

RECREATIONAL VALUE OF THE FOREST IN SOUTHEASTERN MANITOBA

BY

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#### *ABSTRACT*

The two major recreational uses of the forest in southeastern Manitoba are outdoor recreation and hunting, with annual benefits of more than \$6 million. Recreation accounted for almost \$5.5 million of the benefits, most of which came as income and employment to those providing food, accommodation, and other goods and services to tourists and recreationists. During the 1970-1975 period 819 394 visitor-days per year were forecast for the area, 94% of them accounted for by outdoor recreation. Possible changes in forest management and fire control are not expected to alter significantly the total recreational benefits, although they might add or subtract benefits up to \$30 000 per year on a long-term basis. In the case of a disastrous fire in the Whiteshell Park annual loss of benefits might rise temporarily to \$215 000.

#### *RÉSUMÉ*

Dans le sud-est du Manitoba, la récréation en plein air et la chasse constituent deux usages importants de la forêt, rapportant annuellement plus de 6 millions de dollars. Les 5.5 millions provenant de la seule récréation étaient sous forme de revenus et de salaires à ceux qui fournissaient la nourriture, le gîte et autres produits et services aux touristes et vacanciers. On estime à 819 394 visiteurs-jours la fréquentation durant le période 1970-1975, dont 94% de ce chiffre pour la seule récréation. Les auteurs doutent que des méthodes nouvelles

d'aménagement des forêts et de lutte contre les incendies de forêts changent significativement ces chiffres. Elles pourraient tout au plus augmenter ou diminuer annuellement de 30 000 dollars les revenus à long terme. Dans le cas du désastreux incendie dans le parc Whiteshell la diminution annuelle des revenus pourrait atteindre temporairement 215 000 dollars.

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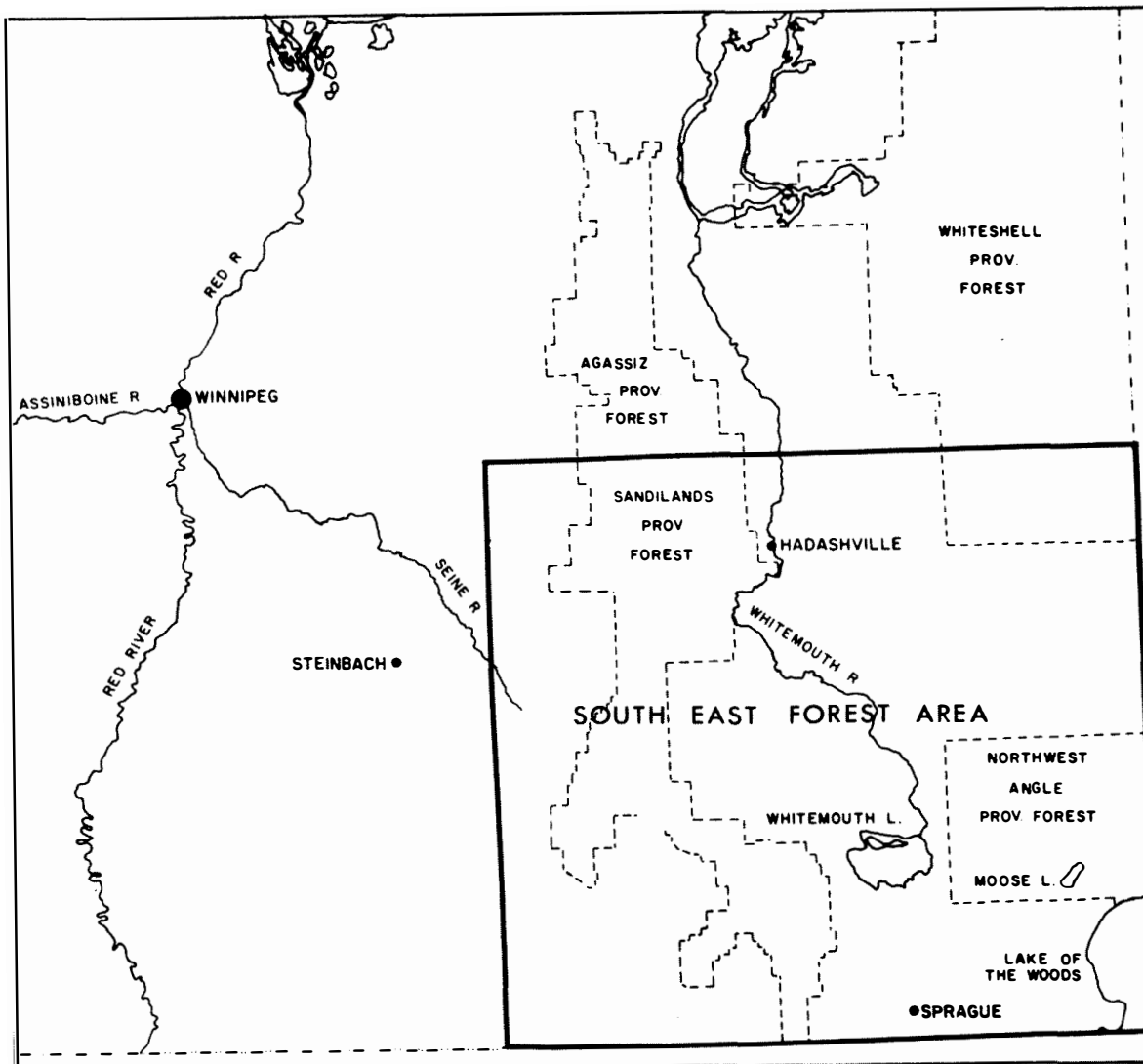
## *INTRODUCTION*

In 1968 a study was initiated by the Forestry Branch, Canada Department of Fisheries and Forestry to evaluate criteria for assessing the effectiveness of expenditures on forest fire control, with special application to the Southeast Forest Area of Manitoba. The study, contracted to the Department of Agricultural Economics, University of Manitoba, was conducted in three parts. The first section dealt with an analysis of recent forest fire history in the area and evaluated some of the more important determinants of fire suppression through the application of regression analysis (Capel and Teskey 1970). The second part estimated the economic importance of commercial forestry, including present annual harvests of round wood, employment and income generated, and potential forest production in the area (Capel and Teskey 1971).

This report forms the third part of the study, an estimate of the value of recreational uses in the area. It estimates total benefits of outdoor summer recreation and hunting activity and considers the possible effects of significant changes in forest management and incidence of severe forest fires on these activities.

## *STUDY AREA*

The Southeast Forest Area is located in the extreme southeastern corner of Manitoba and covers about 728 000 ha (1.8 million acres) of lower productivity soils (see Map). The area is bounded on the east by the Northwest Angle territory of Minnesota and the Province of Ontario and on the south by the State of Minnesota. The northern boundary includes a southern portion of the Whiteshell Forest Reserve



Map of Southeast Forest Area, Manitoba, 1969.

and coincides with the northern limit of Township Nine west of the Reserve. A western boundary is defined by the range line between Ranges 8 and 9 east of the prime meridian, corresponding roughly with the eastern edge of the main settled area. Soils vary from sand ridges in the southwestern portion to poorly drained bogs in the east-central portion. An excellent description of major factors affecting soil formation (climate, vegetation, parent material, relief, and drainage) is contained in *Soils Report No. 14* (Manitoba Department of Agriculture and Conservation 1964).

Present land use emphasizes wood production. Over one-half of the area is classified as productive forest land and another 10% is potentially productive. Together, productive and potentially productive forest land exceed 405 000 ha (1 million acres). Cover types of the productive forest include 65% softwood, 25% hardwood, and 10% mixedwood; about 17% of the productive area is stocked with mature stands. Land ownership rests mainly with the Manitoba government (85% of both total and productive forest land), with several small private landowners controlling the remainder.

The major recreational uses in the Area depend on the environment it provides. Activities include recreational use of water resources; sightseeing from highways; picnicking and camping at improved sites; hunting, berry picking, naturalist use, hiking, camping etc. at unimproved sites; and power tobogganing, cross-country skiing, and Christmas tree harvesting. Some of these uses depend on the proximity of unburned forest to a particular site. It is ~~not~~ necessary to keep a

particular piece of forest unburned if it is possible either for users to move to another site, as in camping at an unimproved site, or for the facility or improvement to be moved at a low cost, as a picnic table.

The Southeast Area is readily accessible from Winnipeg (pop. in excess of 500,000) via the Trans-Canada highway and Provincial highway 12, the average distance of the Area from Winnipeg being about 80 miles. Proximity of the trans Canada highway also makes the Area readily accessible to transient visitors.

#### *ECONOMIC BENEFITS FROM RECREATION*

Methods used to estimate benefits from outdoor recreation differ according to the type of benefit in question. Benefits may accrue to various groups--to the nation, the province, the locality, recreationists themselves, and businesses serving recreationists. Benefits may include net increases in income and employment, favorable redistribution of same, and net intangible benefits. Net government expenditure in an area is a local benefit. A complete accounting of benefits would be conceptually and empirically difficult to achieve, but as a start, the analysis should include estimates of direct expenditures on recreation as well as secondary or multiplier effects.

#### NATIONAL, PROVINCIAL, AND LOCAL BENEFITS

From the national point of view, total or average income is unlikely to be dependent on whether or not there is outdoor recreation in the Southeast Area. If there is any national benefit obtainable



from recreation in the Area, it likely consists of redistribution of income and employment towards a disadvantaged area, and intangible benefits of improving the quality of life for both residents and visitors to the Area. National income would be increased only if recreation purchases were sufficiently large to decrease unemployment nationally, or to be associated with an absolute advantage in international trade.

Provincial income, by contrast, could quite plausibly be altered by such effects, and the income of the Southeast Area is undoubtedly very much affected. Assuming that the visitors' incomes are not affected<sup>1</sup>, a dollar more spent on recreation in the Southeast Area means a dollar less spent on something else. Probably the brunt of the competition is felt by other recreation areas, but there is also likely to be some reduction in purchases of other goods, including some goods of local production and others which are imported<sup>2</sup>. Direct expenditures associated with visiting the Southeast Area are divided between expenditures at the visitors' origin (hunting licenses, car maintenance, recreation equipment, gasoline, groceries etc.) and expenditures in the Southeast Area (admission fees, groceries, restaurant meals, accommodation, gasoline etc.). These direct

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<sup>1</sup> This is likely to be adequately realistic to the extent that visitors come from areas with relatively low levels of unemployment.

<sup>2</sup> Boyet and Tolley (1966) estimated cross elasticities between possibly competing recreation facilities, but little attention seems to have been given to the problem since their work.

expenditures become income to the recipients (operators of gas stations, retail stores, hotels etc.), and when the recipients in turn spend their income (business and consumption expenditures), secondary rounds of expenditure occur as described in the familiar multiplier analysis. In areas with less than full employment, or to which immigration of workers can occur, output increases<sup>3</sup>. If output cannot be increased, local inflation occurs. Areas suffering competition, e.g. competing rural recreation areas, would feel a "de-multiplier" effect, and would suffer from increased unemployment and possibly out-migration of workers<sup>4</sup>.

#### BENEFITS TO RECREATIONISTS

It is generally accepted that recreationists themselves receive benefits as consumers. Methods used to measure these benefits have usually been based on visitors' willingness to pay, as estimated from their stated opinions or, more usually, implicitly from their actual expenditures on travel (Clawson 1959). In either case, benefits are estimated using the concept of consumers' surplus, as the area under the demand curve above the price line (Mishan 1964).

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<sup>3</sup> The Southeast Area has less than full employment and is able to attract workers from other areas.

<sup>4</sup> Areas competing with the Southeast Area may include Kenora, recreation areas around Lake Winnipeg, and a number of smaller parks within a radius of about 100 km of Winnipeg.

*ESTIMATED BENEFITS IN THE SOUTHEAST AREA*

## OUTDOOR SUMMER RECREATION

Visitation

Visitation to the Southeast Area for general summer (May-September) outdoor recreation is very unevenly distributed. The southern portion of Whiteshell Provincial Park is very heavily used, and in the southeast there is a small resort at Moose Lake. Otherwise there are few facilities to attract visitors and visitation levels are low.

Estimated visitation for general summer outdoor recreation is shown in Table 1. The figures given are projected annual averages for 1970-1975. They are based on quite limited data and must be regarded as approximations. Information on visitation to the Whiteshell in 1968 was obtained from Nixon (1970), and total visitation to the park was then deflated to arrive at an estimate for that portion of the park lying within the Southeast Area. This was done by weighing the following factors: 73% of the campsites in the park are in the Southeast Area, 54% of the hotel, motel and commercial cabin units are in the Area, and 64% of the park exiting traffic departed from exits in the Southeast Area (Nixon 1970). Based on this, it was decided to attribute 68% of the visitor-days estimated by Nixon for the whole Park to the portion in the Southeast Area. The result was then inflated to allow for increased visitation in 1970-1975 compared to 1968. The factor (1.41) was obtained from the ratio of 1971 to 1968 traffic counts of vehicles exiting the Whiteshell within the Southeast Area, given by Taylor (1972). To estimate visitation to Moose Lake and other areas,

Table 1. Estimated Annual Average Summer Outdoor Recreation  
Visitation (May-September) Southeast Area, 1970-1975

Area	Day Visits	Cottage and Camping	Commercial Accommodation
(visitor-days per year)			
Portion of Whiteshell Provincial Park within Southeast Area	73 602	617 758	51 871
Moose Lake and other areas	4 033	17 946	7 684
TOTAL <sup>1</sup>	77 635	635 704	59 555
Origin of Visitors			
Southeast Area	1 580	339	0
Winnipeg	62 406	454 490	42 604
Other Manitoba	8 261	46 366	4 344
Other Canada	3 800	80 258	7 523
U. S. A.	1 588	54 251	5 084
TOTAL <sup>1</sup>	77 635	635 704	59 555

<sup>1</sup> Overall total visitor-days were 772 894. At \$.70 of consumer surplus per visitor-day, recreationists' benefits were estimated at \$541 000.

the total Whiteshell visitation was first multiplied by the ratio of Moose Lake : Whiteshell traffic counts also given by Taylor (1972)<sup>5</sup>. To this was added an additional amount which, for want of data, had to be based on opinions from the Department of Tourism, Recreation and Cultural Affairs. Visitation attributed to Moose Lake plus other areas was judged to be equal to 2.6% of visitation to the whole Whiteshell. No information was available on recent trends in origin of visitors, so the percentage distribution given by Nixon (1970) was applied to the projections.

#### Expenditure and Direct Benefits

To estimate total expenditures associated with this visitation, assumptions were required about expenditures per visitor-day and about the division of these expenditures between the Southeast Area and other areas. Application of these assumptions (Table 2) to the estimated visitation in Table 1 gave the estimated total expenditures shown in Table 3. It is estimated that about \$3.27 million will be spent in the Southeast Area annually in 1970-75 while about \$0.8 million will be spent elsewhere as a direct result of summer outdoor recreation in the Area. Residents of Winnipeg will contribute about \$2.36 million, or a little over 70% of the total. Other Manitobans will contribute 8%, other Canadians 12%, and residents of the U.S. 8%. As can be estimated approximately from Table 1, almost 95% of the expenditures are associated with recreation in Whiteshell Provincial Park.

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<sup>5</sup> Moose Lake traffic counts were 2.3% of Whiteshell plus Moose Lake counts.

Table 2. Estimated Expenditures per Visitor-Day, and Origin of Visitors to Southeast Area, 1970-1975

Item Purchased	Day Visitors	Cottagers and Campers	Hotel and Motel Guests
(\$ per day)			
Accommodation	0	0.48	3.08
Transportation	4.05	1.27	1.88
Restaurants	0.36	0.47	1.89
Groceries	0.27	0.88	0.31
Other Items	0.55	1.73	2.96
TOTAL	5.23	4.83	10.12
	Day Visitors from Southeast Area	Cottagers and Campers from U.S.A.	Hotel and Motel Guests from U.S.A.
Accommodation	0	0.52	3.52
Transportation	2.00	1.26	1.25
Restaurants	0.36	0.47	2.45
Groceries	0.27	0.96	0.30
Other Items	0.55	1.55	2.02
TOTAL	3.18	4.76	9.54

Other Assumption:

35% of transportation expenditure is incurred within the Southeast Area and 65% elsewhere in Manitoba (except for residents of Southeast Area).

SOURCE: McCloy, D.B. 1972. Visitor Expenditure Study, 1971. Manitoba Department of Tourism, Recreation and Cultural Affairs. Report No. 105.

Table 3. Estimated Annual Average Expenditures Directly Associated with Summer Outdoor Recreation, Southeast Area, 1970-1975<sup>1</sup>

Items Purchased	Destination of Expenditure	
	Southeast Area	Other Manitoba
	(\$ 000)	
Accommodation	493	0
Transportation	432	795
Restaurants	442	0
Groceries	603	0
Other Items	1 304	0
TOTAL	3 274	795
Origins of Expenditure		
Southeast Area	7	0
Winnipeg	2 361	592
Other Manitoba	246	65
Other Canada	398	85
U.S.A.	262	53
TOTAL	3 274	795

<sup>1</sup> Derived from Tables 1 and 2.

### Secondary Benefits

Secondary rounds of expenditures can be expected to generate secondary benefits; however, the appropriate multiplier is likely not very large because there is little economic diversity in the Area. Almost the only basis for a multiplier effect is the small recreation-oriented service industry. A multiplier of 1.5 for sales to travellers has been estimated for the Interlake Area of Manitoba (MacMillan et al. 1972). If this multiplier is used for the Southeast Area, total sales and income generated in the Area by summer recreation are an estimated \$4.9 million. Primary benefits are \$3.3 million and secondary benefits are \$1.6 million.

Benefits, or consumer surplus, to recreationists have been found by previous workers to be in the order of \$.40 to \$1.00 per visitor-day (Grubb and Goodwin 1968; Schellenberg and Craddock 1971; Capel and Ross 1973). Accordingly, for this study the benefit has been assumed to be \$.70 per visitor-day.

### HUNTING

Hunting of game birds and deer is an important activity in the Area, and moose and bear hunting are practised to a small extent. Rabbits and various predators are also hunted, but there are no data on which to evaluate the activity.

Data were made available to us on number of hunter-days and number of animals killed since about 1965 from annual hunter surveys by the Manitoba Department of Mines, Resources and Environmental Management. For each species, the numbers of hunter days and



animals killed have fluctuated quite widely during 1965-1971. The data seem to indicate potential overhunting, and it appears that in several years demand has been checked by regulations and possibly by advice that prospects for success in the Area were poor. In view of this it seemed irrelevant to project an upward trend in hunter-days. Hunter-days per year in 1970-1975 (Table 4) have been projected from the 1965-1971 data on hunter-days and kill as maxima which seem to be attainable without long-term reduction in game populations. In other words, it was felt that the numbers of hunting days projected would constitute maximum hunting pressures consistent with sustained yields of game under current land and game management practices. Demands will be quite adequate to provide for these levels of hunting pressure, and indeed if ways could be found to increase sustainable game yields, the increased hunting activity would be very beneficial to the Area. Origins of hunting pressures are given in Table 5.

Direct expenditures associated with hunting were estimated using the same approach as for outdoor recreation. Assumptions about expenditure per hunter-day are shown in Table 6 and estimated direct expenditures in Table 7. Estimated direct benefits are about \$260 000 per year. Applying the same multiplier as for summer recreation (1.5), total benefits are estimated to be about \$390 000 per year.

Benefits to hunters (consumer surplus) were estimated following the same procedures as those used in summer recreation. Previous work has indicated a benefit of \$8 to \$10 per hunter-day (Capel and Pandey 1973). Based on this, a benefit of \$9 per hunter-day was assumed for this study.

Table 4. Estimated Annual Average Hunting Pressures, Southeast Area, 1970-1975<sup>1</sup>

Species Hunted	Hunting Pressure	
	Resident	Non-Resident
	(hunter-days per year)	
Game Birds	24 750	250
Deer	20 000	— <sup>2</sup>
Moose	1 000	— <sup>3</sup>
Bear <sup>4</sup>	475	25
Other	— <sup>5</sup>	— <sup>5</sup>

<sup>1</sup> Source and methods described in text.

<sup>2</sup> Negligible.

<sup>3</sup> Non-resident hunting not permitted in the Area 1965-1972.

<sup>4</sup> Based on only 2 years' data.

<sup>5</sup> No data available.

Table 5. Estimated Origins of Hunting Pressures, Southeast Area, 1970-1975

	Hunter-Days per Year
Southeast Area	500
Winnipeg	21 575
Other Manitoba	24 150
Other Canada	175
U. S. A.	100

SOURCE: Based on Table 4, and on sample indicating spatial distribution of hunters in 1968, given in Pandey (1972) pp. 63-65.

Table 6. Estimated Expenditures per Hunter-Day, Visitors to Southeast Area, 1970-1975.

Item Purchased	Expenditure
	(\$ per day)
Accommodation	0.90
Transportation	2.50
Food and Beverages	5.38
Other Items	2.58
TOTAL	11.36

Other Assumptions:

35% of transportation expenditures, 66% of expenditures on food and beverages, and 10% of expenditures on other items are incurred in the Southeast Area. The balance of expenditure on each item is incurred elsewhere in Manitoba. Residents of Southeast Area incur all their expenditures in the Area.

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SOURCES: Manitoba Department of Mines, Resources and Environmental Management. 1962. Homebrook Road Experiment. Mimeo.

Bowden, G. and P.H. Pearse. 1968. Non-Resident Big Game Hunting and the Guiding Industry in British Columbia. Price Publishing Co. Vancouver.

Table 7. Estimated Annual Average Expenditures Directly Associated with Hunting, Southeast Area, 1970-1975<sup>1</sup>

Items Purchased	Destination of Expenditure	
	Southeast Area	Other Manitoba
	(\$'000)	
Accommodation	42	0
Transportation	41	75
Food and Beverages	170	80
Other Items	10	110
TOTAL	263	265
<u>Origins of Expenditure</u>		
Southeast Area	6	3
Winnipeg	115	117
Other Manitoba	128	130
Other Canada	9	10
U.S.A.	5	5

<sup>1</sup> Derived from Tables 5 and 6.

## GOVERNMENT EXPENDITURE AND REVENUE

Government undertakes expenditures in the Area to maintain and service parks and related facilities as well as to administer forest and game resources. Government also collects revenues from park admission fees, sales of camping permits, tickets for government-operated sports facilities etc. The excess, if any, of government expenditure over revenue in an area constitutes a net benefit (expenditure) to the area. As with other expenditures, total benefit is larger than direct net government expenditure by some multiplier.

Data were not available to us on government expenditures in the Southeast Area, so it was not possible to estimate the benefits due to net government expenditure.

## SUMMARY

In summary, benefits to the Area from direct (primary) and indirect (secondary) expenditures on recreation are estimated to exceed \$5.3 million annually during the period 1970-1975. Details are given in Table 8.

In addition the participants in the various recreational activities were estimated to receive benefits of almost \$1 million annually during the period.

Table 8. Estimated Annual Area Benefits, 1970-75

Activity	Expenditures in \$000's		
	Primary	Secondary	Total
Summer Recreation	3274	1637	4911
Hunting	263	132	395

## Recreationists' Benefits (Consumer Surplus)

Summer Recreation <sup>1</sup>	541
Hunting <sup>2</sup>	<u>419</u>
Total	960

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<sup>1</sup> See Table 1

<sup>2</sup> Assuming a consumer surplus benefit of \$9 per hunter-day and 46 500 hunter-days yields total hunters' benefits from participation of \$418 500.

*ESTIMATED PORTION OF BENEFITS ATTRIBUTABLE TO THE FOREST*

Total outdoor recreation benefits estimated along the lines suggested above for the Southeast Area are significant. However, it is not valid to assume that all or even a major part of these benefits are dependent on the forest. Some of the general outdoor recreation benefits are closely associated with certain types of forest cover existing in certain areas while other benefits do not depend on the presence of trees in any particular area, as long as diverse and aesthetically pleasing scenery is maintained over substantial portions of the Area. Hunter benefits are not likely to depend on maintaining particular blocks of forest, but probably do depend on the existence of substantial wooded areas. Most of the species which are important to hunters in the Area thrive best when a variety of plant successions is present, i.e. when there are numerous forest clearings and trees of several ages. Total hunter benefits likely should be attributed to the forest for selected game species only, while for other species benefits should be assumed to be available in any event, regardless of the existence of the forest.

In terms of per-acre benefit or value, forest areas close to buildings are the most important. Buildings should and do receive top priority in fire protection. For efficiency, it is evident that forest areas which are liable to fire and are near buildings should be cleared unless their amenity value is at least equal to the implicit cost of insurance--without fire protection--against forest fire. It follows that areas which are efficiently forested and adjacent to

buildings have a benefit at least equal to, and in most cases greater than the present value of such insurance. Areas in this category are located near Falcon Lake, Faloma Beach, Toniata Beach, and Moose Lake.

Next highest in value per acre are the shorelines of developed resorts and recreational areas. A list of such places in the Southeast Area would include those already mentioned, as well as Whitemouth River Park and Birch Point. The latter provides the only highway access in Manitoba to Lake of the Woods.

#### *IMPACT OF FOREST PROTECTION ON RECREATION*

In these intensive recreation areas any unsightly destruction of trees would undoubtedly cause some reduction in recreation benefits. There is at present no need to consider possible agricultural or urban uses, for both are economically unfeasible. However, the effects of forest fire damage and unaesthetic clearing of trees should be evaluated. The extent of damage (loss of benefits) to recreation would depend on the nature and extent of aesthetic damage to the forest. If, for example, portions only of a lake shoreline in a recreation area were burned, it is likely that many visitors would find nearby substitute areas. However, if a more extreme hypothetical example is taken, it is possible to make a good case for substantial benefits being protected by fire control and regulated cutting.

To illustrate this, let us assume the forest along the whole shoreline of Falcon Lake was burned to a depth of 600 m, and that this reduced visitation for one year by 10%. Based on Nixon (1970),<sup>6</sup>

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<sup>6</sup> Based on traffic counts, we have assumed that 40% of visitor-days in the Whiteshell are accounted for by visitation to Falcon Lake.



and using the procedures discussed earlier in this report, it is estimated that this would reduce primary benefits by \$131 000, secondary benefits by \$65 480, and recreationists' benefits by \$20 800 during the year in which visitation was reduced.

If recreationists' safety and enjoyment were threatened, losses would then be substantial. No cases in which this occurred could be found in records of the Southeast, but an interview survey was made of resort owners affected by the Crowduck Lake fire, Manitoba and Ontario, June 11 through September 3, 1961, and the Sioux Lookout fire, Ontario, June 3-7, 1967, in order to evaluate effects of large fires on activity and expenditures by recreationists, hunters, and fishermen.

According to respondents, the Crowduck Lake fire had little effect on their business, likely because it did not threaten guests' safety or resort owners' property and because many unburned areas were left, mitigating adverse effects on scenery and wildlife. However, the Sioux Lookout fire apparently had a drastic, though short-lived, effect on tourist businesses, mainly due to the evacuation of guests and closure of the only highway into the resort area. These findings suggest that the hypothetical example given earlier for Falcon Lake might not be too unrealistic. Similar examples could be worked out for other parts of the Whiteshell and for Moose Lake. It must, however, be re-emphasized that there is no local experience of such damage to recreation, and projections of the likely extent of benefit losses are therefore highly tentative.

Barring a major fire extending over 300 km<sup>2</sup> or more, there seems to be little basis for expecting the level of fire protection or methods of forest management in areas away from the Whiteshell and Moose Lake to make any difference to recreation benefits. Fire damage to a small camping or picnicking facility which had no unique natural attractiveness would cause a loss of benefits not much greater than the cost of reconstructing the facility at another location. Forest uses at unimproved sites would not be appreciably affected provided other unburned locations of similar quality were available.

Hunting activity seems to be spread much more evenly over the Southeast Area than is general outdoor recreation. Unfortunately, it is not known in any detail how the hunting pressure is distributed over the Area, only that deer hunting is spread fairly evenly, while bird hunting is concentrated in the Sandilands area. Moose and bear hunting appear to be done mainly in the eastern half of the Southeast Area. The Area is at present a good habitat for birds and deer. Fires in relatively small areas, and clearings associated with commercial forestry are generally considered to improve the habitat for deer, most birds, and most of the small animals for which hunters do not need a license. This is because the food plants supporting these species thrive only at certain stages in the succession of vegetation (Cringan 1958, Spencer and Hakala 1964). This is not to say that fire is in all cases beneficial, or even that it is never harmful to wildlife. It is possible, and perhaps often better, to obtain a suitable succession of vegetation by cutting timber or failing to control infestations of forest insects. At any rate, it seems unlikely that any generally applicable dollar value could be found which would be a valid measure of fire damage to wildlife.

Estimation of possible impacts of changes in forest management and protection on recreation benefits is at this stage little more than speculation. However, it does not seem that recreation benefits would be much altered by likely changes in forestry in the Area. The limits of the possible impact would in our opinion be to add or subtract benefits of up to \$30,000 per year on a long-term basis, or to subtract up to \$215,000 on a temporary basis in the event of a disastrous fire in Whiteshell Park. These values may be compared to estimated total recreation benefits of about \$6 million.

#### *POLICY IMPLICATIONS*

The Southeast Area is characterized by low incomes and economic underdevelopment; therefore, policy-makers are particularly interested in programs and development which will ameliorate these conditions.

Both wood and recreational forest uses have been shown to contribute significantly to the Area's income and employment. In an earlier study it was estimated that income from the sale of wood products was in the order of \$3.7 million (Capel and Teskey 1971)<sup>7</sup>. In the present study, it has been estimated that summer recreation alone generates about \$5 million per year in income to the Area. Total income of the Area due to recreation uses is judged to be even higher than this. In addition, intangible benefits to consumers of non-wood uses (recreation, hunting, fishing, etc.) are estimated to be very substantial.

Important questions for forestry policy are, therefore, how to maintain and enhance both wood and non-wood benefits. In the Southeast Area, it is convenient to consider two types of forest area.

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<sup>7</sup> Direct income was estimated to be \$2.5 million per year. If a multiplier of 1.5 is assumed, total income is estimated to be \$3.75 million per year.

One--covering most of the Area--would be primarily for wood uses, with extensive recreational use as a secondary purpose. The other--confined to the more scenic and accessible areas, around lakes and/or having more undulating topography--would be for intensive recreational use, with wood uses being secondary or even incidental. This arrangement could probably optimize use in view of potential conflicts between users.

Forest management, including fire control, would differ between the two types of area according to use goals. In the wood-use areas, objectives would be based on efficiency in wood production. In the intensive recreation areas, objectives would be based on efficient investment in the aesthetic aspects of the forest, i.e., maximizing intangible benefits per dollar of cost. The criterion for fire control of minimum-cost-plus-loss seems appropriate in both areas, providing it is possible to establish the true losses which are being averted in both areas.

Further research could profitably be done on (1) benefits of forest use, especially under multiple conflicting uses, (2) benefits as a function of forest management and fire control, and (3) more specific management objectives assuming net benefit maximization as the overall goal. In particular, for management of intensive recreation-oriented forest areas, research is needed on how to modify and manage the forest, at justifiable costs, so as to encourage high rates of recreational participation. Although much is already known about suitable tree species, ages and spacing of trees, ground covers etc., there may well be opportunities for worthwhile innovation, and there

are almost certainly opportunities for improvement from a cost-effectiveness point of view.

#### *ACKNOWLEDGEMENTS*

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