nœud hiérarchique	Rétention variable	
		Nœud hiérarchique	Pourcentage
		Nœud hiérarchique	Rôle
	Nœud hiérarchique	Stratégie combinée	
		Nœud hiérarchique	Ratio
Nœud hiérarchique	**VISION DE L'AMÉNAGEMENT FORESTIER**		
	Nœud hiérarchique	Neutre	
	Nœud hiérarchique	Perception négative	
		Nœud hiérarchique	Arbitrage par MRNF
		Nœud hiérarchique	Emploi dans la région
		Nœud hiérarchique	Gaspillage de la ressource et surexploitation
		Nœud hiérarchique	Impacts sur l'environnement
		Nœud hiérarchique	Lenteur du système
		Nœud hiérarchique	Lois et réglementation
		Nœud hiérarchique	Pas d'accès ou de droit pour la population locale
	Nœud hiérarchique	Perception positive	
		Nœud hiérarchique	Développement durable

	Nœud hiérarchique	Préoccupation paysagère	

10 APPENDIX 4: FOCUS GROUPS CODING CATEGORIES

Type	Nom	Mémo_lié
Nœud hiérarchique	Aires protégées	Oui
Nœud hiérarchique	Aménagement durable des forêts	Oui
Nœud hiérarchique	Aménagement écosystémique	Oui

Type	Nom
Nœud hiérarchique	Répartition des coupes
Nœud hiérarchique	Manque de connaissance pour juger
Nœud hiérarchique	Forêt résiduelle
Nœud hiérarchique	Confusion avec laisser brûler les feux
Nœud hiérarchique	Conditions pour acceptabilité
Nœud hiérarchique	Brûlage après coupe

Nœud hiérarchique	Avantages	Oui

Type	Nom
Nœud hiérarchique	Mieux pour la régénération
Nœud hiérarchique	Mieux pour la faune
Nœud hiérarchique	Mieux pour bandes riveraines
Nœud hiérarchique	concentration

Nœud hiérarchique	Bénéfices apportés par la forêt	Oui
Nœud hiérarchique	Caribou forestier	Oui
Nœud hiérarchique	Chablis	Oui
Nœud hiérarchique	Consommation des produits forestiers	Oui
Nœud hiérarchique	Désengagement social de l'industrie	Oui
Nœud hiérarchique	Emplois forestiers	Oui
Nœud hiérarchique	Forêt en santé	Oui
Nœud hiérarchique	Îlots, corridors, péninsules	Oui
Nœud hiérarchique	Imiter la nature	Oui
Nœud hiérarchique	Lien affectif avec la forêt	Oui
Nœud hiérarchique	Paradigme dominant	Oui
Nœud hiérarchique	Participation du public	Oui
Nœud hiérarchique	Perception exploitation forestière	

Type	Nom
Nœud hiérarchique	Vision à long terme
Nœud hiérarchique	Taille des coupes
Nœud hiérarchique	Respect de la nature
Nœud hiérarchique	Rentabilité
Nœud hiérarchique	Réglementation
Nœud hiérarchique	Régénération

	Nœud hiérarchique	Préoccupation pour la faune
	Nœud hiérarchique	Plantations
	Nœud hiérarchique	Petits arbres au nord
	Nœud hiérarchique	Perte d'espace pour autres usages
	Nœud hiérarchique	Perte de confiance
	Nœud hiérarchique	Perception coupes partielles
	Nœud hiérarchique	Perception coupes à blanc

Type
Nœud hiérarchique

	Nœud hiérarchique	Pas de problème de surexploitation
	Nœud hiérarchique	Nécessaire pour produits forestiers utlisés
	Nœud hiérarchique	Machinerie
	Nœud hiérarchique	Impacts esthétiques
	Nœud hiérarchique	Impacts environnementaux
	Nœud hiérarchique	Gaspillage
	Nœud hiérarchique	Exploitation abusive
	Nœud hiérarchique	Éclaircie précommerciale
	Nœud hiérarchique	Diminution de la récolte pcq crise forestière
	Nœud hiérarchique	Coupes à petite échelle
	Nœud hiérarchique	Coupe Mosaïque
	Nœud hiérarchique	Comparaison avec une autre industrie
	Nœud hiérarchique	Bandes écrans
	Nœud hiérarchique	Bande riveraine
	Nœud hiérarchique	Attentes envers le gouvernement
	Nœud hiérarchique	Approvisionnement en ressource ligneuse
	Nœud hiérarchique	Appât du gain
	Nœud hiérarchique	Anciennes méthodes
	Nœud hiérarchique	Aménagement multi-ressource
	Nœud hiérarchique	Améliorations à apporter
Nœud hiérarchique	Période d'opérations	Oui
Nœud hiérarchique	Perturbations naturelles	Oui

Type	Nom
Nœud hiérarchique	différence avec exploitation forestière

Nœud hiérarchique	position face à la forêt	Oui
Nœud hiérarchique	Protection de la forêt	Oui
Nœud hiérarchique	Raison de la fréquentation de la forêt	Oui
Nœud hiérarchique	Recherche	Oui
Nœud hiérarchique	Reforestation des terres agricoles	

Nœud hiérarchique	Réserve Faunique	Oui
Nœud hiérarchique	Résilience de la nature	Oui
Nœud hiérarchique	Thèmes des questions	