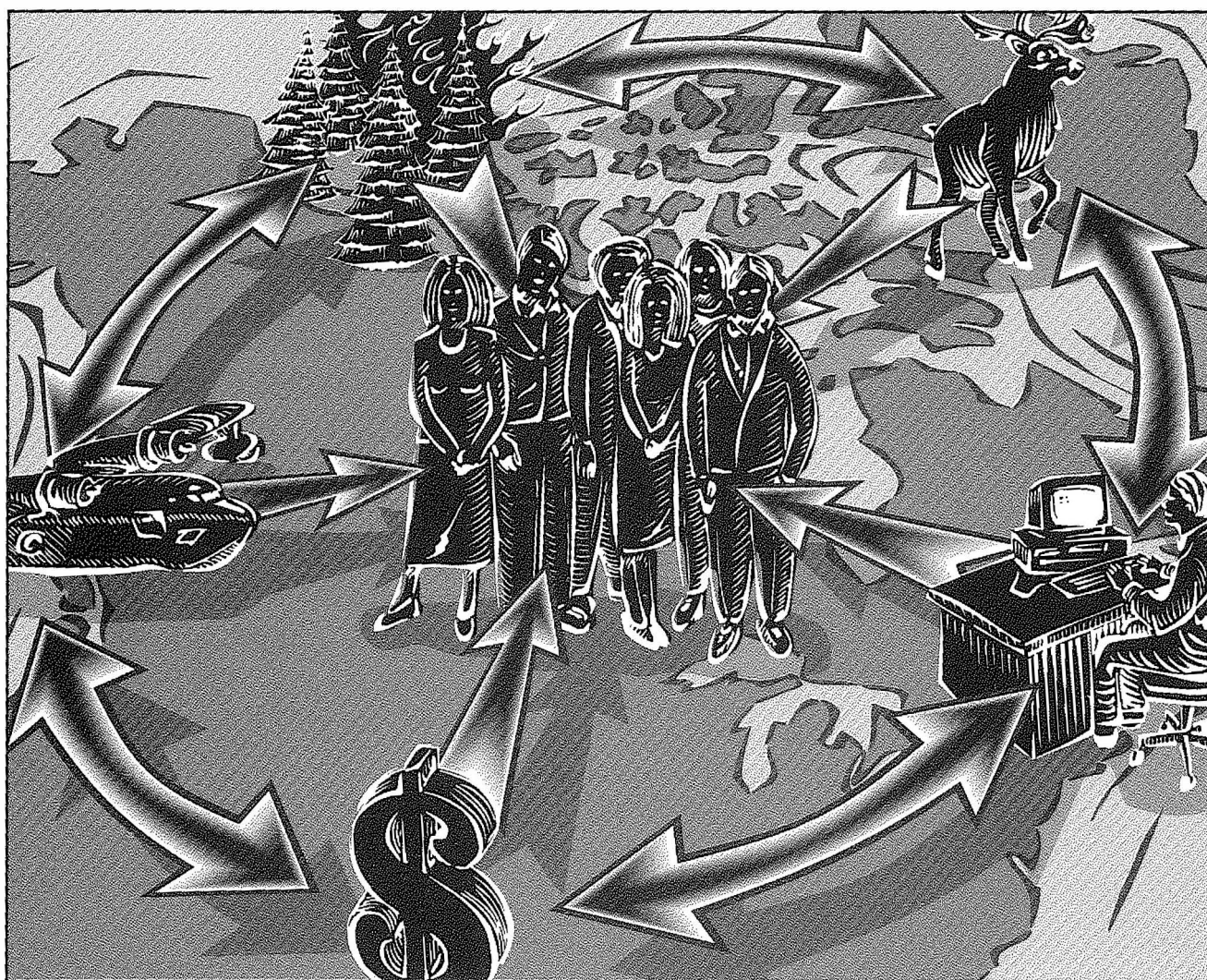# A perception survey of forest fire research needs for west-central Canada

M.M. Pinedo, B.S. Lee, and K.G. Hirsch
Northwest Region • Information Report NOR-X-343

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The Canadian Forest Service's Northwest Region is responsible for fulfilling the federal role in forestry research, regional development, and technology transfer in Alberta, Saskatchewan, Manitoba, and the Northwest Territories. The main objectives are research and regional development in support of improved forest management for the economic, social, and environmental benefit of all Canadians. The Northwest Region also has responsibility for the implementation of federal–provincial forestry agreements within its three provinces and territory.

Regional activities are directed from the Northern Forestry Centre in Edmonton, Alberta, and there are district offices in Prince Albert, Saskatchewan, and Winnipeg, Manitoba. The Northwest Region is one of six regions and two national forestry institutes of the Canadian Forest Service, which has its headquarters in Ottawa, Ontario.

Service canadien des forêts, région du Nord–Ouest, représente le gouvernement fédéral en Alberta, en Saskatchewan, au Manitoba et dans les Territoires du Nord–Ouest en ce qui a trait aux recherches forestières, à l'aménagement du territoire et au transfert de technologie. Cet organisme s'intéresse surtout à la recherche et à l'aménagement du territoire en vue d'améliorer l'aménagement forestier afin que tous les Canadiens puissent en profiter aux points de vue économique, social et environnemental. Le bureau de la région du Nord–Ouest est également responsable de la mise en oeuvre des ententes forestières fédérales–provinciales au sein de ces trois provinces et du territoire concerné.

Les activités régionales sont gérées à partir du Centre de foresterie du Nord dont le bureau est à Edmonton (Alberta); on trouve également des bureaux de district à Prince Albert (Saskatchewan) et à Winnipeg (Manitoba). La région du Nord–Ouest correspond à l'une des six régions de Service canadien des forêts, dont le bureau principal est à Ottawa (Ontario). Elle représente également deux des instituts nationaux de foresterie de ce Ministère.

A PERCEPTION SURVEY OF FOREST FIRE RESEARCH NEEDS FOR WEST-CENTRAL CANADA

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INFORMATION REPORT NOR-X-343

Canadian Forest Service
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1995

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ABSTRACT

A three-part questionnaire was used to identify current and anticipated forest fire research needs and priorities for west-central Canada (Alberta, Manitoba, Saskatchewan, and the Northwest Territories). In addition, the prioritization of research needs based on their value to the user agencies, and the process of fire research at the Northern Forestry Centre, Edmonton, Alberta, were also discussed by respondents. The questionnaire was completed by 43 professionals, primarily from fire management agencies, the forest industry, academia, and selected resource management agencies. Seventy research needs were ranked for the region and for the provinces and territory according to their present importance (1–2 years) and future importance (3–5 years). In addition, 36 activities were identified by users as potential research activities.

RÉSUMÉ

On a utilisé un questionnaire en trois sections pour déterminer quels sont les priorités et les besoins actuels et futurs en matière de recherche sur les feux de forêt dans le centre-ouest du Canada (Alberta, Manitoba, Saskatchewan et Territoires du Nord-Ouest). De plus, les répondants ont commenté le classement des besoins de recherche selon leur importance pour les organismes clients, et les recherches entreprises au Centre de foresterie du Nord à Edmonton (Alberta). Quarante-trois spécialistes ont répondu au questionnaire. Ces professionnels travaillent pour la plupart pour des organismes de gestion des feux, l'industrie forestière, des établissements d'enseignement et des organismes choisis de gestion des ressources. On a classé 70 besoins en matière de recherche, pour la région et les provinces ou territoires, selon leur importance actuelle (délai de 1 à 2 ans) et future (délai de 3 à 5 ans). Les répondants ont également mentionné 36 activités qui pourraient faire l'objet d'une recherche.

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Note

The exclusion of certain manufactured products does not necessarily imply disapproval nor does the mention of other products necessarily imply endorsement by Natural Resources Canada.

OBJECTIVE OF SURVEY

In summer 1991, the Fire Management Research Project at the Northern Forestry Centre, Edmonton, Alberta, conducted a survey of fire management agencies, the forest industry, academic institutions, and selected resource management agencies within Forestry Canada's Northwest Region. The results (Appendix 1) were aimed at helping to develop a strategic plan to guide the project's activities over the next 5 years.

The objectives of this survey were as follows:

- to identify current and anticipated fire research, development, and technology transfer needs and to determine their relative importance;

- to define fire research, development, and technology transfer needs based on their value to the user agencies; and

- to obtain a clients' perception on the fire-research process at the Northern Forestry Centre.

METHODOLOGY

Participant Selection

Participants in this study were primarily the major users of fire research, development, and technology transfer products developed at the Northern Forestry Centre. In addition, there were individuals from agencies representing government, industry, and academic institutions from the various subregions (Alberta, Manitoba, Saskatchewan, and the Northwest Territories). Participants were requested to distribute extra copies of the survey to their staff as required. A list of original participants as well as a list of respondents to the survey (and their affiliations) are given in Appendix 2.

Questionnaire

A questionnaire with a covering letter stating the purpose of the survey was mailed to each identified participant. The questionnaire (Appendix 3) consisted of three parts. Part I provided an extensive list of potential research-related topics. Participants were asked to rate each topic according to its present and future importance. Respondents were also given the opportunity to identify other potential research topics. Part II asked respondents to list and rank the highest-priority projects (up to a maximum of 10) from Part I, and that the desired level of Northern Forestry Centre involvement be identified. Part III consisted of questions relating to the general process of fire research at the Northern Forestry Centre and potential interagency cooperation.

Analyses were done separately for Parts I, II, and III of the questionnaires. Forty-three responses were received for Part I and 35 for Parts II and III. Part I constituted the backbone for the survey analyses. The data were broken down on the basis of: geographic location (province/agency), discipline related to fire, and type of position of respondents. Respondents were grouped into fire and nonfire categories because the discipline of the majority of respondents (63%) was fire as opposed to nonfire-discipline respondents (37%). This type of analysis was chosen because participants and subsequent respondents in the survey included a group of individuals with diverse backgrounds and the responsibilities for some were not directly in fire management. Additionally, the survey was also intended to raise awareness of research needs to nonfire and fire practitioners. Finally, the analyses included type of position by grouping respondents in managerial and operational positions. According to these criteria, analyses of Part I were done for the following categories:

Region as a whole
Fire group by region
Nonfire group by region
Managerial position by region
Operational position by region
Geographic location by province/agency

The Canadian Parks Service was treated as a separate entity for the purpose of the analysis by geographic location because of the nature of the agency, its fire management program, and its national mandate. Research activities with the definition "other" were analyzed separately. These sections were: A8c, "Research on the fire behavior characteristics of high intensity fires such as - other"; B9c, "Research on smoke management issues such as - other"; D2c, "Development of the next generation FMDSS that operates on the following workstation platforms"; and Section F.

Descriptive statistics of mean and standard deviation were calculated for the ratings of each fire research/technology transfer activity at the present (1–2 years) and future (3–5 years) importance. The mean score furnished the basis for determining the rating of activities, while the standard deviation indicated the degree of consensus among respondents regarding the mean score (Phillips et al. 1986). A very low standard deviation indicated a very high degree of consensus around the mean score, regardless of whether the mean score happened to be high, medium, or low.

Analysis of Part II of the questionnaire was done for the entire region only because fewer individuals responded to this section. The analysis included tables presenting the prioritization of fire research activities and the level of participation that the Northern Forestry Centre should have in conducting these research projects.

Analysis of Part III of the questionnaire focused primarily on looking at the ways respondents answered the questions of this section. Responses were tabulated in terms of percentage of preference among respondents to a particular question. Again, this section was done only for the region.

SURVEY RESULTS

The questionnaire was mailed to an original list of participants in the summer of 1991. There were 43 returns for Part I of the questionnaire. (A distribution of respondents by geographic location is given in Appendix 1, Table A.) For Parts II and III, only 35 returns were received. Nine participants in the Northwest Territories who answered individually to Part I responded collectively to Parts II and III.

Part I

Region as a Whole

After reviewing all returns, some categories of "other" were unusable for analysis because they received rankings without listing activities. Only six responses were received for category A8c, "Research on the fire behavior characteristics of high intensity fires such as - other"; only seven for B9c, "Research on smoke management issues such as - other"; and only seven for D2c, "Development of the next generation fire management decision-support system (FMDSS) that operates on the following workstation platforms - other". As a result, 70 items from Sections A to E were entered for subsequent analysis.

A statistical summary of rating scores for present and future importance for the region are given in Appendix 1, Table B.

The means for "present importance" range from a high of 3.70 for B5, "Development of guidelines and decision aids for planning prescribed burns", to a low of 1.90 for D19, "Development of an automatic vehicle location system for fire management". The highest degree of consensus is for E3, "Research on the use of remote sensing for forest fuels mapping, analysis and monitoring", with a standard deviation of 0.91; the lowest degree of consensus is for D10, "Development of training packages for fire management decision-support systems such as the Intelligent Fire Management Information System (IFMIS)", and B1, "Research on the silvicultural use of fire for site preparation, mixed-wood management, stand tending, etc.", each with a standard deviation of 1.50 and mean scores of 3.03 and 2.97, respectively.

The mean scores for "future importance" range from a high of 4.02 for B3, "Research on the ecological role of fire", to a low of 2.33 for D5, "Development of guidelines and/or software for determining optimal aerial detection routes". The highest degree of consensus is for A8a, "Research on the fire behavior characteristics of high intensity fires such as spotting", with a standard deviation of 0.95; the lowest degree of consensus is for D19, "Development of an automatic vehicle location system for fire management", with a standard deviation of 1.55 and a mean score of 2.50. Table 1 lists the top 10 fire research/technology transfer activities for the region. Six activities had preference at both present and future importance.

Section F, Part I, of the questionnaire was answered by 15 respondents. Thirty-six research activities were listed as additional projects to complement those potential research studies given in Sections A to E; however, because all activities were mentioned only once, using their given ratings is irrelevant. A listing in no particular order of importance by province/agency is shown in Appendix 1, Table C. Sixteen projects were listed by respondents from Alberta, three from Saskatchewan, and

17 from the Canadian Parks Service. The responses fit into the categories A to E as follows: A. "Fire behavior/danger rating", six items; B. "Fire ecology and use", 10 items; C. "Fire suppression", nine items; D. "Fire management systems", six items; E. "General", five items.

Fire Group by Region

The mean scores for the "present importance" range from a high of 4.00 for B5, "Development of guidelines and decision aids for planning prescribed burns", to a low of 1.53 for D7, "Development of a senior executive information module in the next generation FMDSS". The highest degree of consensus is also for D7, with a standard deviation of 0.64. The lowest degree of consensus is for C1a, "Research and development on the use of infrared scanners for airtanker guidance", and B1, "Research on the silvicultural use of fire for site preparation, mixed-wood management, stand tending, etc.", each with a standard deviation of 1.59 and mean scores of 2.42 and 3.08, respectively.

The means for "future importance" range from a high of 4.12 for B2, "Research on the relationship of wildfires and prescribed fire to wildlife habitat", and E9, "Research on improved fire weather forecasting (especially long range forecasts)", to a low of 1.79 for D7. The highest degree of consensus is also for D7, with a standard deviation of 0.80. The lowest degree of consensus is for B1, with a standard deviation of 1.56 and a mean score of 3.42. A listing of the top 10 research activities is given in Table 2 for the fire group (region). Seven items had preference at both present and future importance (Appendix 1, Table D).

Nonfire Group by Region

The mean scores for "present importance" range from a high of 3.80 for C1b, "Research and development on the use of infrared scanners for detection of holdover fires", to a low of 2.08 for B6, "Research on the impacts of various types of ignition patterns and techniques". The highest degree of consensus is for C2, "Evaluation of the effectiveness of various Global Positioning Systems for use in fire management", with a standard deviation of 0.53. The lowest degree of consensus is for B7, "Research on the effects forest fires have on global warming", with a standard deviation of 1.69 and a mean of 2.55.

The mean scores for "future importance" range from a high of 4.21 for E7, "Development of a multi-resource valuing system for fire management", to a low of 2.55 for A4a, "Research and development of moisture codes that accommodate high latitude conditions". The highest degree of consensus is for A8a, "Research on the fire

behavior characteristics of high intensity fires such as spotting", with a standard deviation of 0.64. The lowest degree of consensus is for D16b, "Research and development of models for lightning prediction", with a standard deviation of 1.78 and a mean score of 3.18. Table 3 lists the top 10 research activities for the nonfire group (region). Six items had ratings at both present and future importance (Appendix 1, Table E).

Managerial Position by Region

The means for "present importance" range from a high of 4.00 for C1c, "Research and development on the use of infrared scanners for near real-time (video) mapping of campaign fires", to a low of 2.18 for A4a, "Research and development of moisture codes that accommodate high latitude conditions". The highest degree of consensus is for A8a, "Research on the fire behavior characteristics of high intensity fires such as spotting", and A8b, "Research on the fire behavior characteristics of high intensity fires such as convection column dynamics", with standard deviations of 0.46; the lowest degree of consensus is for B1, "Research on the silvicultural use of fire for site preparation, mixed-wood management, stand tending, etc.", with a standard deviation of 1.59 and a mean score of 2.83.

The mean scores for "future importance" range from a high of 4.33 for C1c, to a low of 2.36 for A4a. The highest degree of consensus is for A3a, "Production of training packages and/or interpretive guides for the FBP system, workbooks, posters, etc.", with a standard deviation of 0.52; the lowest degree of consensus is for D16b, "Research and development of models for lightning prediction", with a standard deviation of 1.71 and a mean score of 3.25. Table 4 lists the top 10 fire research/technology transfer activities for the managerial group (region). Five topics had preference at both present and future importance (Appendix 1, Table F).

Operational Position by Region

The mean scores for the "present importance" for this category range from a high of 3.82 for B3, "Research on the ecological role of fire", to a low of 1.57 for D7, "Development of a senior executive information module in the next generation FMDSS". The highest degree of consensus is also for D7, with a standard deviation of 0.76; the lowest degree of consensus is for E6, "Research and development on the impact that fire has on long-term wood supply", with a standard deviation of 1.58 and a mean score of 2.73.

The mean scores for the "future importance" range from a high of 4.14 for B3, to a low of 1.90 for D5, "Development of guidelines and/or software for

3

determining optimum aerial detection routes". The highest degree of consensus is for D8, "Incorporate daily and seasonal economic analysis models for detection, prevention, pre-positioning and initial attack dispatch into the next generation FMDSS", with a standard deviation of 0.97; the lowest degree of consensus is for D6, "Development of a comprehensive forest fire threat assessment module within the next generation FMDSS", with a standard deviation of 1.70 and a mean score of 2.78. Table 5 lists the top 10 fire research/technology transfer activities for the operational group (region). Seven topics had preference at both present and future importance (Appendix 1, Table G).

Geographic Location by Province/Agency

Statistics of rating scores for Alberta, Manitoba, Saskatchewan, the Northwest Territories, and the Canadian Parks Service are given in Appendix 1, Tables H, I, J, K, and L, respectively. The respective summary tables listing the top 10 activities by each province/agency are also included in Appendix 1, Tables H-1, I-1, J-1, K-1, and L-1.

A summary of rankings of activities is presented in Tables 6A and 6B. At the present importance, the pattern of responses from Alberta, the Northwest Territories, and the Canadian Parks Service, deserve some commentary. Although Alberta constituted nearly 50% of the sample, it ranked six items that showed up on the regional top 10 list, as compared to the Northwest Territories and the Canadian Parks Service, which represented 21% and 16% of the sample, but ranked six and five items, respectively. Manitoba and Saskatchewan, comprising 14% of the sample, ranked four and two topics, respectively. At the future importance, the Canadian Parks Service, Saskatchewan, Northwest Territories, Alberta, and Manitoba ranked five, five, four, three, and three activities, respectively, that showed up on the regional top 10 list. The cluster of responses by province/agency indicates that the preferences among the top 10 regional topics are shared by the groups.

In addition, activities ranked among the top 10 for each province/agency that did not show up on the regional top 10 list are presented in Tables 7A and 7B for the present and future importance. Totals of 21 and 22 topics were listed by the provinces/agency at both present and future, respectively. Certain activities had equal rating scores among the top 10 in each province/agency and they are footnoted in Tables 6A and B and 7A and B for easy cross-reference.

Analysis of Part I

There are obvious differences in the responses given by the fire and nonfire groups (Tables 2 and 3). The top 10 topics of each group are different at both present and future importance. The same pattern is found by contrasting Tables 4 and 5, which list the top 10 activities rated by the groups of managerial and operational positions. Analysis of the answers from these groups shows that the managerial group chose topics mostly in category C of the questionnaire, fire suppression.

The responses for the operational group are more diverse. Chosen among the top 10 were topics from almost all the main categories of the questionnaire, including fire behavior/danger rating, fire ecology and use, fire suppression, and general aspects.

Also shown in the results are similarities in rating of the top 10 items by fire group and operational group (Tables 2 and 5), with each selecting eight out of the top 10 from the same topics.

Operational respondents perceived the needs of fire research differently from the managerial group, at least for the present time (1–2 years); however, their participation in the decision-making process is perhaps not as crucial as the managerial group's. This perception is important when designing any future research policy.

The top 10 topics for the region as a whole are not much different from the top 10 rated by the fire and operational groups, in contrast with the nonfire and managerial groups. This suggests that these two sets of groups are the same. Although there might be some duplication of respondents within the fire and operational groups, the composition of the nonfire and managerial groups is different, and their responses are quite diverse in the top 10 (Tables 3 and 4).

Part II

Part II of the questionnaire comprises two sections. In the first section, respondents were asked to select and prioritize up to 10 projects from the listing in Part I, based on project importance to their respective agencies. Thirty-one returns to this section were usable, but not all respondents selected up to 10 projects as their priorities. Appendix 1, Table M, gives a list of fire research projects and the number of respondents who chose a particular rank for a project. For example, A1, "Validation of and/or further research on fire behavior in current Fire Behavior Prediction (FBP) System fuel types", was given first priority by four respondents, seventh priority by two respondents, and eighth priority by one respondent. All but four projects from sections A to E were selected at least once. The 10 most-chosen projects, at different levels of priority based on weighted number of respondents, are given in Table 8. Six of these projects were

listed in Table 1 as the most-preferred fire research activities for the region, either at the present or future importance.

The selection and ranking procedures of research projects in Part II differ from those in Part I, but the findings of this section reflect similar preferences among respondents when they select and prioritize projects according to project importance to their agencies. Ten projects from section F of Part I were also selected by respondents as rating among their 10 priorities; however, they were not included in the analysis because each was mentioned only once by a particular respondent in Part I. These 10 priority projects are noted in Appendix 1, Table C.

In the second section of Part II, respondents indicated the type of role or involvement that the fire research staff of the Northern Forestry Centre (NoFC) should take in conducting the research work. Only 28 responses were suitable for analysis to this section; some of the 35 returns to Part II either listed the projects with no ratings or did not answer the section. Appendix 1, Table N gives a rating of the level of participation of NoFC in conducting fire-research projects by respondents. According to the scale of role or involvement, 59% of responses selected Number 4 as the most-rated type of role or involvement, i.e., "Forestry Canada's NoFC should act as the leading agency but work would be conducted in close cooperation with the fire management agencies and/or researchers". Number 3, "Forestry Canada's NoFC involvement as a cooperator but not as the leading agency", was chosen second, with 18% of responses. Number 5, "Considering NoFC as the leading agency with little or no assistance from outside agencies or individuals", was ranked third, with 16% of responses.

Part III

In this last section of the survey, respondents were asked general opinions on the fire-research process at NoFC.

With respect to what percentage of time the NoFC fire-research unit should spend on basic research, applied research or development, and technology transfer, respondents considered that most time should be devoted to applied research (43%), and less to technology transfer and basic research (29% and 28%, respectively). When asked if effort should be put into basic research even if it is possible that the work need not have an immediate operational application, 54% of respondents agreed, 7% answered no, and 39% thought that this effort should be considered sometimes.

Forestry Canada's NoFC fire-research group has an annual base budget of approximately $40,000. excluding salaries. With this budget, intensive fieldwork on research projects requires additional external funding. With regard to this fiscal limitation, respondents were asked if fire management and other resource-management agencies should support the efforts of the NoFC fire research group. A total of 61% of respondents answered positively by indicating a willingness to provide additional funding; 39% said no. Considering other ways of help, by providing support in kind (e.g., aircraft time, crews, staff time), all responses agreed 100% to support the efforts of the NoFC fire research group.

Additionally, respondents were asked if their agencies would be willing to support a specific research project if that project were conducted in one province or territory, with results applicable in other jurisdictions. On the prospect of direct funding, 43% of responses agreed and 57% did not agree with this type of support. Considering direct support, 75% of respondents answered positively and 25% answered negatively. Of the individuals who answered to the prospect of providing staff, 79% said yes and 21% said no. On the same issue, respondents were asked their opinions if funds provided under the federal/provincial forestry agreements should be used for these types of projects. All respondents agreed that this type of funding should support these kinds of projects.

Finally, there is concern among managers within Forestry Canada and the Northwest Region that some of their staff participate in more interdisciplinary research projects (e.g., fire staff working with silviculture staff). Given that some of these projects address broader forest and resource management issues, respondents were asked their opinions on what percentage of time NoFC fire research staff should spend on this type of work. On average, they thought 27% of time should be devoted to this work.

SUMMARY AND CONCLUSIONS

This survey identified and prioritized forest fire research needs in the west-central region of Canada

(Alberta, Manitoba, Saskatchewan, and the Northwest Territories). The following three objectives were met:

1. identification of current and anticipated fire research, development, and technology transfer needs and the determination of their relative importance;

2. definition of fire research, development, and technology transfer needs based on their value to user agencies; and

3. determination of client perception on the fire-research process at the Northern Forestry Centre (NoFC).

These objectives were met through the use of a three-part questionnaire mailed to professionals from fire management agencies, the forest industry, resource management agencies, and academia. In total, 43 questionnaires were returned for use in the analysis. Part I of the questionnaire consisted of 70 potential research topics in the following five categories:

A. Fire behavior/danger rating   (13 topics)
B. Fire ecology and use   (10 topics)
C. Fire suppression   (16 topics)
D. Fire management systems   (22 topics)
E. General   (9 topics)

Using the results from Part I of the questionnaires, prioritized lists of present and future forest fire-research needs were prepared for the Northwest Region, by fire and nonfire professionals; management and operational positions; and geographic location (province/agency). While these lists in many cases showed close agreement, there were a number of noteworthy differences. These differences can be summarized by comparing the occurrence of fire-research activities by category and client group (Table 9).

The fire suppression category showed up most frequently in both regional and managerial group top 10 summaries for Part I. For the fire group summary, the fire ecology category outnumbered fire suppression, which had the second-highest number of occurrences. By comparison, the nonfire group had no rankings in the fire ecology category. This group overwhelmingly chose fire management systems as being highest in importance. The fire ecology category was also selected most often by the operations group. The occurrence of activities by province/agency had a different connotation. The fire suppression category showed up mostly in Alberta. Manitoba and Saskatchewan chose topics similarly from all categories.

The Northwest Territories chose mostly from fire behavior and fire ecology, and none from fire management systems. The Canadian Parks Service, on the contrary, selected from fire ecology and fire management systems categories.

In Part II of the questionnaire, respondents were asked to rank 10 research activities from Part I based on the projects' perceived importance to their respective agencies. Six of the top 10 research activities selected in Part I for the region occurred in this list. Part II also asked respondents to indicate the level and type of involvement of NoFC fire research staff in conducting research activities. A majority of respondents stated that NoFC should act as the lead agency, but work in close cooperation with clients.

Responses to Part III of the questionnaire indicated a willingness of clients to provide in-kind support for projects both within and outside their jurisdictions if the research is directly applicable to them. On the issue of direct funding, a majority of respondents expressed a willingness to do this, but only for projects being conducted within their jurisdiction.

This study provides valuable information for monitoring the responsiveness of the NoFC fire management research project in meeting client research needs in west-central Canada. Such information will help to ensure research priorities are targeted toward the most important problems as identified by client agencies. It also provides useful information for strategic planning of the NoFC fire research program. Constraints on meeting these research priorities include the lack of research expertise, inadequate funding, conflicting objectives, data gaps, and ill-defined problems.

The study highlights the differences in perception of fire-research priorities by client groups. The inclusion of nontraditional client groups such as wildlife and forest resource managers increases awareness of fire and broadens the scope of fire-research priorities for west-central Canada. The differences in perception of research priorities among client groups create a definite challenge for NoFC fire research. The authors hope that bringing forth these differences in priorities will encourage increased dialogue between Forestry Canada and its client groups. There is a need to continue this process at frequent intervals, updating research needs and priorities as changing conditions dictate and new clients are identified. Such efforts are essential to ensure that fire research continues to be responsive to needs of all clients in west-central Canada.

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Table 1. The 10 most-preferred fire research/technology transfer activities for the region

	Activity	Present importance rating score[a]		Activity	Future importance rating score[a]
B5	Development of guidelines and decision aids for planning prescribed burns	3.70	B3	Research on the ecological role of fire	4.02
E9	Research on improved fire weather forecasting (especially long range forecasts)	3.61	E9	Research on improved fire weather forecasting (especially long range forecasts)	3.97
C3	Development and application of a geographic information system seen area mapping system	3.60	B2	Research on the relationship of wildfires and prescribed fires to wildlife habitat	3.95
C2	Evaluation of the effectiveness of various global positioning systems for use in fire management	3.57	C3	Development and application of a geographic information system seen area mapping system	3.94
B3	Research on the ecological role of fire	3.55	D16c	Research and development of models for: lightning fire occurrence prediction	3.88
A9	Research on the relationship of the upper atmospheric conditions to severe fire behavior	3.50	B5	Development of guidelines and decision aids for planning prescribed burns	3.82
C1b	Research and development on the use of infra-red scanners for: detection of holdover fires	3.50	A2	Research on fire behavior in fuel types not currently found in the Fire Behavior Prediction System (e.g., mixed wood, spruce–balsam)	3.79
C10	Development of guidelines on the use of backburning as a fire suppression tool	3.44	D12	Research and development on the use of geographic information systems in various fire management activities	3.76
D12	Research and development on the use of geographic information systems in various fire management activities	3.41	C10	Development of guidelines on the use of backburning as a fire suppression tool	3.75
B4	Research on the use of fire for hazard reduction and fuels management	3.38	C11	Research on the effectiveness of fuels management (e.g., thinning, green stripping, etc.) at increasing fire suppression effectiveness in high value areas	3.68

[a] Ratings are on a five-point scale with 5 being high and 1 being low. Numbers are from Appendix 1, Table B.

Table 2. The 10 most-preferred fire research/technology transfer activities for the region (fire group)

	Activity	Present importance rating score[a]		Activity	Future importance rating score[a]
B5	Development of guidelines and decision aids for planning prescribed burns	4.00	B2	Research on the relationship of wildfires and prescribed fires to wildlife habitat	4.12
E9	Research on improved fire weather forecasting (especially long range forecasts)	3.80	E9	Research on improved fire weather forecasting (especially long range forecasts)	4.12
B3	Research on the ecological role of fire	3.70	B3	Research on the ecological role of fire	4.11
B4	Research on the use of fire for hazard reduction and fuels management	3.65	D16c	Research and development of models for: lightning fire occurrence prediction	4.00
B2	Research on the relationship of wildfires and prescribed fires to wildlife habitat	3.63	C3	Development and application of a geographic information system seen area mapping system	4.00
C3	Development and application of a geographic information system seen area mapping system	3.61	A2	Research on fire behavior in fuel types not currently found in the Fire Behavior Prediction System (e.g., mixed wood, spruce–balsam)	3.81
A9	Research on the relationship of the upper atmospheric conditions to severe fire behavior	3.60	B5	Development of guidelines and decision aids for planning prescribed burns	3.81
C2	Evaluation of the effectiveness of various global positioning systems for use in fire management	3.59	B4	Research on the use of fire for hazard reduction and fuels management	3.78
B6	Research on the impacts of various types of ignition patterns and techniques	3.58	D1	Development of the next generation fire management decision-support system by integrating and enhancing the current fire management systems developed at Petawawa National Forestry Institute and Northern Forestry Centre.	3.73
D16c	Research and development of models for: lightning fire occurrence prediction	3.50	E3	Research on the use of remote sensing for forest fuels mapping, analysis and monitoring (e.g., fuel moisture/green-up monitoring)	3.69

[a] Ratings are on a five-point scale with 5 being high and 1 being low. Numbers are from Appendix 1, Table D.

Table 3. The 10 most-preferred fire research/technology transfer activities for the region (nonfire group)

	Activity	Present importance rating score[a]		Activity	Future importance rating score[a]
C1b	Research and development on the use of infra-red scanners for: detection of holdover fires	3.80	E7	Development of a multi-resource valuing system for fire management	4.21
C1c	Research and development on the use of infra-red scanners for: near real-time (video) mapping of campaign fires	3.78	C10	Development of guidelines on the use of backburning as a fire suppression tool	4.18
D10	Development of training packages for fire management decision-support systems such as the Intelligent Fire Management Information System	3.75	A7	Development of comprehensive theories and models that relate fire behavior to specific fuel characteristics (e.g., density, age, fuel loading, etc.)	4.15
D12	Research and development on the use of geographic information systems in various fire management activities	3.75	C1c	Research and development on the use of infra-red scanners for: near real-time (video) mapping of campaign fires	4.11
C7	Development of guidelines and models that relate fire behavior characteristics (e.g., intensity, rate of spread, etc.) to fire suppression activities	3.70	D14	Development of improved weather interpolation techniques that account for features such as elevation, aspects, lake effects, etc.	4.00
D11	Development of guidelines for customizing fuel types used in a fire management decision-support system	3.70	D10	Development of training packages for fire management decision-support systems such as the Intelligent Fire Management Information System	4.00
D6	Development of a comprehensive forest fire threat assessment module within the next generation fire management decision-support system	3.67	D18	Research on how fire management principles can be incorporated into forest management planning activities such as harvest cycle planning, regeneration, stand tending, etc.	4.00
D18	Research on how fire management principles can be incorporated into forest management planning activities such as harvest cycle planning, regeneration, stand tending, etc.	3.67	D12	Research and development on the use of geographic information systems in various fire management activities	4.00
A4b	Research and development of moisture codes that accommodate: different aspects, slopes and elevations	3.64	D15	Development and application of surface wind models for fire management	4.00
D15	Development and application of surface wind models for fire management	3.64	D6	Development of a comprehensive forest fire threat assessment module within the next generation fire management decision-support system	3.92

[a] Ratings are on a five-point scale with 5 being high and 1 being low. Numbers are from Appendix 1, Table E.

Table 4. The 10 most-preferred fire research/technology transfer activities for the region (managerial postition)

	Activity	Present importance rating score[a]		Activity	Future importance rating score[a]
C1c	Research and development on the use of infra-res scanners for: near real-time (video) mapping of campaign fires	4.00	C1c	Research and development on the use of infra-red scanners for: near real-time (video) mapping of campaign fires	4.33
C1b	Research and development on the use of infra-red scanners for: detection of holdover fires	3.90	E9	Research on improved fire weather forecasting (especially long range forecasts)	4.30
E9	Research on improved fire weather forecasting (especially long range forecasts)	3.80	E7	Development of a multi-resource valuing system for fire management	4.25
D12	Research and development on the use of geographic information systems in various fire management activities	3.78	C10	Development of guidelines on the use of backburning as a fire suppression tool	4.18
C12b	Research into the effectiveness of foam: aerial application	3.75	A2	Research on fire behavior in fuel types not currently found in the Fire Behavior Prediction System (e.g., mixed wood, spruce–balsam)	4.08
C2	Evaluation of the effectiveness of various global positioning systems for use in fire management	3.67	C12b	Research into the effectiveness of foam: aerial application	4.00
C10	Development of guidelines on the use of backburning as a fire suppression tools	3.64	C11	Research on the effectiveness of fuels management (e.g., thinning, green stripping, etc.) at increasing fire suppression effectiveness in high value areas	3.92
C 1a	Research and development on the use of infra-red scanners for: airtanker guidance	3.63	B5	Development of guidelines and aids for planning prescribed burns	3.91
C12a	Research into the effectiveness of foam: ground application	3.63	D15	Development and application of surface wind models for fire management	3.91
C7	Development of guidelines and models that relate fire behavior characteristics (e.g., intensity, rate of spread, etc.) to fire suppression activities	3.60	C1b	Research and development on the use of infra-red scanners for: detection of holdover fires	3.90

[a] Ratings are on a five-point scale with 5 being high and 1 being low. Numbers are from Appendix 1, Table F.

Table 5. **The 10 most-preferred fire research/technology transfer activities for the region (operational position)**

	Activity	Present importance rating score[a]		Activity	Future importance rating score[a]
B3	Research on the ecological role of fires	3.82	B3	Research on the ecological role of fire	4.14
B5	Development of guidelines and decision aids for planning prescribed burns)	3.82	B2	Research on the relationship of wildfires and prescribed fires to wildlife habitat	4.11
C3	Development and application of a geographic information system seen area mapping systems	3.68	C3	Development and application of a geographic information system seen area mapping system	4.05
B2	Research on the relationship of wildfires and prescribed fires to wildlife habitat	3.66	D16c	Research and development of models for: lightning fire occurrence prediction	3.95
E9	Research on improved fire weather forecasting (especially long range forecasts)	3.60	E9	Research on improved fire weather forecasting (especially long range forecasts)	3.92
B4	Research on the use of fire for hazard reduction and fuels management	3.58	B5	Development of guidelines and decision aids for planning prescribed burns	3.74
C2	Evaluation of the effectiveness of various global positioning systems for use in fire management	3.56	A5	Research on the effect of slope on rate of spread and fire intensity	3.72
A5	Research on the effect of slope on rate of spread and fire intensity	3.50	E3	Research on the use of remote sensing for forest fuels mapping, analysis and monitoring (e.g., fuel moisture/green-up monitoring)	3.71
A9	Research on the relationship of the upper atmospheric conditions to severe fire behavior	3.48	D12	Research and development on the use of geographic information systems in various fire management activities	3.68
A3b	Production of training packages and/or interpretive guides for the Fire Behavior Prediction System: computer-assisted training packages	3.43	B4	Research on the use of fire for hazard reduction and fuels management	3.67

[a] Ratings are on a five-point scale with 5 being high and 1 being low. Numbers are from Appendix 1, Table G.

Table 6A. Present importance: ranking of fire-research activities by province/agency

Activity		Present importance rank[a]					
		Region	Alberta	Manitoba	Saskatchewan	Northwest Territories	Canadian Parks Service
B5	Development of guidelines and decision aids for planning prescribed burns	1	NR[b]	NR	NR	2[c]	5[c]
E9	Research on improved fire weather forecasting (especially long range forecasts)	2	6	NR	1[c]	NR	5[c]
C3	Development and application of a geographic information system seen area mapping system	3	10	NR	NR	5[c]	NR
C2	Evaluation of the effectiveness of various global positioning systems for use in fire management	4	4	NR	NR	2[c]	NR
B3	Research on the ecological role of fire	5	NR	NR	10	1	1
A9	Research on the relationship of the upper atmospheric conditions to severe fire behavior	6[c]	NR	8[c]	NR	7[c]	NR
C1b	Research and development on the use of infrared scanners for: detection of holdover fires	6[c]	1	8[c]	NR	NR	NR
C10	Development of guidelines on the use of backbuming as a fire suppression tool	8	9	NR	NR	NR	NR
D12	Research and development on the use of geographic information system in various fire management activities	9	7	3[c]	NR	NR	10
B4	Research on the use of fire for hazard reduction and duels management	10	NR	3[c]	NR	7[c]	2[c]

[a] Rankings pertain to the importance of the top 10 research activities of each province/agency at present. (Numbers are from Table 1 and Appendix 1, Tables H-1, J-1, K-1, and L-I.)

[b] NR = not ranked for this particular province/agency among the regional top 10 list.

[c] Activities with equal rating scores among the top 10 in each province/agency.

Table 6B. Future importance: ranking of fire research activities by province/agency

	Activity	Future importance rank[a]					
		Region	Alberta	Manitoba	Saskatchewan	Northwest Territories	Canadian Parks Service
B3	Research on the ecological role of fire	1	NR[b]	NR	6[c]	1	4[c]
E9	Research on improved fire weather forecasting (especially long range forecasts)	2	3	NR	1[c]	7[c]	NR
B2	Research on the relationship of wildfires and prescribed fires to wildlife habitat	3	NR	NR	6[c]	3	3
C3	Development and application of a geographic information system seen area mapping system	4	NR	4[c]	NR	2	NR
D16c	Research and development of models for: lightning fire occurrence prediction	5	NR	NR	1[c]	NR	4[c]
B5	Development of guidelines and decision aids for planning prescribed burns	6	5[c]	NR	6[c]	NR	NR
A2	Research on fire behavior in fuel types not currently found in the Fire Behavior Prediction System (e.g., mixed wood, spruce–balsam)	7	2	7[c]	NR	NR	2
D12	Research and development on the use of geographic information systems in various fire management activities	8	NR	NR	NR	NR	10
C10	Development of guidelines on the use of backburning as a fire suppression tool	9	NR	NR	NR	NR	NR
C11	Research on the effectiveness of fuels management (e.g., thinning, green stripping, etc.) at increasing fire suppression effectiveness in high value areas	10	NR	2[c]	NR	NR	NR

[a] Rankings pertain to the future importance of the top 10 research activities of each province/agency. (Numbers are from Table 1 and Appendix 1, Tables H-1, I-1, J-1, K-1, and L-1.)
[b] NR = not ranked for this particular province/agency among the regional top 10 list.
[c] Activities with equal rating scores among the top 10 in each province/agency.

Table 7A. Present importance: top ten fire research activities by province/agency that did not appear on the regional top 10 list

	Activity	Present importance rank[a]				
		Alberta	Manitoba	Saskatchewan	Northwest Territories	Canadian Parks Service
D10	Development of training packages for fire management decision-support systems such as the Intelligent Fire Management Information System	2	NR[b]	NR	NR	NR
C1a	Research and development on the use of infrared scanners for: a) airtanker guidance	3	NR	NR	NR	NR
D17	Development of a comprehensive computerized prescribed fire effects information system	5	NR	NR	NR	5[c]
C12b	Research into the effectiveness of foam: b) aerial application	8	NR	NR	NR	NR
E7	Development of a multi-resource valuing system for fire management	NR	1	NR	NR	NR
E6	Research and development on the impact that fire has on long-term wood supply	NR	2	NR	NR	NR
A3b	Production of training packages and/or interpretive guides for the Fire Behavior Prediction System: b) computer-assisted training packages	NR	3[c]	1[c]	4	NR
C4	Development of a low cost video transmission system for disseminating fire intelligence information	NR	3[c]	NR	NR	NR
D5	Development of guidelines and/or software for determining optimum aerial detection routes	NR	3[c]	NR	NR	NR
C11	Research on the effectiveness of fuels management (e.g., thinning, green stripping, etc.) at increasing fire suppression effectiveness in high value areas	NR	8[c]	NR	NR	NR
A3a	Production of training packages and/or interpretive guides for the Fire Behavior Prediction System: a) workbooks, posters, etc.	NR	NR	1[c]	9[c]	NR
C5	Research on the initial attack effectiveness (e.g., production rates, line holding capability, etc.) of crews, helicopters, and airtankers	NR	NR	1[c]	NR	NR

Table 7A. concluded

Activity		Present importance rank[a]				
		Alberta	Manitoba	Saskatchewan	Northwest Territories	Canadian Parks Service
C8	Evaluation of the effectiveness and cost-efficiency of various strategies and tactics used in campaign fire suppression	NR	NR	1[c]	NR	NR
D2b	Development of the next generation fire management decision-support system that operates on the following workstation platforms: b) UNIX	NR	NR	1[c]	NR	NR
D16b	Research and development of models for: b) lightning prediction	NR	NR	1[c]	NR	NR
D16c	Research and development of models for: c) lightning fire occurrence prediction	NR	NR	1[c]	NR	4
E5	Development of protection guidelines for the wildland/ urban interface	NR	NR	1[c]	NR	NR
B2	Research on the relationship of wildfires and prescribed fires to wildlife habitat	NR	NR	NR	5[c]	2[c]
A4a	Research and development of moisture codes that accommodate: a) high latitude conditions	NR	NR	NR	9[c]	NR
A5	Research on the effect of slope on rate of spread and fire intensity	NR	NR	NR	NR	5[c]
A2	Research on fire behavior in fuel types not currently found in the Fire Behavior Prediction System (e.g., mixed wood, spruce–balsam)	NR	NR	NR	NR	9

[a] Rankings pertain to the present importance of research activities that did not appear on the regional top 10 list of each province/agency. (Numbers are from Table 1 and Appendix 1, Tables H-1, I-1, J-1, K-1, and L-1.)

[b] NR = not ranked by that province/agency.

[c] Activities with equal rating scores among the top 10 in each province/agency.

Table 7B. Future importance: top 10 fire research activities by province/agency that did not appear on the regional top 10 list

Activity	Future importance rank[a]				
	Alberta	Manitoba	Saskatchewan	Northwest Territories	Canadian Parks Service
E7 Development of a multi-resource valuing system for fire management	1	1	NR[b]	NR	NR
B1 Research on the silvicultural use of fire for site preparation, mixed-wood management, stand tending etc.	4	NR	NR	9[c]	NR
A7 Development of comprehensive theories and models that relate fire behavior to specific fuel characteristics (e.g., density, age, fuel loading, etc.)	5[c]	NR	NR	NR	NR
C1c Research and development on the use of infrared scanners for: near real-time (video) mapping of campaign fires	7[c]	4[c]	NR	NR	NR
D14 Development of improved weather interpolation techniques that account for features such as elevation, aspects, lake effects, etc.	7[c]	NR	NR	NR	NR
C1b Research and development on the use of infrared scanners for: detection of holdover fires	7[c]	NR	1[c]	NR	NR
D15 Development and application of surface wind models for fire management	10	NR	NR	NR	NR
D5 Development of guidelines and/or software for determining optimum aerial detection routes	NR	2[c]	NR	NR	NR
E6 Research and development on the impact that fire has on long-term wood supply	NR	4[c]	NR	NR	NR
A3b Production of training packages and/or interpretive guides for the Fire Behavior Prediction System: b) computer-assisted training packages	NR	7[c]	NR	9[c]	NR
A9 Research on the relationship of the upper atmospheric conditions to severe fire behavior	NR	7[c]	NR	NR	NR
B4 Research on the use of fire for hazard reduction and fuels management	NR	7[c]	10	5	1

Table 7B. concluded

Activity		Future importance rank[a]				
		Alberta	Manitoba	Saskatchewan	Northwest Territories	Canadian Parks Service
C8	Evaluation of the effectiveness and cost-efficiency of various strategies and tactics used in campaign fire suppression	NR	NR	1[c]	NR	NR
D16b	Research and development of models for: b) lightning prediction	NR	NR	1[c]	NR	NR
E5	Development of protection guidelines for the wildland/urban interface	NR	NR	6[c]	NR	NR
C2	Evaluation of the effectiveness of various global positioning systems for use in fire management	NR	NR	NR	4	NR
A4a	Research and development of moisture codes that accommodate: a) high latitude conditions	NR	NR	NR	6	NR
B9a	Research on smoke management issues such as: a) air quality	NR	NR	NR	7[c]	NR
A5	Research on the effect of slope on rate of spread and fire intensity	NR	NR	NR	NR	6[c]
D17	Development of a comprehensive computerized prescribed fire effects information system	NR	NR	NR	NR	6[c]
E3	Research on the use of remote sensing for forest fuels, mapping analysis and monitoring (e.g., fuel moisture/green-up monitoring)	NR	NR	NR	NR	6[c]
B8	Research on the potential effect of climate change on future fire management scenarios	NR	NR	NR	NR	6[c]

[a] Rankings pertain to the future importance of research activities that did not appear on the regional top 10 list of each province/agency. (Numbers are from Table 1 and Appendix 1, Tables H-1, I-1, J-1, K-1, and L-1.)

[b] NR = not ranked by that province/agency.

[c] Activities with equal rating scores among the top 10 in each province/agency.

Table 8. The 10 most-selected and ranked fire-research projects (questionnaire Part II)

Activity	Priority rank[a]										No. of respondents	Weighted no. of respondents
	1	2	3	4	5	6	7	8	9	10		
B2 Research on the relationship of wildfires and prescribed fires to wildlife habitat	1	4	1	4	1	1	1	1	2	NR[b]	16	104
A2 Research on fire behavior in fuel types not currently found in the Fire Behavior Prediction System (e.g., mixed wood, spruce–balsam)	4	2	1	3	NR	1	NR	NR	1	1	13	95
B3 Research on the ecological role of fire	5	2	1	NR	1	NR	2	1	NR	NR	12	93
A7 Development of comprehensive theories and models that relate fire behavior to specific fuel characteristics (e.g., density, age, fuel loading, etc.)	1	2	2	2	NR	1	1	NR	1	NR	10	69
C1b Research and development on the use of infrared scanners for: b) detection of holdover fires	NR	2	2	NR	2	NR	1	1	NR	NR	8	53
A1 Validation of and/or further research on fire behavior in current Fire Behavior Prediction System fuel types	4	NR	NR	NR	NR	NR	2	1	NR	NR	7	51
C1a Research and development on the use of infrared scanners for: a) airtanker guidance	1	1	1	1	2	NR	1	NR	NR	NR	7	50
B5 Development of guidelines and decision aids for planning prescribed burns	NR	NR	1	2	NR	2	2	2	NR	3	12	49
E7 Development of a multi-resource valuing system for fire management	1	1	NR	2	2	NR	1	NR	NR	NR	7	49
E9 Research on improved fire weather forecasting (especially long range forecasts)	2	NR	2	1	NR	NR	NR	NR	3	NR	8	49

[a] Numbers are from Appendix 1, Table M.

[b] NR = not ranked by any respondent.

Table 9. Summary of the occurrence of fire-research activities by category and client group in the top 10 summaries of Part I of the questionnaire (present/future)

Client group	Fire behavior danger	Fire ecology and use	Fire suppression	Fire management systems	General
Region	1/1	3/3	4/3	1/2	1/1
Fire group	1/1	5/4	2/1	1/2	1/2
Nonfire group	1/1	0/0	3/2	6/6	0/1
Managers	0/1	0/1	8/5	1/1	1/2
Operations	3/1	4/4	2/1	0/2	1/2
Alberta	0/2	0/2	6/2	3/2	1/2
Manitoba	2/3	1/1	3/3	2/1	2/2
Saskatchewan	2/0	1/4	2/2	3/2	2/2
Northwest Territories	4/2	4/5	2/2	0/0	0/1
Canadian Parks Service	2/2	4/4	0/0	3/3	1/1

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APPENDIX 1
SURVEY RESULTS

Table A.   Distribution of respondents by geographic location

Geographic location	Respondents	
	Number	Percent
Alberta	21	48.8
Northwest Territories	9	20.9
Canadian Parks Service	7	16.3
Manitoba	4	9.3
Saskatchewan	2	4.7
Total	43	100.0

Table B. Rating scores[a] of fire-research needs by respondents to questionnaire Part I for region

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
A. Fire Behavior/Danger Rating										
1. Validation of and/or further research on fire behavior in current Fire Behavior Prediction (FBP) System fuel types	2.87	1.26	1	5	38	3.29	1.09	1	5	38
2. Research on fire behavior in fuel types not currently found in the FBP System (e.g., mixed wood, spruce–balsam)	3.24	1.30	1	5	38	3.79	1.28	1	5	39
3. Production of training packages and/or interpretive guides for the FBP System:										
a) workbooks, posters, etc.	3.03	1.25	1	5	35	2.79	1.07	1	5	34
b) computer-assisted training packages	3.35	1.10	1	5	34	3.43	1.14	1	5	35
4. Research and development of moisture codes that accommodate:										
a) high latitude conditions	2.66	1.36	1	5	32	2.91	1.40	1	5	32
b) different aspects, slopes and elevations	3.20	1.18	1	5	35	3.44	1.25	1	5	36
c) unique fuel types (cladonia, slash, etc.)	3.19	1.20	1	5	37	3.29	1.29	1	5	38
5. Research on the effect of slope on rate of spread and fire intensity	3.19	1.24	1	5	36	3.41	1.26	1	5	37
6. Validation of and/or further research on the acceleration of wildfires from a point source ignition	2.92	1.22	1	5	38	3.08	1.28	1	5	38
7. Development of comprehensive theories and models that relate fire behavior to specific fuel characteristics (e.g., density, age, fuel loading, etc.)	3.26	1.16	1	5	39	3.64	1.25	1	5	39
8. Research on the fire characteristics of high intensity fires such as:										
a) spotting	2.88	1.05	1	5	33	3.03	0.95	1	5	33
b) convection column dynamics	2.91	1.01	1	5	33	3.12	0.99	1	5	33
9. Research on the relationship of the upper atmospheric conditions to severe fire behavior	3.50	1.05	1	5	32	3.38	1.10	1	5	32

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
B. Fire Ecology and Use										
1. Research on the silvicultural use of fire for site preparation, mixed-wood management, stand tending, etc.	2.97	1.50	1	5	37	3.49	1.37	1	5	37
2. Research on the relationship of wildfires and prescribed fires to wildlife habitat	3.38	1.34	1	5	42	3.95	1.26	1	5	41
3. Research on the ecological role of fire	3.55	1.30	1	5	40	4.02	1.14	1	5	40
4. Research on the use of fire for hazard reduction and fuels management	3.38	1.16	1	5	39	3.63	1.05	1	5	40
5. Development of guidelines and decision aids for planning prescribed burns	3.70	1.11	1	5	40	3.82	1.02	2	5	39
6. Research on the impacts of various types of ignition patterns and techniques	3.08	1.22	1	5	39	3.15	1.19	1	5	40
7. Research on the effects forest fires have on global warming	2.24	1.28	1	5	38	2.95	1.45	1	5	40
8. Research on the potential effect of climate change on future fire management scenarios	2.59	1.26	1	5	37	3.18	1.33	1	5	38
9. Research on smoke management issues such as:										
a) air quality	2.97	1.13	1	5	38	3.49	1.19	1	5	37
b) smoke distribution	2.92	1.18	1	5	36	3.38	1.16	1	5	37
C. Fire Suppression										
1. Research and development on the use of infrared scanners for:										
a) airtanker guidance	2.66	1.47	1	5	32	2.72	1.46	1	5	32
b) detection of holdover fires	3.50	1.23	1	5	36	3.56	1.03	1	5	36
c) near real-time (video) mapping of campaign fires	3.06	1.35	1	5	34	3.26	1.36	1	5	34

Table B. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
2. Evaluation of the effectiveness of various global positioning systems for use in fire management	3.57	1.01	2	5	35	3.65	1.10	2	5	34
3. Development and application of a geographic information system (GIS) seen area mapping system	3.60	1.00	2	5	30	3.94	1.12	1	5	31
4. Development of a low cost video transmission system for disseminating fire intelligence information	2.81	1.25	1	5	31	3.23	1.28	1	5	31
5. Research on the initial attack effectiveness (e.g., production rates, line holding capability, etc.) of crews, helicopters, and airtankers	2.70	1.29	1	5	37	2.86	1.36	1	5	37
6. Research on the sustained action production rates of crews, heavy equipment, and airtankers	2.59	1.23	1	5	34	2.79	1.39	1	5	34
7. Development of guidelines and models that relate fire behavior characteristics (e.g., intensity, rate of spread, etc.) to fire suppression activities	3.17	1.22	1	5	35	3.27	1.28	1	5	37
8. Evaluation of the effectiveness and cost-efficiency of various strategies and tactics used in campaign fire suppression	2.97	1.13	1	5	33	3.15	1.35	1	5	33
9. Development of guidelines and software that will improve the efficiency of large fire suppression activities (e.g., servicing, planning, mop-up, etc.)	2.55	1.20	1	5	33	2.91	1.30	1	5	32
10. Development of guidelines on the use of backburning as a fire suppression tool	3.44	1.18	1	5	36	3.75	1.05	1	5	36

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
11. Research on the effectiveness of fuels management (e.g., thinning, green stripping, etc.) at increasing fire suppression effectiveness in high value areas	3.00	1.22	1	5	37	3.68	1.19	1	5	38
12. Research into the effectiveness of foam:										
a) ground application	3.25	1.19	1	5	32	3.09	1.25	1	5	32
b) aerial application	3.13	1.23	1	5	31	2.97	1.28	1	5	31
c) on structures	2.66	1.32	1	5	29	2.66	1.37	1	5	29
D. Fire Management Systems										
1. Development of the next generation fire management decision-support system (FMDSS) by integrating and enhancing the current fire management systems developed at Petawawa National Forestry Institute and Northern Forestry Centre	3.00	1.23	1	5	30	3.67	1.09	1	5	30
2. Development of the next generation FMDSS that operates on the following workstation platforms:										
a) PC	3.00	1.26	1	5	25	3.12	1.20	1	5	25
b) UNIX	2.59	1.33	1	5	17	3.24	1.35	1	5	17
3. Development of a new spatial and quantitatively based preparedness planning module within the next generation FMDSS	2.56	1.19	1	5	27	3.19	1.27	1	5	27
4. Validation and cost-effectiveness of initial attack preparedness planning system	3.12	1.30	1	5	34	3.03	1.29	1	5	33
5. Development of guidelines and/or software for determining optimum aerial detection routes	2.13	1.28	1	5	31	2.33	1.40	1	5	30
6. Development of a comprehensive forest fire threat assessment module within the next generation FMDSS	2.65	1.40	1	5	31	3.10	1.52	1	5	30

Table B. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
7. Development of a senior executive information module in the next generation FMDSS	2.00	1.14	1	5	24	2.43	1.34	1	5	23
8. Incorporate daily and seasonal economic analysis models for detection, prevention, pre-positioning, and initial attack dispatch into the next generation FMDSS	2.33	1.24	1	5	24	2.78	1.24	1	5	23
9. Development of improved graphic information displays for fire management systems such as the Intelligent Fire Management Information System (IFMIS)	2.90	1.23	1	5	29	3.41	1.12	1	5	27
10. Development of training packages for FMDSS such as IFMIS	3.03	1.50	1	5	30	3.33	1.07	1	5	27
11. Development of guidelines for customizing fuel types used in a FMDSSS	2.71	1.37	1	5	31	3.07	1.26	1	5	30
12. Research and development on the use of GIS in various fire management activities	3.41	1.10	1	5	34	3.76	1.06	1	5	33
13. Development of 3-dimensional fire growth models	2.89	1.41	1	5	35	3.35	1.43	1	5	34
14. Development of improved weather interpolation techniques that account for features such as elevation, aspects, lake effects, etc.	3.06	1.29	1	5	36	3.49	1.09	1	5	35
15. Development and application of surface wind models for fire management	2.97	1.42	1	5	37	3.39	1.38	1	5	36
16. Research and development of models for:										
a) human-caused fire occurrence prediction	2.47	1.26	1	5	34	2.91	1.44	1	5	33
b) lightning prediction	3.03	1.29	1	5	35	3.47	1.31	1	5	34
c) lightning fire occurrence prediction	3.29	1.34	1	5	35	3.88	1.17	1	5	33

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
17. Development of a comprehensive computerized prescribed fire effects information system	3.18	1.42	1	5	34	3.50	1.33	1	5	34
18. Research on how fire management principles can be incorporated into forest management planning activities such as harvest cycle planning, regeneration, stand tending, etc.	2.75	1.40	1	5	36	3.17	1.50	1	5	36
19. Development of an automatic vehicle location system for fire management	1.90	1.22	1	5	31	2.50	1.55	1	5	28
E. General										
1. Development and maintenance of a fire weather records archive for the Northwest Region	2.60	1.29	1	5	35	2.91	1.42	1	5	34
2. Development and maintenance of a fire management/research publications library at Northern Forestry Centre for use by client agencies	2.89	1.21	1	5	35	3.26	1.16	1	5	34
3. Research on the use of remote sensing for forest fuels mapping, analysis, and monitoring (e.g., fuel moisture/green-up monitoring)	3.23	0.91	1	5	35	3.66	1.06	1	5	35
4. Fire history studies	2.65	1.33	1	5	40	2.77	1.40	1	5	40
5. Development of protection guidelines for the wildland/urban interface	3.26	1.31	1	5	39	3.62	1.27	1	5	39
6. Research and development on the impact that fire has on long-term wood supply	2.91	1.49	1	5	33	3.23	1.43	1	5	31
7. Development of a multi-resource valuing system for fire management	3.05	1.35	1	5	37	3.67	1.37	1	5	36

Table B.   concluded

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
8. Research on the socioeconomic impact of fire management practices	2.34	1.26	1	5	38	2.74	1.45	1	5	38
9. Research on improved fire weather forecasting (especially long range forecasts)	3.61	1.36	1	5	36	3.97	1.18	1	5	36

[a] Based on 43 respondents. Ratings are on a five-point scale with 5 being high and 1 being low.

Table C. Activities listed in Section F, "other fire research/technology transfer activities" of Part I by province/agency

Activity	Province/agency[a]		
	Alberta	Saskatchewan	Canadian Parks Service
1. Relationship between fire and deciduous/mixed wood landbase productivity[b]	1	–[c]	–
2. Incorporate lightning into the Intelligent Fire Management Information System (IFMIS)	–	1	–
3. Research the probability of ignition from lightning (+) (–)	–	1	–
4. Effects of barometric pressure on ignition	–	1	–
5. Development of comprehensive models relating fire behavior to selective logging (to reduce fire risk)	1	–	–
6. Development of a technology transfer program strategy with the Forest Technology School, Hinton[b]	1	–	–
7. Evaluate automated detection systems, e.g., laser beam	1	–	–
8. Evaluate ground fire detection systems	1	–	–
9. Lightning forecasts - time and place	1	–	–
10. New aerial retardants - more effective	1	–	–
11. New aerial delivery systems - more effective bombers[b]	1	–	–
12. Fire as habitat management tool	1	–	–
13. Research into additional fuel types and moisture codes	–	–	1
14. Effects of fire (intensity) on succession	–	–	1
15. Effects of fire (intensity) on wildlife	–	–	1
16. Effects of fire (intensity) on non native plant species	–	–	1
17. Research into fire behavior in the aspen parkland/grassland fuel types[b]	–	–	1
18. Research into fire and ecological succession in aspen parkland	–	–	1
19. Ungulate use of prescribed fire	–	–	1
20. Research in calibrating the Fire Weather Index (FWI) for aspen forests	–	–	1
21. Effect of fire intensity on ecology[b]	–	–	1
22. Mapping of Alberta under the provincial 1:20 000 base mapping program	1	–	–
23. Fire effects in prescribed burns[b]	1	–	–
24. Airtankers for the future (type?)[b]	1	–	–
25. Rappel from light and intermediate rotary wing[b]	1	–	–
26. Ground tankers - Alberta needs to decide on type we should be getting into - existing large and old	1	–	–

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Table C. concluded

Activity	Province/agency[a]		
	Alberta	Saskatchewan	Canadian Parks Service
27. Evaluation of new fire retardant products (effectiveness and cost efficiency)	1	–	–
28. Assessment of airtanker capability and availability after the turn of the century	1	–	–
29. Computerized escaped fire situation analysis program	–	–	1
30. Role of pre-European man in fire regime	–	–	1
31. Grassland biome - identify threshold indices/codes for preparedness	–	–	1
32. Low impact control guidelines for prescribed burns in continuous mixed-wood stands	–	–	1
33. Fuel loading assessment guidelines and technology transfer workshops	–	–	1
34. Fire/vegetation/wildlife interactions	–	–	1
35. Monitoring fire effects; parameters, methods, data storage and analysis - archiving for large scale application[b]	–	–	1
36. Precipitation radar[b]	–	–	1
Total	16	3	17

[a] Number 1 indicates that the activity was listed once by the corresponding province/agency. Manitoba and the Northwest Territories did not list any activity.

[b] Projects selected by respondents of Part II as one of their 10 priorities.

[c] Activity not listed by province/agency.

Table D. Rating scores[a] of fire-research needs by respondents to questionnaire Part I for region (fire group)

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
A. Fire Behavior/Danger Rating										
1. Validation of and/or further research on fire behavior in current Fire Behavior Prediction (FBP) System fuel types	2.88	1.28	1	5	26	3.27	1.12	1	5	26
2. Research on fire behavior in fuel types not currently found in the FBP System (e.g., mixed wood, spruce–balsam)	3.16	1.37	1	5	25	3.81	1.41	1	5	26
3. Production of training packages and/or interpretive guides for the FBP System:										
a) workbooks, posters, etc.	3.16	1.31	1	5	25	2.88	1.09	1	5	25
b) computer-assisted training packages	3.40	1.12	1	5	25	3.40	1.19	1	5	25
4. Research and development of moisture codes that accommodate:										
a) high latitude conditions	2.71	1.23	1	5	21	3.10	1.26	1	5	21
b) different aspects, slopes, and elevations	3.00	1.18	1	5	24	3.36	1.32	1	5	25
c) unique fuel types (cladonia, slash, etc.)	3.04	1.21	1	5	25	3.19	1.36	1	5	26
5. Research on the effect of slope on rate of spread and fire intensity	3.16	1.25	1	5	25	3.46	1.27	1	5	26
6. Validation of and/or further research on the acceleration of wildfires from a point source ignition	2.88	1.14	1	5	26	3.04	1.22	1	5	26
7. Development of comprehensive theories and models that relate fire behavior to specific fuel characteristics (e.g., density, age, fuel loading, etc.)	3.08	1.13	1	5	26	3.38	1.20	1	5	26
8. Research on the fire characteristics of high intensity fires such as:										
a) spotting	2.88	1.17	1	5	25	3.00	1.04	1	5	25
b) convection column dynamics	2.84	1.03	1	5	25	3.08	1.04	1	5	25
9. Research on the relationship of the upper atmospheric conditions to severe fire behavior	3.60	1.00	1	5	25	3.36	1.08	1	5	25

Table D. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
B. Fire Ecology and Use										
1. Research on the silvicultural use of fire for site preparation, mixed-wood management, stand tending, etc.	3.08	1.59	1	5	24	3.42	1.56	1	5	24
2. Research on the relationship of wildfires and prescribed fires to wildlife habitat	3.63	1.28	1	5	27	4.12	1.18	1	5	26
3. Research on the ecological role of fire	3.70	1.32	1	5	27	4.11	1.12	1	5	27
4. Research on the use of fire for hazard reduction and fuels management	3.65	1.09	2	5	26	3.78	1.12	1	5	27
5. Development of guidelines and decision aids for planning prescribed burns	4.00	0.83	3	5	27	3.81	1.06	2	5	26
6. Research on the impacts of various types of ignition patterns and techniques	3.58	0.99	1	5	26	3.37	1.11	1	5	27
7. Research on the effects forest fires have on global warming	2.11	1.09	1	5	27	2.93	1.38	1	5	27
8. Research on the potential effect of climate change on future fire management scenarios	2.52	1.19	1	5	27	3.23	1.27	1	5	26
9. Research on smoke management issues such as:										
a) air quality	2.92	1.06	1	5	26	3.52	1.23	1	5	25
b) smoke distribution	2.88	1.09	1	5	25	3.38	1.17	1	5	26
C. Fire Suppression										
1. Research and development on the use of infrared scanners for:										
a) airtanker guidance	2.42	1.59	1	5	24	2.42	1.50	1	5	24
b) detection of holdover fires	3.38	1.30	1	5	26	3.50	1.07	1	5	26
c) near real-time (video) mapping of campaign fires	2.80	1.41	1	5	25	2.96	1.37	1	5	25

Table D. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
2. Evaluation of the effectiveness of various global positioning systems for use in fire management	3.59	1.12	2	5	27	3.62	1.17	2	5	26
3. Development and application of a geographic information system (GIS) seen area mapping system	3.61	0.94	2	5	23	4.00	0.95	2	5	23
4. Development of a low cost video transmission system for disseminating fire intelligence information	2.57	1.16	1	5	23	3.13	1.29	1	5	23
5. Research on the initial attack effectiveness (e.g., production rates, line holding capability, etc.) of crews, helicopters, and airtankers	2.65	1.23	1	5	26	2.81	1.27	1	5	26
6. Research on the sustained action production rates of crews, heavy equipment, and airtankers	2.32	1.14	1	4	25	2.56	1.33	1	5	25
7. Development of guidelines and models that relate fire behavior characteristics (e.g., intensity, rate of spread, etc.) to fire suppression activities	2.96	1.24	1	5	25	3.04	1.22	1	5	26
8. Evaluation of the effectiveness and cost-efficiency of various strategies and tactics used in campaign fire suppression	2.83	1.05	1	5	24	2.96	1.37	1	5	24
9. Development of guidelines and software that will improve the efficiency of large fire suppression activities (e.g., servicing, planning, mop-up, etc.)	2.33	1.20	1	5	24	2.61	1.23	1	5	23
10. Development of guidelines on the use of backburning as a fire suppression tool	3.44	1.12	1	5	25	3.56	1.08	1	5	25

Table D.   continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
11. Research on the effectiveness of fuels management (e.g., thinning, green stripping, etc.) at increasing fire suppression effectiveness in high value areas	3.04	1.22	1	5	26	3.65	1.26	1	5	26
12. Research into the effectiveness of foam:										
a) ground application	3.28	1.17	1	5	25	3.04	1.21	1	5	25
b) aerial application	3.08	1.25	1	5	24	2.83	1.24	1	5	24
c) on structures	2.67	1.32	1	5	21	2.67	1.39	1	5	21
D. Fire Management Systems										
1. Development of the next generation fire management decision-support system (FMDSS) by integrating and enbancing the current fire management systems developed at Petawawa National Forestry Institute and Northern Forestry Centre	3.00	1.27	1	5	22	3.73	1.16	1	5	22
2. Development of the next generation FMDSS that operates on the following workstation platforms:										
a) PC	2.78	1.11	1	5	18	3.17	1.25	1	5	18
b) UNIX	2.20	1.23	1	5	10	3.00	1.49	1	5	10
3. Development of a new spatial and quantitatively based preparedness planning module within the next generation FMDSS	2.37	1.16	1	4	19	2.95	1.27	1	5	19
4. Validation and cost-effectiveness of initial attack preparedness planning system	3.17	1.30	1	5	23	2.86	1.21	1	5	22
5. Development of guidelines and/or software for determining optimum aerial detection routes	1.86	1.25	1	5	22	1.95	1.20	1	5	21
6. Development of a comprehensive forest fire threat assessment module within the next generation FMDSS	2.00	1.15	1	4	19	2.56	1.46	1	5	18

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
7. Development of a senior executive information module in the next generation FMDSS	1.53	0.64	1	3	15	1.79	0.08	1	3	14
8. Incorporate daily and seasonal economic analysis models for detection, prevention, pre-positioning, and initial attack dispatch into the next generation FMDSS	2.06	1.20	1	5	17	2.50	1.32	1	5	16
9. Development of improved graphic information displays for fire management systems such as the Intelligent Fire Management Information System (IFMIS)	2.71	1.15	1	4	21	3.32	1.16	1	5	19
10. Development of training packages for FMDSS such as IFMIS	2.77	1.51	1	5	22	3.05	1.03	1	5	19
11. Development of guidelines for customizing fuel types used in a FMDSS	2.24	1.18	1	5	21	2.65	1.23	1	5	20
12. Research and development on the use of GIS in various fire management activities	3.31	1.01	1	5	26	3.67	1.01	1	5	24
13. Development of 3-dimensional fire growth models	2.58	1.35	1	5	24	3.13	1.46	1	5	23
14. Development of improved weather interpolation techniques that account for features such as elevation, aspects, lake effects, etc.	2.84	1.25	1	5	25	3.25	1.11	1	5	24
15. Development and application of surface wind models for fire management	2.69	1.38	1	5	26	3.12	1.36	1	5	25
16. Research and development of models for:										
a) human-caused fire occurrence prediction	2.30	1.26	1	5	23	2.68	1.46	1	5	22
b) lightning prediction	3.17	1.20	1	5	24	3.61	1.03	1	5	23
c) lightning fire occurrence prediction	3.50	1.22	1	5	24	4.00	0.98	1	5	22

Table D. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
17. Development of a comprehensive computerized prescribed fire effects information system	3.00	1.41	1	5	23	3.36	1.33	1	5	22
18. Research on how fire management principles can be incorporated into forest management planning activities such as harvest cycle planning, regeneration, stand tending, etc.	2.29	1.20	1	5	24	2.70	1.52	1	5	23
19. Development of an automatic vehicle location system for fire management	1.59	1.05	1	5	22	1.95	1.35	1	5	19
E. General										
1. Development and maintenance of a fire weather records archive for the Northwest Region	2.59	1.26	1	5	22	2.71	1.27	1	5	21
2. Development and maintenance of a fire management/research publications library at Northern Forestry Centre for use by client agencies	2.95	1.17	1	5	22	3.33	1.20	1	5	21
3. Research on the use of remote sensing for forest fuels mapping, analysis and monitoring (e.g., fuel moisture/green-up monitoring)	3.31	0.88	2	5	26	3.69	1.12	1	5	26
4. Fire history studies	2.78	1.25	1	5	27	2.85	1.35	1	5	27
5. Development of protection guidelines for the wildland/urban interface	3.31	1.38	1	5	26	3.54	1.33	1	5	26
6. Research and development on the impact that fire has on long-term wood supply	2.57	1.50	1	5	21	2.84	1.50	1	5	19
7. Development of a multi-resource valuing system for fire management	2.79	1.38	1	5	24	3.32	1.52	1	5	22

Table D. concluded

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
8. Research on the socioeconomic impact of fire management practices	2.21	1.25	1	5	24	2.67	1.55	1	5	24
9. Research on improved fire weather forecasting (especially long range forecasts)	3.80	1.26	1	5	25	4.12	1.09	1	5	25

[a] Based on 27 respondents to Part I. Ratings are on a five-point scale with 5 being high and 1 being low.

Table E. Rating scores[a] of fire-research needs by respondents to questionnaire Part I for region (nonfire group)

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
A. Fire Behavior/Danger Rating										
1. Validation of and/or further research on fire behavior in current Fire Behavior Prediction (FBP) System fuel types	2.83	1.27	1	5	12	3.33	1.07	2	5	12
2. Research on fire behavior in fuel types not currently found in the FBP System (e.g., mixed wood, spruce–balsam)	3.38	1.19	1	5	13	3.77	1.01	2	5	13
3. Production of training packages and/or interpretive guides for the FBP System:										
a) workbooks, posters, etc.	2.70	1.06	1	4	10	2.56	1.01	1	4	9
b) computer-assisted training packages	3.22	1.09	2	5	9	3.50	1.08	2	5	10
4. Research and development of moisture codes that accommodate:										
a) high latitude conditions	2.55	1.63	1	5	11	2.55	1.63	1	5	11
b) different aspects, slopes, and elevations	3.64	1.12	2	5	11	3.64	1.12	2	5	11
c) unique fuel types (cladonia, slash, etc.)	3.50	1.17	1	5	12	3.50	1.17	1	5	12
5. Research on the effect of slope on rate of spread and fire intensity	3.27	1.27	1	5	11	3.27	1.27	1	5	11
6. Validation of and/or further research on the acceleration of wildfires from a point source ignition	3.00	1.41	1	5	12	3.17	1.47	1	5	12
7. Development of comprehensive theories and models that relate fire behavior to specific fuel characteristics (e.g., density, age, fuel loading, etc.)	3.62	1.19	2	5	13	4.15	1.21	2	5	13
8. Research on the fire characteristics of high intensity fires such as:										
a) spotting	2.88	0.64	2	4	8	3.13	0.64	2	4	8
b) convection column dynamics	3.13	0.99	2	5	8	3.25	0.89	2	5	8
9. Research on the relationship of the upper atmospheric conditions to severe fire behavior	3.14	1.21	2	5	7	3.43	1.27	2	5	7

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
B. Fire Ecology and Use										
1. Research on the silvicultural use of fire for site preparation, mixed-wood management, stand tending, etc.	2.77	1.36	1	5	13	3.62	0.96	2	5	13
2. Research on the relationship of wildfires and prescribed fires to wildlife habitat	2.93	1.39	1	5	15	3.67	1.40	1	5	15
3. Research on the ecological role of fire	3.23	1.24	1	5	13	3.85	1.21	2	5	13
4. Research on the use of fire for hazard reduction and fuels management	2.85	1.14	1	4	13	3.31	0.85	2	5	13
5. Development of guidelines and decision aids for planning prescribed burns	3.08	1.38	1	5	13	3.85	0.99	2	5	13
6. Research on the impacts of various types of ignition patterns and techniques	2.08	1.04	1	3	13	2.69	1.25	1	5	13
7. Research on the effects forest fires have on global warming	2.55	1.69	1	5	11	3.00	1.63	1	5	13
8. Research on the potential effect of climate change on future fire management scenarios	2.80	1.48	1	5	10	3.08	1.51	1	5	12
9. Research on smoke management issues such as:										
a) air quality	3.08	1.31	1	5	12	3.42	1.16	1	5	12
b) smoke distribution	3.00	1.41	1	5	11	3.36	1.21	1	5	11
C. Fire Suppression										
1. Research and development on the use of infrared scanners for:										
a) airtanker guidance	3.38	0.74	3	5	8	3.63	0.92	3	5	8
b) detection of holdover fires	3.80	1.03	2	5	10	3.70	0.95	2	5	10
c) near real-time (video) mapping of campaign fires	3.78	0.83	3	5	9	4.11	0.93	3	5	9

Table E. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
2. Evaluation of the effectiveness of various global positioning systems for use in fire management	3.50	0.53	3	4	8	3.75	0.89	3	5	8
3. Development and application of a geographic information system (GIS) seen area mapping system	3.57	1.27	2	5	7	3.75	1.58	1	5	8
4. Development of a low cost video transmission system for disseminating fire intelligence information	3.50	1.31	1	5	8	3.50	1.31	1	5	8
5. Research on the initial attack effectiveness (e.g., production rates, line holding capability, etc.) of crews, helicopters, and airtankers	2.82	1.47	1	5	11	3.00	1.61	1	5	11
6. Research on the sustained action production rates of crews, heavy equipment, and airtankers	3.33	1.22	1	5	9	3.44	1.42	1	5	9
7. Development of guidelines and models that relate fire behavior characteristics (e.g., intensity, rate of spread, etc.) to fire suppression activities	3.70	1.06	2	5	10	3.82	1.33	1	5	11
8. Evaluation of the effectiveness and cost-efficiency of various strategies and tactics used in campaign fire suppression	3.33	1.32	1	5	9	3.67	1.22	2	5	9
9. Development of guidelines and software that will improve the efficiency of large fire suppression activities (e.g., servicing, planning, mop-up, etc.)	3.11	1.05	1	5	9	3.67	1.22	1	5	9
10. Development of guidelines on the use of backburning as a fire suppression tool	3.45	1.37	1	5	11	4.18	0.87	3	5	11

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
11. Research on the effectiveness of fuels management (e.g., thinning, green stripping, etc.) at increasing fire suppression effectiveness in high value areas	2.91	1.30	1	5	11	3.75	1.06	2	5	12
12. Research into the effectiveness of foam:										
a) ground application	3.14	1.35	1	5	7	3.29	1.50	1	5	7
b) aerial application	3.29	1.25	1	5	7	3.43	1.40	1	5	7
c) on structures	2.63	1.41	1	5	8	2.63	1.41	1	5	8
D. Fire Management Systems										
1. Development of the next generation fire management decision-support system (FMDSS) by integrating and enhancing the current fire management systems developed at Petawawa National Forestry Institute and Northern Forestry Centre	3.00	1.20	1	5	8	3.50	0.93	2	5	8
2. Development of the next generation FMDSS that operates on the following workstation platforms:										
a) PC	3.57	1.51	1	5	7	3.00	1.15	1	5	7
b) UNIX	3.14	1.35	1	5	7	3.57	1.13	2	5	7
3. Development of a new spatial and quantitatively based preparedness planning module within the next generation FMDSS	3.00	1.20	1	5	8	3.75	1.16	2	5	8
4. Validation and cost-effectiveness of initial attack preparedness planning system	3.00	1.34	1	5	11	3.36	1.43	1	5	11
5. Development of guidelines and/or software for determining optimum aerial detection routes	2.78	1.20	1	5	9	3.22	1.48	1	5	9
6. Development of a comprehensive forest fire threat assessment module within the next generation FMDSS	3.67	1.15	1	5	12	3.92	1.24	1	5	12

Table E. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
7. Development of a senior executive information module in the next generation FMDSS	2.78	1.39	1	5	9	3.44	1.42	1	5	9
8. Incorporate daily and seasonal economic analysis models for detection, prevention, pre-positioning, and initial attack dispatch into the next generation FMDSS	3.00	1.15	1	5	7	3.43	0.79	3	5	7
9. Development of improved graphic information displays for fire management systems such as the Intelligent Fire Management Information System (IFMIS)	3.38	1.41	1	5	8	3.63	1.06	2	5	8
10. Development of training packages for FMDSS such as IFMIS	3.75	1.28	1	5	8	4.00	0.93	3	5	8
11. Development of guidelines for customizing fuel types used in a FMDSS	3.70	1.25	1	5	10	3.90	0.88	3	5	10
12. Research and development on the use of GIS in various fire management activities	3.75	1.39	1	5	8	4.00	1.22	2	5	9
13. Development of 3-dimensional fire growth models	3.55	1.37	1	5	11	3.82	1.33	1	5	11
14. Development of improved weather interpolation techniques that account for features such as elevation, aspects, lake effects, etc.	3.55	1.29	1	5	11	4.00	0.89	3	5	11
15. Development and application of surface wind models for fire management	3.64	1.36	1	5	11	4.00	1.26	1	5	11
16. Research and development of models for:										
a) human-caused fire occurrence prediction	2.82	1.25	1	5	11	3.36	1.36	1	5	11
b) lightning prediction	2.73	1.49	1	5	11	3.18	1.78	1	5	11
c) lightning fire occurrence prediction	2.82	1.54	1	5	11	3.64	1.50	1	5	11

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
17. Development of a comprehensive computerized prescribed fire effects information system	3.55	1.44	1	5	11	3.75	1.36	1	5	12
18. Research on how fire management principles can be incorporated into forest management planning activities such as harvest cycle planning, regeneration, stand tending, etc.	3.67	1.37	1	5	12	4.00	1.08	2	5	13
19. Development of an automatic vehicle location system for fire management	2.67	1.32	1	5	9	3.67	1.32	1	5	9
E. General										
1. Development and maintenance of a fire weather records archive for the Northwest Region	2.62	1.39	1	5	13	3.23	1.64	1	5	13
2. Development and maintenance of a fire management/research publications library at Northern Forestry Centre for use by client agencies	2.77	1.30	1	5	13	3.15	1.14	1	5	13
3. Research on the use of remote sensing for forest fuels mapping, analysis and monitoring (e.g., fuel moisture/green-up monitoring)	3.00	1.00	1	4	9	3.56	0.88	2	5	9
4. Fire history studies	2.38	1.50	1	5	13	2.62	1.56	1	5	13
5. Development of protection guidelines for the wildland/urban interface	3.15	1.21	1	5	13	3.77	1.17	2	5	13
6. Research and development on the impact that fire has on long-term wood supply	3.50	1.31	1	5	12	3.83	1.11	2	5	12
7. Development of a multi-resource valuing system for fire management	3.54	1.20	1	5	13	4.21	0.89	3	5	14

Table E. concluded

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
8. Research on the socioeconomic impact of fire management practices	2.57	1.28	1	5	14	2.86	1.29	1	5	14
9. Research on improved fire weather forecasting (especially long range forecasts)	3.18	1.54	1	5	11	3.64	1.36	1	5	11

[a] Based on 16 respondents to Part I. Ratings are on a five-point scale with 5 being high and 1 being low.

Table F. Rating scores[a] of fire-research needs by respondents to questionnaire Part I for region (managerial position)

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
A. Fire Behavior/Danger Rating										
1. Validation of and/or further research on fire behavior in current Fire Behavior Prediction (FBP) System fuel types	2.75	1.14	1	4	12	3.42	1.16	2	5	12
2. Research on fire behavior in fuel types not currently found in the FBP System (e.g., mixed wood, spruce–balsam)	3.33	0.98	1	4	12	4.08	1.00	2	5	12
3. Production of training packages and/or interpretive guides for the FBP System:										
a) workbooks, posters, etc.	2.91	0.94	2	5	11	2.60	0.52	2	3	10
b) computer-assisted training packages	3.18	0.98	2	5	11	3.67	1.07	2	5	12
4. Research and development of moisture codes that accommodate:										
a) high latitude conditions	2.18	1.17	1	4	11	2.36	1.43	1	5	11
b) different aspects, slopes, and elevations	3.00	1.10	1	5	11	3.18	1.25	1	5	11
c) unique fuel types (cladonia, slash, etc.)	3.08	1.00	1	4	12	3.25	1.14	1	5	12
5. Research on the effect of slope on rate of spread and fire intensity	2.55	1.04	1	4	11	2.73	1.19	1	4	11
6. Validation of and/or further research on the acceleration of wildfires from a point source ignition	2.67	1.07	1	4	12	3.00	1.28	1	5	12
7. Development of comprehensive theories and models that relate fire behavior to specific fuel characteristics (e.g., density, age, fuel loading, etc.)	3.08	0.90	2	5	12	3.75	1.14	2	5	12
8. Research on the fire characteristics of high intensity fires such as:										
a) spotting	2.75	0.46	2	3	8	3.13	0.64	2	4	8
b) convection column dynamics	2.75	0.46	2	3	8	3.00	0.53	2	4	8
9. Research on the relationship of the upper atmospheric conditions to severe fire behavior	3.56	1.01	2	5	9	3.67	1.00	2	5	9

Table F. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
B. Fire Ecology and Use										
1. Research on the silvicultural use of fire for site preparation, mixed-wood management, stand tending, etc.	2.83	1.59	1	5	12	3.67	1.15	2	5	12
2. Research on the relationship of wildfires and prescribed fires to wildlife habitat	2.58	1.08	1	5	12	3.50	1.31	1	5	12
3. Research on the ecological role of fire	2.92	1.00	1	5	12	3.75	1.06	2	5	12
4. Research on the use of fire for hazard reduction and fuels management	2.92	1.24	1	5	12	3.50	0.90	2	5	12
5. Development of guidelines and decision aids for planning prescribed burns	3.27	1.42	1	5	11	3.91	0.83	3	5	11
6. Research on the impacts of various types of ignition patterns and techniques	2.75	1.22	1	5	12	3.17	1.11	1	5	12
7. Research on the effects forest fires have on global warming	2.22	1.20	1	4	9	2.55	1.51	1	5	11
8. Research on the potential effect of climate change on future fire management scenarios	2.22	1.20	1	4	9	2.45	1.44	1	5	11
9. Research on smoke management issues such as:										
a) air quality	2.80	1.03	1	5	10	3.10	1.20	1	5	10
b) smoke distribution	2.70	1.06	1	5	10	3.00	1.15	1	5	10
C. Fire Suppression										
1. Research and development on the use of infrared scanners for:										
a) airtanker guidance	3.63	0.92	3	5	8	3.75	0.89	3	5	8
b) detection of holdover fires	3.90	0.99	2	5	10	3.90	0.99	2	5	10
c) near real-time (video) mapping of campaign fires	4.00	0.87	3	5	9	4.33	0.87	3	5	9

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
2. Evaluation of the effectiveness of various global positioning systems for use in fire management	3.67	0.71	3	5	9	3.89	0.93	3	5	9
3. Development and application of a geographic information system (GIS) seen area mapping system	3.43	0.98	2	4		3.75	1.49	1	5	8
4. Development of a low cost video transmission system for disseminating fire intelligence information	3.56	1.33	1	5	9	3.67	1.41	1	5	9
5. Research on the initial attack effectiveness (e.g., production rates, line holding capability, etc.) of crews, helicopters, and airtankers	2.67	1.37	1	5	12	2.92	1.51	1	5	12
6. Research on the sustained action production rates of crews, heavy equipment, and airtankers	3.00	1.33	1	5	10	3.20	1.40	1	5	10
7. Development of guidelines and models that relate fire behavior characteristics (e.g., intensity, rate of spread, etc.) to fire suppression activities	3.60	1.07	2	5	10	3.55	1.21	1	5	11
8. Evaluation of the effectiveness and cost-efficiency of various strategies and tactics used in campaign fire suppression	3.10	1.10	1	5	10	3.80	1.03	2	5	10
9. Development of guidelines and software that will improve the efficiency of large fire suppression activities (e.g., servicing, planning, mop-up, etc.)	3.00	1.00	1	4	9	3.44	1.13	1	5	9
10. Development of guidelines on the use of backburning as a fire suppression tool	3.64	1.29	1	5	11	4.18	0.87	3	5	11

Table F. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
11. Research on the effectiveness of fuels management (e.g., thinning, green stripping, etc.) at increasing fire suppression effectiveness in high value areas	2.82	1.17	1	4	11	3.92	1.00	2	5	12
12. Research into the effectiveness of foam:										
a) ground application	3.63	1.30	2	5	8	3.88	1.25	2	5	8
b) aerial application	3.75	1.16	2	5	8	4.00	1.07	3	5	8
c) on structures	2.89	1.36	1	5	9	3.00	1.32	1	5	9
D. Fire Management Systems										
1. Development of the next generation fire management decision-support system (FMDSS) by integrating and enhancing the current fire management systems developed at Petawawa National Forestry Institute and Northern Forestry Centre	3.00	1.50	1	5	9	3.89	1.05	2	5	9
2. Development of the next generation FMDSS that operates on the following workstation platforms:										
a) PC	2.75	1.16	1	5	8	3.25	1.16	1	5	8
b) UNIX	2.50	0.93	1	4	8	3.25	0.89	2	5	8
3. Development of a new spatial and quantitatively based preparedness planning module within the next generation FMDSS	2.67	0.87	1	4	9	3.44	1.01	2	5	9
4. Validation and cost-effectiveness of initial attack preparedness planning system	3.27	1.19	1	5	11	3.55	1.21	1	5	11
5. Development of guidelines and/or software for determining optimum aerial detection routes	2.67	1.41	1	5	9	3.00	1.41	1	5	9
6. Development of a comprehensive forest fire threat assessment module within the next generation FMDSS	3.18	1.08	1	5	11	3.45	1.04	1	5	11

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
7. Development of a senior executive information module in the next generation FMDSS	2.33	1.12	1	5	9	2.67	1.22	1	5	9
8. Incorporate daily and seasonal economic analysis models for detection, prevention, pre-positioning, and initial attack dispatch into the next generation FMDSS	2.75	1.16	1	5	8	3.50	1.07	2	5	8
9. Development of improved graphic information displays for fire management systems such as the Intelligent Fire Management Information System (IFMIS)	3.11	1.05	1	4	9	3.56	0.88	2	5	9
10. Development of training packages for FMDSS such as IFMIS	3.56	1.13	1	5	9	3.67	0.87	3	5	9
11. Development of guidelines for customizing fuel types used in a FMDSS	3.30	1.06	1	5	10	3.60	0.84	3	5	10
12. Research and development on the use of GIS in various fire management activities	3.78	1.30	1	5	9	3.80	1.03	2	5	10
13. Development of 3-dimensional fire growth models	2.82	0.98	1	5	11	3.27	1.19	1	5	11
14. Development of improved weather interpolation techniques that account for features such as elevation, aspects, lake effects, etc.	3.45	1.04	1	5	11	3.82	0.87	3	5	11
15. Development and application of surface wind models for fire management	3.45	1.21	1	5	11	3.91	1.22	1	5	11
16. Research and development of models for:										
a) human-caused fire occurrence prediction	2.83	1.03	1	5	12	3.42	1.31	1	5	12
b) lightning prediction	2.83	1.40	1	5	12	3.25	1.71	1	5	12
c) lightning fire occurrence prediction	2.92	1.38	1	5	12	3.67	1.37	1	5	12

Table F. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
17. Development of a comprehensive computerized prescribed fire effects information system	3.18	1.47	1	5	11	3.25	1.36	1	5	12
18. Research on how fire management principles can be incorporated into forest management planning activities such as harvest cycle planning, regeneration, stand tending, etc.	3.27	1.27	1	5	11	3.67	1.07	2	5	12
19. Development of an automatic vehicle location system for fire management	2.67	1.12	1	5	9	3.67	1.12	2	5	9
E. General										
1. Development and maintenance of a fire weather records archive for the Northwest Region	2.58	1.24	1	5	12	3.25	1.60	1	5	12
2. Development and maintenance of a fire management/research publications library at Northern Forestry Centre for use by client agencies	2.67	1.15	1	4	12	3.17	1.11	2	5	12
3. Research on the use of remote sensing for forest fuels mapping, analysis and monitoring (e.g., fuel moisture/green-up monitoring)	3.00	0.94	1	4	10	3.60	0.97	2	5	10
4. Fire history studies	2.67	1.44	1	5	12	3.08	1.56	1	5	12
5. Development of protection guidelines for the wildland/urban interface	2.92	1.08	1	5	12	3.58	1.08	2	5	12
6. Research and development on the impact that fire has on long-term wood supply	3.20	1.32	1	5	10	3.60	1.17	2	5	10
7. Development of a multi-resource valuing system for fire management	3.55	1.29	1	5	11	4.25	0.87	3	5	12

Table F.   concluded

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
8. Research on the socioeconomic impact of fire management practices	2.25	0.97	1	4	12	2.75	1.29	1	5	12
9. Research on improved fire weather fore-casting (especially long range forecasts)	3.80	1.32	1	5	10	4.30	0.95	3	5	10

[a] Based on 12 respondents to Part I. Ratings are on a five-point scale with 5 being high and 1 being low.

Table G. Rating scores[a] of fire-research needs by respondents to questionnaire Part I for region (operational position)

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
A. Fire Behavior/Danger Rating										
1. Validation of and/or further research on fire behavior in current Fire Behavior Prediction (FBP) System fuel types	2.92	1.35	1	5	25	3.24	1.09	1	5	25
2. Research on fire behavior in fuel types not currently found in the FBP System (e.g., mixed wood, spruce–balsam)	3.16	1.46	1	5	25	3.65	1.41	1	5	26
3. Production of training packages and/or interpretive guides for the FBP System:										
a) workbooks, posters, etc.	3.17	1.34	1	5	23	3.96	1.19	1	5	23
b) computer-assisted training packages	3.43	1.16	1	5	23	3.30	1.18	1	5	23
4. Research and development of moisture codes that accommodate:										
a) high latitude conditions	2.80	1.36	1	5	20	3.10	1.29	1	5	20
b) different aspects, slopes, and elevations	3.22	1.20	1	5	23	3.50	1.25	1	5	24
c) unique fuel types (cladonia, slash, etc.)	3.17	1.27	1	5	24	3.24	1.36	1	5	25
5. Research on the effect of slope on rate of spread and fire intensity	3.50	1.25	1	5	24	3.72	1.21	1	5	25
6. Validation of and/or further research on the acceleration of wildfires from a point source ignition	3.08	1.29	1	5	25	3.16	1.31	1	5	25
7. Development of comprehensive theories and models that relate fire behavior to specific fuel characteristics (e.g., density, age, fuel loading, etc.)	3.27	1.25	1	5	26	3.54	1.30	1	5	26
8. Research on the fire characteristics of high intensity fires such as:										
a) spotting	2.92	1.21	1	5	24	3.00	1.06	1	5	24
b) convection column dynamics	2.88	1.08	1	5	24	3.08	1.06	1	5	24
9. Research on the relationship of the upper atmospheric conditions to severe fire behavior	3.48	1.08	1	5	23	3.26	1.14	1	5	23

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
B. Fire Ecology and Use										
1. Research on the silvicultural use of fire for site preparation, mixed-wood management, stand tending, etc.	2.96	1.46	1	5	24	3.33	1.46	1	5	24
2. Research on the relationship of wildfires and prescribed fires to wildlife habitat	3.66	1.32	1	5	29	4.11	1.23	1	5	28
3. Research on the ecological role of fire	3.82	1.33	1	5	28	4.14	1.18	1	5	28
4. Research on the use of fire for hazard reduction and fuels management	3.58	1.10	2	5	26	3.67	1.14	1	5	27
5. Development of guidelines and decision aids for planning prescribed burns	3.82	0.94	2	5	28	3.74	1.10	2	5	27
6. Research on the impacts of various types of ignition patterns and techniques	3.31	1.16	1	5	26	3.22	1.19	1	5	27
7. Research on the effects forest fires have on global warming	2.14	1.24	1	5	28	3.04	1.40	1	5	28
8. Research on the potential effect of climate change on future fire management scenarios	2.67	1.27	1	5	27	3.46	1.21	1	5	26
9. Research on smoke management issues such as:										
a) air quality	3.00	1.18	1	5	27	3.62	1.20	1	5	26
b) smoke distribution	2.96	1.24	1	5	25	3.50	1.17	1	5	26
C. Fire Suppression										
1. Research and development on the use of infrared scanners for:										
a) airtanker guidance	2.30	1.52	1	5	23	2.35	1.50	1	5	23
b) detection of holdover fires	3.36	1.32	1	5	25	3.44	1.04	1	5	25
c) near real-time (video) mapping of campaign fires	2.71	1.37	1	5	24	2.88	1.33	1	5	24

Table G. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
2. Evaluation of the effectiveness of various global positioning systems for use in fire management .	3.56	1.12	2	5	25	3.58	1.18	2	5	24
3. Development and application of a geographic information system (GIS) seen area mapping system	3.68	1.04	2	5	22	4.05	1.00	2	5	24
4. Development of a low cost video transmission system for disseminating fire intelligence information	2.43	1.08	1	4	21	3.00	1.22	1	5	21
5. Research on the initial attack effectiveness (e.g., production rates, line holding capability, etc.) of crews, helicopters, and airtankers	2.67	1.27	1	5	24	2.79	1.32	1	5	24
6. Research on the sustained action production rates of crews, heavy equipment, and airtankers	2.35	1.15	1	4	23	2.57	1.38	1	5	23
7. Development of guidelines and models that relate fire behavior characteristics (e.g., intensity, rate of spread, etc.) to fire suppression activities	2.92	1.21	1	5	24	3.08	1.29	1	5	25
8. Evaluation of the effectiveness and cost-efficiency of various strategies and tactics used in campaign fire suppression	2.82	1.10	1	5	22	2.77	1.34	1	5	22
9. Development of guidelines and software that will improve the efficiency of large fire suppression activities (e.g., servicing, planning, mop-up, etc.)	2.26	1.14	1	5	23	2.59	1.26	1	5	22
10. Development of guidelines on the use of backburning as a fire suppression tool	3.29	1.12	1	5	24	3.50	1.06	1	5	24

Table G. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
11. Research on the effectiveness of fuels management (e.g., thinning, green stripping, etc.) at increasing fire suppression effectiveness in high value areas	3.08	1.29	1	5	25	3.60	1.29	1	5	25
12. Research into the effectiveness of foam:										
a) ground application	3.22	1.09	1	5	23	2.91	1.12	1	4	23
b) aerial application	3.00	1.15	1	5	22	2.68	1.13	1	4	22
c) on structures	2.63	1.30	1	5	19	2.58	1.39	1	5	19
D. Fire Management Systems										
1. Development of the next generation fire management decision-support system (FMDSS) by integrating and enhancing the current fire management systems developed at Petawawa National Forestry Institute and Northern Forestry Centre	3.00	1.17	1	5	20	3.60	1.14	1	5	20
2. Development of the next generation FMDSS that operates on the following workstation platforms:										
a) PC	3.00	1.26	1	5	16	2.94	1.18	1	4	16
b) UNIX	2.38	1.51	1	5	8	3.00	1.69	1	5	8
3. Development of a new spatial and quantitatively based preparedness planning module within the next generation FMDSS	2.35	1.22	1	4	17	2.94	1.34	1	5	17
4. Validation and cost-effectiveness of initial attack preparedness planning system	2.95	1.33	1	5	22	2.67	1.20	1	4	21
5. Development of guidelines and/or software for determining optimum aerial detection routes	1.76	1.00	1	4	21	1.90	1.17	1	5	20
6. Development of a comprehensive forest fire threat assessment module within the next generation FMDSS	2.21	1.40	1	5	19	2.78	1.70	1	5	18

Table G. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
7. Development of a senior executive information module in the next generation FMDSS	1.57	0.76	1	3	14	2.08	1.26	1	5	13
8. Incorporate daily and seasonal economic analysis models for detection, prevention, pre-positioning, and initial attack dispatch into the next generation FMDSS	1.93	1.03	1	4	15	2.21	0.97	1	4	14
9. Development of improved graphic information displays for fire management systems such as the Intelligent Fire Management Information System (IFMIS)	2.68	1.25	1	5	19	3.24	1.20	1	5	17
10. Development of training packages for FMDSS such as IFMIS	2.70	1.56	1	5	20	3.06	1.09	1	5	17
11. Development of guidelines for customizing fuel types used in a FMDSS	2.30	1.34	1	5	20	2.68	1.29	1	5	19
12. Research and development on the use of GIS in various fire management activities	3.21	0.98	1	5	24	3.68	1.09	1	5	22
13. Development of 3-dimensional fire growth models	2.83	1.56	1	5	23	3.32	1.55	1	5	22
14. Development of improved weather interpolation techniques that account for features such as elevation, aspects, lake effects, etc.	2.79	1.32	1	5	24	3.26	1.14	1	5	23
15. Development and application of surface wind models for fire management	2.68	1.44	1	5	25	3.08	1.38	1	5	24
16. Research and development of models for:										
a) human-caused fire occurrence prediction	2.14	1.24	1	5	21	2.50	1.40	1	5	20
b) lightning prediction	3.05	1.21	1	5	22	3.52	1.03	1	5	21
c) lightning fire occurrence prediction	3.41	1.30	1	5	22	3.95	1.05	1	5	20

Table G. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
17. Development of a comprehensive computerized prescribed fire effects information system	3.09	1.41	1	5	22	3.57	1.33	1	5	21
18. Research on how fire management principles can be incorporated into forest management planning activities such as harvest cycle planning, regeneration, stand tending, etc.	2.42	1.35	1	5	24	2.83	1.61	1	5	23
19. Development of an automatic vehicle location system for fire management	1.62	1.16	1	5	21	2.00	1.46	1	5	18
E. General										
1. Development and maintenance of a fire weather records archive for the Northwest Region	2.64	1.36	1	5	22	2.76	1.34	1	5	21
2. Development and maintenance of a fire management/research publications library at Northern Forestry Centre for use by client agencies	3.09	1.19	1	5	22	3.43	1.12	1	5	21
3. Research on the use of remote sensing for forest fuels mapping, analysis and monitoring (e.g., fuel moisture/green-up monitoring)	3.33	0.92	2	5	24	3.71	1.12	1	5	24
4. Fire history studies	2.70	1.30	1	5	27	2.70	1.32	1	5	27
5. Development of protection guidelines for the wildland/urban interface	3.38	1.42	1	5	26	3.58	1.36	1	5	26
6. Research and development on the impact that fire has on long-term wood supply	2.73	1.58	1	5	22	3.00	1.56	1	5	20
7. Development of a multi-resource valuing system for fire management	2.76	1.30	1	5	25	3.30	1.49	1	5	23

Table G. concluded

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
8. Research on the socioeconomic impact of fire management practices	2.28	1.31	1	5	25	2.64	1.50	1	5	25
9. Research on improved fire weather forecasting (especially long range forecasts)	3.60	1.38	1	5	25	3.92	1.22	1	5	25

[a] Based on 30 respondents to Part I. Ratings are on a five-point scale with 5 being high and 1 being low.

Table H. Rating scores[a] of fire research needs by respondents to questionnaire Part I for Alberta

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
A. Fire Behavior/Danger Rating										
1. Validation of and/or further research on fire behavior in current Fire Behavior Prediction (FBP) System fuel types	3.32	1.29	1	5	19	3.63	1.07	2	5	19
2. Research on fire behavior in fuel types not currently found in the FBP System (e.g., mixed wood, spruce–balsam)	3.55	1.10	1	5	20	4.10	1.02	2	5	20
3. Production of training packages and/or interpretive guides for the FBP System:										
a) workbooks, posters, etc.	3.00	1.41	1	5	17	2.69	1.20	1	5	16
b) computer-assisted training packages	3.13	1.13	1	5	15	3.62	1.26	1	5	16
4. Research and development of moisture codes that accommodate:										
a) high latitude conditions	2.75	1.53	1	5	16	3.00	1.63	1	5	16
b) different aspects, slopes and elevations	3.53	1.07	2	5	17	3.67	1.08	2	5	18
c) unique fuel types (cladonia, slash, etc.)	3.39	1.09	1	5	18	3.53	1.22	1	5	19
5. Research on the effect of slope on rate of spread and fire intensity	3.32	1.11	1	5	19	3.47	1.17	1	5	19
6. Validation of and/or further research on the acceleration of wildfires from a point source ignition	3.00	1.37	1	5	19	3.21	1.44	1	5	19
7. Development of comprehensive theories and models that relate fire behavior to specific fuel characteristics (e.g., density, age, fuel loading, etc.)	3.40	1.14	2	5	20	3.95	1.19	2	5	20
8. Research on the fire characteristics of high intensity fires such as:										
a) spotting	2.93	0.88	2	5	15	3.20	0.77	2	5	15
b) convection column dynamics	2.87	1.06	1	5	15	3.07	0.96	1	5	15
9. Research on the relationship of the upper atmospheric conditions to severe fire behavior	3.31	1.38	1	5	13	3.08	1.32	1	5	13

Tahle H. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
B. Fire Ecology and Use										
1. Research on the silvicultural use of fire for site preparation, mixed-wood management, stand tending, etc.	3.32	1.49	1	5	19	4.00	0.94	2	5	19
2. Research on the relationship of wildfires and prescribed fires to wildlife habitat	2.95	1.39	1	5	20	3.70	1.34	1	5	20
3. Research on the ecological role of fire	2.83	1.25	1	5	18	3.61	1.33	1	5	18
4. Research on the use of fire for hazard reduction and fuels management	2.79	1.18	1	5	19	3.05	1.03	1	5	19
5. Development of guidelines and decision aids for planning prescribed burns	3.63	1.30	1	5	19	3.95	0.91	2	5	19
6. Research on the impacts of various types of ignition patterns and techniques	2.95	1.39	1	5	19	3.16	1.34	1	5	19
7. Research on the effects forest fires have on global warming	2.18	1.42	1	5	17	2.74	1.45	1	5	19
8. Research on the potential effect of climate change on future fire management scenarios	2.44	1.21	1	5	16	2.89	1.32	1	5	18
9. Research on smoke management issues such as:										
a) air quality	3.17	1.20	1	5	18	3.67	1.14	1	5	18
b) smoke distribution	3.12	1.22	1	5	17	3.65	1.11	1	5	17
C. Fire Suppression										
1. Research and development on the use of infrared scanners for:										
a) airtanker guidance	3.87	0.92	3	5	15	3.87	0.92	3	5	15
b) detection of holdover fires	4.06	0.97	2	5	17	3.94	0.90	2	5	17
c) near real-time (video) mapping of campaign fires	3.56	1.15	1	5	16	3.69	1.20	1	5	16

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
2. Evaluation of the effectiveness of various global positioning systems for use in fire management	3.80	0.68	3	5	15	3.67	0.98	2	5	15
3. Development and application of a geographic information system (GIS) seen area mapping system	3.64	1.15	2	5	14	3.80	1.32	1	5	15
4. Development of a low cost video transmission system for disseminating fire intelligence information	3.27	1.22	1	5	15	3.40	1.35	1	5	15
5. Research on the initial attack effectiveness (e.g., production rates, line holding capability, etc.) of crews, helicopters, and airtankers	2.78	1.44	1	5	18	2.89	1.53	1	5	18
6. Research on the sustained action production rates of crews, heavy equipment, and airtankers	2.81	1.38	1	5	16	2.94	1.48	1	5	16
7. Development of guidelines and models that relate fire behavior characteristics (e.g., intensity, rate of spread, etc.) to fire suppression activities	3.47	1.18	1	5	17	3.67	1.28	1	5	18
8. Evaluation of the effectiveness and cost-efficiency of various strategies and tactics used in campaign fire suppression	3.13	1.26	1	5	16	3.56	1.31	1	5	16
9. Development of guidelines and software that will improve the efficiency of large fire suppression activities (e.g., servicing, planning, mop-up, etc.)	2.75	1.29	1	5	16	3.27	1.22	1	5	15
10. Development of guidelines on the use of backburning as a fire suppression tool	3.67	1.19	1	5	18	3.94	0.80	3	5	18

Table H. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
11. Research on the effectiveness of fuels management (e.g., thinning, green stripping, etc.) at increasing fire suppression effectiveness in high value areas	2.83	1.15	1	5	18	3.84	0.96	2	5	19
12. Research into the effectiveness of foam:										
a) ground application	3.62	1.33	1	5	13	3.15	1.34	1	5	13
b) aerial application	3.69	1.25	1	5	13	3.23	1.30	1	5	13
c) on structures	2.64	1.45	1	5	14	2.64	1.34	1	5	14
D. Fire Management Systems										
1. Development of the next generation fire management decision-support system (FMDSS) by integrating and enhancing the current fire management systems developed at Petawawa National Forestry Institute and Northern Forestry Centre	2.86	1.23	1	5	14	3.71	1.07	2	5	14
2. Development of the next generation FMDSS that operates on the following workstation platforms:										
a) PC	3.00	1.35	1	5	12	3.25	1.14	1	5	12
b) UNIX	2.50	1.31	1	5	12	3.25	1.42	1	5	12
3. Development of a new spatial and quantitatively based preparedness planning module within the next generation FMDSS	2.62	1.26	1	5	13	3.38	1.26	1	5	13
4. Validation and cost-effectiveness of initial attack preparedness planning system	3.47	1.28	1	5	17	3.24	1.30	1	5	17
5. Development of guidelines and/or software for determining optimum aerial detection routes	2.07	1.14	1	5	14	2.43	1.34	1	5	14
6. Development of a comprehensive forest fire threat assessment module within the next generation FMDSS	3.07	1.44	1	5	15	3.47	1.41	1	5	15

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
7. Development of a senior executive information module in the next generation FMDSS	2.43	1.22	1	5	14	3.00	1.36	1	5	14
8. Incorporate daily and seasonal economic analysis models for detection, prevention, pre-positioning, and initial attack dispatch into the next generation FMDSS	2.45	1.21	1	5	11	3.09	1.14	1	5	11
9. Development of improved graphic information displays for fire management systems such as the Intelligent Fire Management Information System (IFMIS)	3.20	1.26	1	5	15	3.60	1.18	2	5	15
10. Development of training packages for FMDSS such as IFMIS	3.92	1.44	1	5	13	3.38	1.19	1	5	13
11. Development of guidelines for customizing fuel types used in a FMDSS	3.47	1.36	1	5	15	3.67	1.18	1	5	15
12. Research and development on the use of GIS in various fire management activities	3.71	1.07	1	5	14	3.87	1.06	2	5	15
13. Development of 3-dimensional fire growth models	3.35	1.46	1	5	17	3.76	1.44	1	5	17
14. Development of improved weather interpolation techniques that account for features such as elevation, aspects, lake effects, etc.	3.59	1.18	1	5	17	3.94	0.83	3	5	17
15. Development and application of surface wind models for fire management	3.50	1.38	1	5	18	3.89	1.18	1	5	18
16. Research and development of models for:										
a) human-caused fire occurrence prediction	2.94	1.25	1	5	17	3.53	1.42	1	5	17
b) lightning prediction	3.06	1.35	1	5	18	3.44	1.54	1	5	18
c) lightning fire occurrence prediction	3.22	1.44	1	5	18	3.89	1.28	1	5	18

Table H.   continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
17. Development of a comprehensive computerized prescribed fire effects information system	3.75	1.29	1	5	16	3.88	1.22	1	5	17
18. Research on how fire management principles can be incorporated into forest management planning activities such as harvest cycle planning, regeneration, stand tending, etc.	3.16	1.34	1	5	19	3.70	1.26	1	5	20
19. Development of an automatic vehicle location system for fire management	2.25	1.44	1	5	16	3.06	1.53	1	5	16
E. General										
1. Development and maintenance of a fire weather records archive for the Northwest Region	2.85	1.39	1	5	20	3.25	1.55	1	5	20
2. Development and maintenance of a fire management/research publications library at Northern Forestry Centre for use by client agencies	3.20	1.28	1	5	20	3.50	1.15	1	5	20
3. Research on the use of remote sensing for forest fuels mapping, analysis and monitoring (e.g., fuel moisture/green-up monitoring)	3.12	1.02	1	5	16	3.81	0.98	2	5	16
4. Fire history studies	2.21	1.40	1	5	19	2.47	1.54	1	5	19
5. Development of protection guidelines for the wildland/urban interface	3.16	1.26	1	5	19	3.79	1.23	1	5	19
6. Research and development on the impact that fire has on long-term wood supply	3.35	1.22	1	5	17	3.71	1.05	2	5	17
7. Development of a multi-resource valuing system for fire management	3.33	1.19	1	5	18	4.11	0.88	3	5	19

Table H. concluded

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
8. Research on the socioeconomic impact of fire management practices	2.53	1.17	1	5	19	3.00	1.37	1	5	19
9. Research on improved fire weather forecasting (especially long range forecasts)	3.72	1.41	1	5	18	4.06	1.21	1	5	18

[a] Based on 21 respondents to Part I. Ratings are on a five-point scale with 5 being high and 1 being low.

Table H-1.   Summary of rating scores for the top 10 fire research/technology transfer activities for Alberta

	Activity	Present importance rating score[a]		Activity	Future importance rating score[a]
C1b	Research and development on the use of infrared scanners for: detection of holdover fires	4.06	E7	Development of a multi-resource valuing system for fire management	4.11
D10	Development of training packages for fire management decision-support systems such as the Intelligent Fire Management Information System	3.92	A2	Research on fire behavior in fuel types not currently found in the Fire Behavior Prediction System (e.g., mixed wood, spruce–balsam)	4.10
C1a	Research and development on the use of infrared scanners for: airtanker guidance	3.87	E9	Research on improved fire weather forecasting (especially long range forecasts)	4.06
C2	Evaluation of the effectiveness of various global positioning systems for use in fire management	3.80	B1	Research on the silvicultural use of fire for site preparation, mixed-wood management, stand tending, etc.	4.00
D17	Development of a comprehensive computerized prescribed fire effects information system	3.75	B5	Development of guidelines and decision aids for planning prescribed burns	3.95
E9	Research on improved fire weather forecasting (especially long range forecasts)	3.72	A7	Development of comprehensive theories and models that relate fire behavior to specific fuel characteristics (e.g., density, age, fuel loading, etc.)	3.95
D12	Research and development on the use of geographic information systems in various fire management activities	3.71	C1c	Research and development on the use of infrared scanners for: near real-time (video) mapping of campaign fires	3.94
C12b	Research into the effectiveness of foam: aerial application	3.69	D14	Development of improved weather interpolation techniques that account for features such as elevation, aspects, lake effects, etc.	3.94
C10	Development of guidelines on the use of backburning as a fire suppression tool	3.67	C1b	Research and development on the use of infrared scanners for: detection of holdover fires	3.94
C3	Development and application of a geographic information system seen area mapping system	3.64	D15	Development and application of surface wind models for fire management	3.89

[a] Ratings are on a five-point scale with 5 being high and 1 being low. Ratings are from Table H.

Table I. Rating scores[a] of fire-research needs by respondents to questionnaire Part I for Manitoba

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
A. Fire Behavior/Danger Rating										
1. Validation of and/or further research on fire behavior in current Fire Behavior Prediction (FBP) System fuel types	3.33	0.58	3	4	3	3.67	1.15	3	5	3
2. Research on fire behavior in fuel types not currently found in the FBP System (e.g., mixed wood, spruce–balsam)	3.67	0.58	3	4	3	4.33	0.58	4	5	3
3. Production of training packages and/or interpretive guides for the FBP System:										
a) workbooks, posters, etc.	3.00	0.00	3	3	3	3.00	0.00	3	3	3
b) computer-assisted training packages	4.33	0.58	4	5	3	4.33	0.58	4	5	3
4. Research and development of moisture codes that accommodate:										
a) high latitude conditions	2.00	1.41	1	3	2	2.00	1.41	1	3	2
b) different aspects, slopes, and elevations	2.00	1.41	1	3	2	2.00	1.41	1	3	2
c) unique fuel types (cladonia, slash, etc.)	3.33	1.15	2	4	3	3.33	1.15	2	4	3
5. Research on the effect of slope on rate of spread and fire intensity	1.50	0.71	1	2	2	1.50	0.71	1	2	2
6. Validation of and/or further research on the acceleration of wildfires from a point source ignition	3.00	1.00	2	4	3	3.00	1.00	2	4	3
7. Development of comprehensive theories and models that relate fire behavior to specific fuel characteristics (e.g., density, age, fuel loading, etc.)	2.67	0.58	2	3	3	3.33	1.53	2	5	3
8. Research on the fire characteristics of high intensity fires such as:										
a) spotting	3.00	0.00	3	3	2	3.50	0.71	3	4	2
b) convection column dynamics	3.00	0.00	3	3	2	3.00	0.00	3	3	2
9. Research on the relationship of the upper atmospheric conditions to severe fire behavior	4.00	0.00	4	4	3	4.33	0.58	4	5	3

Table I. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
B. Fire Ecology and Use										
1. Research on the silvicultural use of fire for site preparation, mixed-wood management, stand tending, etc.	3.00	1.73	2	5	3	3.33	1.53	2	5	3
2. Research on the relationship of wildfires and prescribed fires to wildlife habitat	3.00	0.82	2	4	4	3.25	0.96	2	4	4
3. Research on the ecological role of fire	3.75	0.96	3	5	4	3.75	0.96	3	5	4
4. Research on the use of fire for hazard reduction and fuels management	4.33	0.58	4	5	3	4.33	0.58	4	5	3
5. Development of guidelines and decision aids for planning prescribed burns	3.33	0.58	3	4	3	3.33	0.58	3	4	3
6. Research on the impacts of various types of ignition patterns and techniques	3.00	0.00	3	3	3	3.00	0.00	3	3	3
7. Research on the effects forest fires have on global warming	2.00	1.41	1	4	4	2.75	1.50	1	4	4
8. Research on the potential effect of climate change on future fire management scenarios	2.00	1.41	1	4	4	2.75	1.50	1	4	4
9. Research on smoke management issues such as:	2.25	0.96	1	3	4	3.00	0.82	2	4	4
a) air quality	2.00	0.82	1	3	4	2.75	0.50	2	3	4
b) smoke distribution										
C. Fire Suppression										
1. Research and development on the use of infrared scanners for:										
a) airtanker guidance	3.00	0.00	3	3	2	3.50	0.71	3	4	2
b) detection of holdover fires	4.00	0.00	4	4	3	4.00	0.00	4	4	3
c) near real-time (video) mapping of campaign fires	4.00	0.00	4	4	2	4.50	0.71	4	5	2

Table I. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
2. Evaluation of the effectiveness of various global positioning systems for use in fire management	4.00	1.00	3	5	3	4.33	1.15	3	5	3
3. Development and application of a geographic information system (GIS) seen area mapping system	4.00	0.00	4	4	2	4.50	0.71	4	5	2
4. Development of a low cost video transmission system for disseminating fire intelligence information	4.33	0.58	4	5	3	4.33	0.58	4	5	3
5. Research on the initial attack effectiveness (e.g., production rates, line holding capability, etc.) of crews, helicopters, and airtankers	3.00	1.00	2	4	3	3.33	1.53	2	5	3
6. Research on the sustained action production rates of crews, heavy equipment, and airtankers	2.67	1.15	2	4	3	3.00	1.73	2	5	3
7. Development of guidelines and models that relate fire behavior characteristics (e.g., intensity, rate of spread, etc.) to fire suppression activities	3.67	1.15	3	5	3	3.67	1.15	3	5	3
8. Evaluation of the effectiveness and cost-efficiency of various strategies and tactics used in campaign fire suppression	3.33	0.58	3	4	3	4.00	1.00	3	5	3
9. Development of guidelines and software that will improve the efficiency of large fire suppression activities (e.g., servicing, planning, mop-up, etc.)	3.67	0.58	3	4	3	4.33	0.58	4	5	3
10. Development of guidelines on the use of backburning as a fire suppression tool	4.00	1.00	3	5	3	4.33	1.15	3	5	3

Table I. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
11. Research on the effectiveness of fuels management (e.g., thinning, green stripping, etc.) at increasing fire suppression effectiveness in high value areas	4.00	0.00	4	4	3	4.67	0.58	4	5	3
12. Research into the effectiveness of foam:										
a) ground application	3.33	1.53	2	5	3	4.33	1.15	3	5	3
b) aerial application	3.33	1.53	2	5	3	4.33	1.15	3	5	3
c) on structures	3.00	1.73	2	5	3	3.33	1.53	2	5	3
D. Fire Management Systems										
1. Development of the next generation fire management decision-support system (FMDSS) by integrating and enhancing the current fire management systems developed at Petawawa National Forestry Institute and Northern Forestry Centre	4.00	1.00	3	5	3	4.33	0.58	4	5	3
2. Development of the next generation FMDSS that operates on the following workstation platforms:										
a) PC	3.00	0.00	3	3	2	3.50	0.71	3	4	2
b) UNIX	3.00	0.00	3	3	2	3.50	0.71	3	4	2
3. Development of a new spatial and quantitatively based preparedness planning module within the next generation FMDSS	3.33	0.58	3	4	3	4.00	1.00	3	5	3
4. Validation and cost-effectiveness of initial attack preparedness planning system	3.00	0.00	3	3	3	4.00	1.00	3	5	3
5. Development of guidelines and/or software for determining optimum aerial detection routes	4.33	0.58	4	5	3	4.67	0.58	4	5	3
6. Development of a comprehensive forest fire threat assessment module within the next generation FMDSS	3.75	0.50	3	4	4	4.00	0.00	4	4	4

Table I.   continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
7. Development of a senior executive information module in the next generation FMDSS	2.00	0.00	2	2	2	2.00	0.00	2	2	2
8. Incorporate daily and seasonal economic analysis models for detection, prevention, pre-positioning, and initial attack dispatch into the next generation FMDSS	3.33	1.53	2	5	3	3.67	1.53	2	5	3
9. Development of improved graphic information displays for fire management systems such as the Intelligent Fire Management Informaiton System (IFMIS)	4.00	0.00	4	4	3	4.00	0.00	4	4	3
10. Development of training packages for FMDSS such as IFMIS	3.67	0.58	3	4	3	4.00	1.00	3	5	3
11. Development of guidelines for customizing fuel types used in a FMDSS	3.00	0.00	3	3	3	3.00	0.00	3	3	3
12. Research and development on the use of GIS in various fire management activities	4.33	0.58	4	5	3	4.33	0.58	4	5	3
13. Development of 3-dimensional fire growth models	2.67	0.58	2	3	3	3.00	1.00	2	4	3
14. Development of improved weather interpolation techniques that account for features such as elevation, aspects, lake effects, etc.	3.33	0.58	3	4	3	3.67	1.15	3	5	3
15. Development and application of surface wind models for fire management	3.33	0.58	3	4	3	4.00	1.00	3	5	3
16. Research and development of models for:										
a) human-caused fire occurrence prediction	3.33	0.58	3	4	3	3.33	0.58	3	4	3
b) lightning prediction	4.00	0.00	4	4	3	4.33	0.58	4	5	3
c) lightning fire occurrence prediction	4.00	0.00	4	4	3	4.33	0.58	4	5	3

Table I. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
17. Development of a comprehensive computerized prescribed fire effects information system	2.00	0.00	2	2	3	2.33	0.58	2	3	3
18. Research on how fire management principles can be incorporated into forest management planning activities such as harvest cycle planning, regeneration, stand tending, etc.	4.00	1.00	3	5	3	4.33	1.15	3	5	3
19. Development of an automatic vehicle location system for fire management	2.67	0.58	2	3	3	3.33	1.53	2	5	3
E. General										
1. Development and maintenance of a fire weather records archive for the Northwest Region	2.33	0.58	2	3	3	2.67	1.15	2	4	3
2. Development and maintenance of a fire management/research publications library at Northern Forestry Centre for use by client agencies	2.00	0.00	2	2	3	2.33	0.58	2	3	3
3. Research on the use of remote sensing for forest fuels mapping, analysis and monitoring (e.g., fuel moisture/green-up monitoring)	3.00	0.00	3	3	3	3.67	1.15	3	5	3
4. Fire history studies	3.50	0.58	3	4	4	3.75	0.50	3	4	4
5. Development of protection guidelines for the wildland/urban interface	3.33	0.58	3	4	3	3.33	0.58	3	4	3
6. Research and development on the impact that fire has on long-term wood supply	4.50	1.00	3	5	4	4.50	1.00	3	5	4
7. Development of a multi-resource valuing system for fire management	4.75	0.50	4	5	4	5.00	0.00	5	5	4

Table I. concluded

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
8. Research on the socioeconomic impact of fire management practices	3.75	0.96	3	5	4	4.00	0.82	3	5	4
9. Research on improved fire weather forecasting (especially long range forecasts)	3.67	1.15	3	5	3	4.33	1.15	3	5	3

[a] Based on four respondents to Part I. Ratings are on a five-point scale with 5 being high and 1 being low.

Table I-1. Summary of rating scores for the top 10 fire research/technology transfer activities for Manitoba

	Activity	Present importance rating score[a]		Activity	Future importance rating score[a]
E7	Development of a multi-resource valuing system for fire management	4.75	E7	Development of a multi-resource valuing system for fire management	5.00
E6	Research and development on the impact that fire has on long-term wood supply	4.50	C11	Research on the effectiveness of fuels management (e.g., thinning, green stripping, etc.) at increasing fire suppression effectiveness in high value areas	4.67
A3b	Production of training packages and/or interpretive guides for the Fire Behavior Prediction System computer-assisted training packages	4.33	D5	Development of guidelines and/or software for determining optimum aerial detection routes	4.67
B4	Research on the use of fire for hazard reduction and fuels management	4.33	C1c	Research and development on the use of infrared scanners for: near real-time (video) mapping of campaign fires	4.50
C4	Development of a low cost video transmission system for disseminating fire intelligence information	4.33	C3	Development and application of a geographic information system seen area mapping system	4.50
D5	Development of guidelines and/or software for determining optimum aerial detection routes	4.33	E6	Research and development on the impact that fire has on long-term wood supply	4.50
D12	Research and development on the use of geographic information systems in various fire management activities	4.33	A2	Research on fire behavior in fuel types not currently found in the Fire Behavior Prediction System (e.g., mixed wood, spruce–balsam)	4.33
A9	Research on the relationship of the upper atmospheric conditions to severe fire behavior	4.00	A3b	Production of training packages and/or interpretive guides for the Fire Behavior Prediction System computer-assisted training packages	4.33
C1b	Research and development on the use of infrared scanners for: b) detection of holdover fires	4.00	A9	Research on the relationship of the upper atmospheric conditions to severe fire behavior	4.33
C11	Research on the effectiveness of fuels management (e.g., thinning, green stripping, etc.) at increasing fire suppression effectiveness in high value areas	4.00	B4	Research on the use of fire for hazard reduction and fuels management	4.33

[a] Ratings are on a five-point scale with 5 being high and 1 being low. Ratings are from Table I.

Table J. Rating scores[a] of fire-research needs by respondents to questionnaire Part I for Saskatchewan

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
A. Fire Behavior/Danger Rating										
1. Validation of and/or further research on fire behavior in current Fire Behavior Prediction (FBP) System fuel types	4.00	–[b]	4	4	1	4.00	–	4	4	1
2. Research on fire behavior in fuel types not currently found in the FBP System (e.g., mixed wood, spruce–balsam)	4.00	–	4	4	1	3.00	–	3	3	1
3. Production of training packages and/or interpretive guides for the FBP System:										
a) workbooks, posters, etc.	5.00	–	5	5	1	3.00	–	3	3	1
b) computer-assisted training packages	5.00	–	5	5	1	4.00	–	4	4	1
4. Research and development of moisture codes that accommodate:										
a) high latitude conditions	1.00	–	1	1	1	3.00	–	3	3	1
b) different aspects, slopes, and elevations	3.00	–	3	3	1	4.00	–	4	4	1
c) unique fuel types (cladonia, slash, etc.)	3.00	–	3	3	1	3.00	–	3	3	1
5. Research on the effect of slope on rate of spread and fire intensity	NR[c]	NR	NR	NR	NR	4.00	–	4	4	1
6. Validation of and/or further research on the acceleration of wildfires from a point source ignition	4.00	–	4	4	1	4.00	–	4	4	1
7. Development of comprehensive theories and models that relate fire behavior to specific fuel characteristics (e.g., density, age, fuel loading, etc.)	3.00	–	3	3	1	4.00	–	4	4	1
8. Research on the fire characteristics of high intensity fires such as:										
a) spotting	3.00	–	3	3	1	4.00	–	4	4	1
b) convection column dynamics	3.00	–	3	3	1	4.00	–	4	4	1
9. Research on the relationship of the upper atmospheric conditions to severe fire behavior	3.00	–	3	3	1	3.00	–	3	3	1

Table J. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
B. Fire Ecology and Use										
1. Research on the silvicultural use of fire for site preparation, mixed-wood management, stand tending, etc.	3.50	0.71	3	4	2	3.50	0.71	3	4	2
2. Research on the relationship of wildfires and prescribed fires to wildlife habitat	4.00	1.41	3	5	2	4.50	0.71	4	5	2
3. Research on the ecological role of fire	4.50	0.71	4	5	2	4.50	0.71	4	5	2
4. Research on the use of fire for hazard reduction and fuels management	4.00	0.00	4	4	2	4.00	0.00	4	4	2
5. Development of guidelines and decision aids for planning prescribed burns	3.50	2.12	2	5	2	4.50	0.71	4	5	2
6. Research on the impacts of various types of ignition patterns and techniques	2.00	1.41	1	3	2	4.00	0.00	4	4	2
7. Research on the effects forest fires have on global warming	3.00	–	3	3	1	3.00	–	3	3	1
8. Research on the potential effect of climate change on future fire management scenarios	4.00	–	4	4	1	4.00	–	4	4	1
9. Research on smoke management issues such as:										
a) air quality	2.00	–	2	2	1	2.00	–	2	2	1
b) smoke distribution	1.00	–	1	1	1	2.00	–	2	2	1
C. Fire Suppression										
1. Research and development on the use of infrared scanners for:										
a) airtanker guidance	4.00	–	4	4	1	4.00	–	4	4	1
b) detection of holdover fires	4.00	–	4	4	1	5.00	–	5	5	1
c) near real-time (video) mapping of campaign fires	2.00	–	2	2	1	3.00	–	3	3	1

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
2. Evaluation of the effectiveness of various global positioning systems for use in fire management	4.00	–	4	4	1	4.00	–	4	4	1
3. Development and application of a geographic information system (GIS) seen area mapping system	4.00	–	4	4	1	4.00	–	4	4	1
4. Development of a low cost video transmission system for disseminating fire intelligence information	3.00	–	3	3	1	4.00	–	4	4	1
5. Research on the initial attack effectiveness (e.g., production rates, line holding capability, etc.) of crews, helicopters, and airtankers	5.00	–	5	5	1	4.00	–	4	4	1
6. Research on the sustained action production rates of crews, heavy equipment, and airtankers	4.00	–	4	4	1	4.00	–	4	4	1
7. Development of guidelines and models that relate fire behavior characteristics (e.g., intensity, rate of spread, etc.) to fire suppression activities	4.00	–	4	4	1	4.00	–	4	4	1
8. Evaluation of the effectiveness and cost-efficiency of various strategies and tactics used in campaign fire suppression	5.00	–	5	5	1	5.00	–	5	5	1
9. Development of guidelines and software that will improve the efficiency of large fire suppression activities (e.g., servicing, planning, mop-up, etc.)	4.00	–	4	4	1	4.00	–	4	4	1
10. Development of guidelines on the use of backburning as a fire suppression tool	4.00	–	4	4	1	4.00	–	4	4	1

Table J. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
11. Research on the effectiveness of fuels management (e.g., thinning, green stripping, etc.) at increasing fire suppression effectiveness in high value areas	4.00	–	4	4	1	3.00	–	3	3	1
12. Research into the effectiveness of foam:										
a) ground application	4.00	–	4	4	1	3.00	–	3	3	1
b) aerial application	3.00	–	3	3	1	3.00	–	3	3	1
c) on structures	3.00	–	3	3	1	3.00	–	3	3	1
D. Fire Management Systems										
1. Development of the next generation fire management decision-support system (FMDSS) by integrating and enhancing the current fire management systems developed at Petawawa National Forestry Institute and Northern Forestry Centre	3.00	–	3	3	1	4.00	–	4	4	1
2. Development of the next generation FMDSS that operates on the following workstation platforms:										
a) PC	2.00	–	2	2	1	1.00	–	1	1	1
b) UNIX	5.00	–	5	5	1	4.00	–	4	4	1
3. Development of a new spatial and quantitatively based preparedness planning module within the next generation FMDSS	2.00	–	2	2	1	3.00	–	3	3	1
4. Validation and cost-effectiveness of initial attack preparedness planning system	4.00	–	4	4	1	4.00	–	4	4	1
5. Development of guidelines and/or software for determining optimum aerial detection routes	4.00	–	4	4	1	4.00	–	4	4	1
6. Development of a comprehensive forest fire threat assessment module within the next generation FMDSS	3.00	–	3	3	1	4.00	–	4	4	1

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
7. Development of a senior executive information module in the next generation FMDSS	3.00	–	3	3	1	3.00	–	3	3	1
8. Incorporate daily and seasonal economic analysis models for detection, prevention, pre-positioning, and initial attack dispatch into the next generation FMDSS	4.00	–	4	4	1	4.00	–	4	4	1
9. Development of improved graphic information displays for fire management systems such as the Intelligent Fire Management Information System (IFMIS)	3.00	–	3	3	1	4.00	–	4	4	1
10. Development of training packages for FMDSS such as IFMIS	3.00	–	3	3	1	4.00	–	4	4	1
11. Development of guidelines for customizing fuel types used in a FMDSS	3.00	–	3	3	1	3.00	–	3	3	1
12. Research and development on the use of GIS in various fire management activities	3.00	–	3	3	1	4.00	–	4	4	1
13. Development of 3-dimensional fire growth models	3.00	–	3	3	1	3.00	–	3	3	1
14. Development of improved weather interpolation techniques that account for features such as elevation, aspects, lake effects, etc.	4.00	–	4	4	1	4.00	–	4	4	1
15. Development and application of surface wind models for fire management	4.00	–	4	4	1	4.00	–	4	4	1
16. Research and development of models for:										
a) human-caused fire occurrence prediction	3.00	–	3	3	1	4.00	–	4	4	1
b) lightning prediction	5.00	–	5	5	1	5.00	–	5	5	1
c) lightning fire occurrence prediction	5.00	–	5	5	1	5.00	–	5	5	1

Table J. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
17. Development of a comprehensive computerized prescribed fire effects information system	2.00	–	2	2	1	2.00	–	2	2	1
18. Research on how fire management principles can be incorporated into forest management planning activities such as harvest cycle planning, regeneration, stand tending, etc.	3.00	–	3	3	1	3.00	–	3	3	1
19. Development of an automatic vehicle location system for fire management	3.00	–	3	3	1	3.00	–	3	3	1
E. General										
1. Development and maintenance of a fire weather records archive for the Northwest Region	4.00	–	4	4	1	4.00	–	4	4	1
2. Development and maintenance of a fire management/research publications library at Northern Forestry Centre for use by client agencies	4.00	–	4	4	1	4.00	–	4	4	1
3. Research on the use of remote sensing for forest fuels mapping, analysis and monitoring (e.g., fuel moisture/green-up monitoring)	3.00	–	3	3	1	2.00	–	2	2	1
4. Fire history studies	4.00	–	4	4	1	4.00	–	4	4	1
5. Development of protection guidelines for the wildland/urban interface	5.00	0.00	5	5	2	4.50	0.71	4	5	2
6. Research and development on the impact that fire has on long-term wood supply	4.00	–	4	4	1	4.00	–	4	4	1
7. Development of a multi-resource valuing system for fire management	4.00	–	4	4	1	4.00	–	4	4	1

Table J. concluded

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
8. Research on the socioeconomic impact of fire management practices	3.00	–	3	3	1	4.00	–	4	4	1
9. Research on improved fire weather forecasting (especially long range forecasts)	5.00	–	5	5	1	5.00	–	5	5	1

[a] Based on two respondents to Part I. Ratings are on a five-point scale with 5 being high and 1 being low.

[b] Standard deviation was not calculated when number of respondents was 1.

[c] NR = no rating score given for this activity.

Table J-1. Summary of rating scores for the top 10 fire research/technology transfer activities for Saskatchewan

	Activity	Present importance rating score[a]		Activity	Future importance rating score[a]
A3a	Production of training packages and/or interpretive guides for the Fire Behavior Prediction System: workbooks, posters, etc.	5.00	C1b	Research and development on the use of infrared scanners for: detection of holdover fires	5.00
A3b	Production of training packages and/or interpretive guides for the Fire Behavior Prediction System: computer-assisted training packages	5.00	C8	Evaluation of the effectiveness and cost-efficiency of various strategies and tactics used in campaign fire suppression	5.00
C5	Research on the initial attack effectiveness (e.g., production rates, line holding capability, etc.) of crews, helicopters, and airtankers	5.00	D16b	Research and development of models for: lightning prediction	5.00
C8	Evaluation of the effectiveness and cost-efficiency of various strategies and tactics used in campaign fire suppression	5.00	D16c	Research and development of models for: lightning fire occurrence prediction	5.00
D2b	Development of the next generation fire management decision-support systems that operates on the following workstation platforms: UNIX	5.00	E9	Research on improved fire weather forecasting (especially long range forecasts)	5.00
D16b	Research and development of models for: lightning prediction	5.00	B2	Research on the relationship of wildfires and prescribed fires to wildlife habitat	4.50
D16c	Research and development of models for: lightning fire occurrence prediction	5.00	B3	Research on the ecological role of fire	4.50
E5	Development of protection guidelines for the wildland/urban interface	5.00	B5	Development of guidelines and decision aids for planning prescribed burns	4.50
E9	Research on improved fire weather forecasting (especially long range forecasts)	5.00	E5	Development of protection guidelines for the wildland/urban interface	4.50
B3	Research on the ecological role of fire	4.50	B4	Research on the use of fire for hazard reduction and fuels management	4.00

[a] Ratings are on a five-point scale with 5 being high and 1 being low. Ratings are from Table J.

Table K. Rating scores[a] of fire-research needs by respondents to questionnaire Part I for the Northwest Territories

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
A. Fire Behavior/Danger Rating										
1. Validation of and/or further research on fire behavior in current Fire Behavior Prediction (FBP) System fuel types	1.50	0.76	1	3	8	2.38	0.92	1	3	8
2. Research on fire behavior in fuel types not currently found in the FBP System (e.g., mixed wood, spruce–balsam)	1.75	1.16	1	4	8	2.25	1.04	1	4	8
3. Production of training packages and/or interpretive guides for the FBP System:										
a) workbooks, posters, etc.	3.38	1.06	1	4	8	3.13	1.25	1	5	8
b) computer-assisted training packages	3.88	0.83	3	5	8	3.38	0.92	2	5	8
4. Research and development of moisture codes that accommodate:										
a) high latitude conditions	3.38	0.92	2	5	8	3.50	0.93	2	5	8
b) different aspects, slopes, and elevations	2.50	1.20	1	5	8	2.75	1.39	1	5	8
c) unique fuel types (cladonia, slash, etc.)	3.00	1.51	1	5	8	2.75	1.58	1	5	8
5. Research on the effect of slope on rate of spread and fire intensity	2.75	1.49	1	5	8	2.88	1.36	1	5	8
6. Validation of and/or further research on the acceleration of wildfires from a point source ignition	2.75	1.39	1	5	8	2.75	1.39	1	5	8
7. Development of comprehensive theories and models that relate fire behavior to specific fuel characteristics (e.g., density, age, fuel loading, etc.)	3.13	1.36	1	4	8	3.00	1.41	1	5	8
8. Research on the fire characteristics of high intensity fires such as:										
a) spotting	2.63	1.30	1	5	8	2.50	0.93	1	4	8
b) convection column dynamics	2.38	1.06	1	4	8	2.63	1.19	1	4	8
9. Research on the relationship of the upper atmospheric conditions to severe fire behavior	3.50	0.76	2	4	8	3.25	0.89	2	5	8

Table K. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
B. Fire Ecology and Use										
1. Research on the silvicultural use of fire for site preparation, mixed-wood management, stand tending, etc.	3.00	1.51	1	5	8	3.38	1.69	1	5	8
2. Research on the relationship of wildfires and prescribed fires to wildlife habitat	3.67	1.22	1	5	9	4.33	1.41	1	5	9
3. Research on the ecological role of fire	4.00	1.22	2	5	9	4.56	0.73	3	5	9
4. Research on the use of fire for hazard reduction and fuels management	3.50	0.93	2	5	8	3.67	0.87	3	5	9
5. Development of guidelines and decision aids for planning prescribed burns	3.89	0.78	3	5	9	3.25	1.39	2	5	8
6. Research on the impacts of various types of ignition patterns and techniques	3.13	1.13	1	5	8	2.56	1.13	1	4	9
7. Research on the effects forest fires have on global warming	2.11	1.05	1	4	9	2.89	1.62	1	5	9
8. Research on the potential effect of climate change on future fire management scenarios	2.56	1.33	1	5	9	3.00	1.07	1	4	8
9. Research on smoke management issues such as:										
a) air quality	3.00	1.20	1	5	8	3.43	1.40	1	5	7
b) smoke distribution	2.86	1.21	1	5	7	2.88	1.25	1	5	8
C. Fire Suppression										
1. Research and development on the use of infrared scanners for:										
a) airtanker guidance	1.13	0.35	1	2	8	1.25	0.46	1	2	8
b) detection of holdover fires	3.00	1.31	1	4	8	3.13	1.13	1	4	8
c) near real-time (video) mapping of campaign fires	2.88	1.46	1	5	8	3.13	1.25	1	5	8

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
2. Evaluation of the effectiveness of various global positioning systems for use in fire management	3.89	1.17	2	5	9	4.25	1.04	3	5	8
3. Development and application of a geographic information system (GIS) seen area mapping system	3.67	1.03	2	5	6	4.50	0.84	3	5	6
4. Development of a low cost video transmission system for disseminating fire intelligence information	2.00	0.58	1	3	7	3.14	1.21	1	4	7
5. Research on the initial attack effectiveness (e.g., production rates, line holding capability, etc.) of crews, helicopters, and airtankers	2.75	1.04	1	4	8	3.25	1.28	1	5	8
6. Research on the sustained action production rates of crews, heavy equipment, and airtankers	2.63	1.19	1	4	8	3.00	1.51	1	5	8
7. Development of guidelines and models that relate fire behavior characteristics (e.g., intensity, rate of spread, etc.) to fire suppression activities	2.43	1.51	1	4	7	2.63	1.41	1	5	8
8. Evaluation of the effectiveness and cost-efficiency of various strategies and tactics used in campaign fire suppression	2.86	0.69	2	4	7	2.86	0.69	2	4	7
9. Development of guidelines and software that will improve the efficiency of large fire suppression activities (e.g., servicing, planning, mop-up, etc.)	2.00	1.00	1	4	7	2.14	1.21	1	4	7
10. Development of guidelines on the use of backburning as a fire suppression tool	2.71	1.38	1	4	7	2.71	1.38	1	5	7

Table K. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
11. Research on the effectiveness of fuels management (e.g., thinning, green stripping, etc.) at increasing fire suppression effectiveness in high value areas	2.38	1.06	1	4	8	2.75	1.28	1	5	8
12. Research into the effectiveness of foam:										
a) ground application	2.88	1.13	1	4	8	2.75	1.16	1	4	8
b) aerial application	2.50	1.07	1	4	8	2.38	1.19	1	4	8
c) on structures	1.80	1.10	1	3	5	1.60	1.34	1	4	5
D. Fire Management Systems										
1. Development of the next generation fire management decision-support system (FMDSS) by integrating and enhancing the current fire management systems developed at Petawawa National Forestry Institute and Northern Forestry Centre	1.80	0.84	1	3	5	2.60	1.52	1	4	5
2. Development of the next generation FMDSS that operates on the following workstation platforms:										
a) PC	2.00	1.00	1	3	3	1.67	1.15	1	3	3
b) UNIX	1.50	0.71	1	2	2	2.50	2.12	1	4	2
3. Development of a new spatial and quantitatively based preparedness planning module within the next generation FMDSS	2.50	1.29	1	4	4	2.75	1.71	1	5	4
4. Validation and cost-effectiveness of initial attack preparedness planning system	2.86	1.35	1	4	7	3.00	1.26	1	4	6
5. Development of guidelines and/or software for determining optimum aerial detection routes	1.29	0.49	1	2	7	1.50	0.84	1	3	6
6. Development of a comprehensive forest fire threat assessment module within the next generation FMDSS	1.40	0.89	1	3	5	1.75	1.50	1	4	4

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
7. Development of a senior executive information module in the next generation FMDSS	1.00	0.00	1	1	3	1.00	0.00	1	1	2
8. Incorporate daily and seasonal economic analysis models for detection, prevention, pre-positioning and initial attack dispatch into the next generation FMDSS	1.50	0.58	1	2	4	1.67	0.58	1	2	3
9. Development of improved graphic information displays for fire management systems such as the Intelligent Fire Management Information System (IFMIS)	1.80	1.30	1	4	5	2.00	1.00	1	3	3
10. Development of training packages for FMDSS such as IFMIS	1.86	1.21	1	4	7	2.75	1.50	1	4	4
11. Development of guidelines for customizing fuel types used in a FMDSS	1.17	0.41	1	2	6	2.00	1.73	1	5	5
12. Research and development on the use of GIS in various fire management activities	2.44	1.01	1	4	9	2.86	1.21	1	4	7
13. Development of 3-dimensional fire growth models	1.14	0.38	1	2	7	1.67	1.03	1	3	6
14. Development of improved weather interpolation techniques that account for features such as elevation, aspects, lake effects, etc.	1.88	0.99	1	4	8	2.00	1.00	1	3	7
15. Development and application of surface wind models for fire management	1.50	0.76	1	3	8	1.71	1.11	1	4	7
16. Research and development of models for:										
a) human-caused fire occurrence prediction	1.14	0.38	1	2	7	1.33	0.82	1	3	6
b) lightning prediction	2.00	1.15	1	4	7	2.67	1.03	1	4	6
c) lightning fire occurrence prediction	2.29	1.11	1	4	7	2.80	1.10	1	4	5

Table K.   continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
17. Development of a comprehensive computerized prescribed fire effects information system	1.86	1.07	1	4	7	2.33	1.37	1	4	6
18. Research on how fire management principles can be incorporated into forest management planning activities such as harvest cycle planning, regeneration, stand tending, etc.	1.78	1.09	1	4	9	1.88	1.36	1	4	8
19. Development of an automatic vehicle location system for fire management	1.00	0.00	1	1	7	1.00	0.00	1	1	4
E. General										
1. Development and maintenance of a fire weather records archive for the Northwest Region	1.50	1.00	1	3	4	1.67	1.15	1	3	3
2. Development and maintenance of a fire management/research publications library at Northern Forestry Centre for use by client agencies	1.50	1.00	1	3	4	1.67	1.15	1	3	3
3. Research on the use of remote sensing for forest fuels mapping, analysis and monitoring (e.g., fuel moisture/green-up monitoring)	3.13	0.83	2	4	8	3.00	1.07	1	4	8
4. Fire history studies	2.22	0.67	1	3	9	2.44	1.13	1	4	9
5. Development of protection guidelines for the wildland/urban interface	3.11	1.27	1	5	9	3.33	1.22	1	5	9
6. Research and development on the impact that fire has on long-term wood supply	1.29	0.49	1	2	7	1.60	0.55	1	2	5
7. Development of a multi-resource valuing system for fire management	2.14	1.07	1	3	7	2.40	1.34	1	4	5

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
8. Research on the socioeconomic impact of fire management practices	1.75	1.39	1	5	8	2.38	1.60	1	5	8
9. Research on improved fire weather forecasting (especially long range forecasts)	2.86	1.46	1	5	7	3.43	1.51	1	5	7

[a] Based on nine respondents to Part I. Ratings are on a five-point scale with 5 being high and 1 being low.

Table K-1. Summary of rating scores for the top 10 fire research/technology transfer activities for the Northwest Territories

	Activity	Present importance rating score[a]		Activity	Future importance rating score[a]
B3	Research on the ecological role of fire	4.00	B3	Research on the ecological role of fire	4.56
B5	Development of guidelines and decision aids for planning prescribed burns	3.89	C3	Development and application of a geographic information system seen area mapping system	4.50
C2	Evaluation of the effectiveness of various global positioning systems for use in fire management	3.89	B2	Research on the relationship of wildfires and prescribed fires to wildlife habitat	4.33
A3b	Production of training packages and/or interpretive guides for the Fire Behavior Prediction System: computer-assisted training packages	3.88	C2	Evaluation of the effectiveness of various global positioning systems for use in fire management	4.25
C3	Development and application of a geographic information system seen area mapping system	3.67	B4	Research on the use of fire for hazard reduction and fuels management	3.67
B2	Research on the relationship of wildfires and prescribed fires to wildlife habitat	3.67	A4a	Research and development of moisture codes that accommodate: high latitude conditions	3.50
A9	Research on the relationship of the upper atmospheric conditions to severe fire behavior	3.50	B9a	Research on smoke management issues such as: air quality	3.43
B4	Research on the use of fire for hazard reduction and fuels management	3.50	E9	Research on improved fire weather forecasting (especially long range forecasts)	3.43
A4a	Research and development of moisture codes that accommodate: high latitude conditions	3.38	A3b	Production of training packages and/or interpretive guides for the Fire Behavior Prediction System: computer-assisted training packages	3.38
A3a	Production of training packages and/or interpretive guide for the Fire Behavior Prediction System: workbooks, posters, etc.	3.38	B1	Research on the silvicultural use of fire for site preparation, mixed-wood management, stand tending, etc.	3.38

[a] Ratings are on a five-point scale with 5 being high and 1 being low. Ratings are from Table K.

Table L. Rating scores[a] of fire-research needs by respondents to questionnaire Part I for the Canadian Parks Service

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
A. Fire Behavior/Danger Rating										
1. Validation of and/or further research on fire behavior in current Fire Behavior Prediction (FBP) System fuel types	2.86	0.69	2	4	7	3.14	0.90	2	4	7
2. Research on fire behavior in fuel types not currently found in the FBP System (e.g., mixed wood, spruce–balsam)	3.83	1.17	2	5	6	4.57	1.13	2	5	7
3. Production of training packages and/or interpretive guides for the FBP System:										
a) workbooks, posters, etc.	2.33	1.03	1	4	6	2.50	0.84	2	4	6
b) computer-assisted training packages	2.57	0.79	2	4	7	2.57	0.98	1	4	7
4. Research and development of moisture codes that accommodate:										
a) high latitude conditions	1.80	0.84	1	3	5	2.00	1.00	1	3	5
b) different aspects, slopes, and elevations	3.57	1.13	2	5	7	4.00	1.15	2	5	7
c) unique fuel types (cladonia, slash, etc.)	2.86	1.35	1	5	7	3.29	1.38	1	5	7
5. Research on the effect of slope on rate of spread and fire intensity	3.86	0.90	2	5	7	4.29	0.76	3	5	7
6. Validation of and/or further research on the acceleration of wildfires from a point source ignition	2.71	0.76	2	4	7	3.00	1.00	2	5	7
7. Development of comprehensive theories and models that relate fire behavior to specific fuel characteristics (e.g., density, age, fuel loading, etc.)	3.29	1.38	1	5	7	3.57	1.13	2	5	7
8. Research on the fire characteristics of high intensity fires such as:										
a) spotting	3.00	1.41	1	5	7	3.00	1.29	1	5	7
b) convection column dynamics	3.57	0.79	3	5	7	3.71	0.76	3	5	7
9. Research on the relationship of the upper atmospheric conditions to severe fire behavior	3.71	0.95	3	5	7	3.71	0.95	3	5	7

Table L. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
B. Fire Ecology and Use										
1. Research on the silvicultural use of fire for site preparation, mixed-wood management, stand tending, etc.	1.40	0.89	1	3	5	1.80	1.30	1	4	5
2. Research on the relationship of wildfires and prescribed fires to wildlife habitat	4.29	1.25	2	5	7	4.50	0.84	3	5	6
3. Research on the ecological role of fire	4.43	0.98	3	5	7	4.43	0.98	3	5	7
4. Research on the use of fire for hazard reduction and fuels management	4.29	0.76	3	5	7	4.71	0.49	4	5	7
5. Development of guidelines and decision aids for planning prescribed burns	3.86	1.07	3	5	7	4.14	0.90	3	5	7
6. Research on the impacts of various types of ignition patterns and techniques	3.71	0.95	3	5	7	3.71	0.95	3	5	7
7. Research on the effects forest fires have on global warming	2.57	1.40	1	5	7	3.71	1.38	1	5	7
8. Research on the potential effect of climate change on future fire management scenarios	3.14	1.21	2	5	7	4.29	1.25	2	5	7
9. Research on smoke management issues such as:										
a) air quality	3.00	1.00	1	4	7	3.57	1.40	1	5	7
b) smoke distribution	3.29	0.95	2	5	7	3.86	1.21	2	5	7
C. Fire Suppression										
1. Research and development on the use of infrared scanners for:										
a) airtanker guidance	1.33	0.52	1	2	6	1.33	0.52	1	2	6
b) detection of holdover fires	2.43	1.27	1	4	7	2.71	0.76	2	4	7
c) near real-time (video) mapping of campaign fires	2.00	1.29	1	4	7	2.14	1.46	1	4	7

Table L.   continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
2. Evaluation of the effectiveness of various global positioning systems for use in fire management	2.43	0.79	2	4	7	2.57	0.79	2	4	7
3. Development and application of a geographic information system (GIS) seen area mapping system	3.29	0.95	2	5	7	3.57	0.98	2	5	7
4. Development of a low cost video transmission system for disseminating fire intelligence information	1.60	0.55	1	2	5	2.00	0.71	1	3	5
5. Research on the initial attack effectiveness (e.g., production rates, line holding capability, etc.) of crews, helicopters, and airtankers	2.00	1.00	1	4	7	2.00	0.58	1	3	7
6. Research on the sustained action production rates of crews, heavy equipment, and airtankers	1.67	0.52	1	2	6	1.83	0.41	1	2	6
7. Development of guidelines and models that relate fire behavior characteristics (e.g., intensity, rate of spread, etc.) to fire suppression activities	2.86	0.90	1	4	7	2.71	0.95	1	4	7
8. Evaluation of the effectiveness and cost-efficiency of various strategies and tactics used in campaign fire suppression	2.17	0.98	1	3	6	1.67	1.03	1	3	6
9. Development of guidelines and software that will improve the efficiency of large fire suppression activities (e.g., servicing, planning, mop-up, etc.)	1.83	0.75	1	3	6	2.00	0.89	1	3	6
10. Development of guidelines on the use of backburning as a fire suppression tool	3.29	0.95	2	4	7	4.00	0.82	3	5	7

Table L. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
11. Research on the effectiveness of fuels management (e.g., thinning, green stripping, etc.) at increasing fire suppression effectiveness in high value areas	3.57	1.51	1	5	7	4.00	1.41	1	5	7
12. Research into the effectiveness of foam:										
a) ground application	2.86	0.90	2	4	7	2.86	1.21	1	4	7
b) aerial application	2.67	1.03	2	4	6	2.50	1.05	1	4	6
c) on structures	3.17	0.98	2	4	6	3.17	1.33	1	5	6
D. Fire Management Systems										
1. Development of the next generation fire management decision-support system (FMDSS) by integrating and enhancing the current fire management systems developed at Petawawa National Forestry Institute and Northern Forestry Centre	3.71	0.95	3	5	7	4.00	0.58	3	5	7
2. Development of the next generation FMDSS that operates on the following workstation platforms:										
a) PC	3.57	1.27	1	5	7	3.71	0.76	2	4	7
b) UNIX	_b	–	–	–	–	–	–	–	–	–
3. Development of a new spatial and quantitatively based preparedness planning module within the next generation FMDSS	2.17	1.33	1	4	6	2.67	1.21	1	4	6
4. Validation and cost-effectiveness of initial attack preparedness planning system	2.33	1.51	1	5	6	1.83	0.75	1	3	6
5. Development of guidelines and/or software for determining optimum aerial detection routes	1.83	1.17	1	4	6	1.50	0.55	1	2	6
6. Development of a comprehensive forest fire threat assessment module within the next generation FMDSS	1.83	1.17	1	4	6	2.33	1.75	1	5	6

Table L. continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
7. Development of a senior executive information module in the next generation FMDSS	1.00	1.00	1	1	4	1.25	0.50	1	2	4
8. Incorporate daily and seasonal economic analysis models for detection, prevention, pre-positioning and initial attack dispatch into the next generation FMDSS	1.80	1.10	1	3	5	2.00	1.00	1	3	5
9. Development of improved graphic information displays for fire management systems such as the Intelligent Fire Management Information System (IFMIS)	2.40	0.55	2	3	5	3.20	0.84	2	4	5
10. Development of training packages for FMDSS such as IFMIS	2.17	0.98	1	3	6	3.17	0.41	3	4	6
11. Development of guidelines for customizing fuel types used in a FMDSS	2.17	0.98	1	3	6	2.50	0.55	2	3	6
12. Research and development on the use of GIS in various fire management activities	3.71	0.76	3	5	7	4.14	0.69	3	5	7
13. Development of 3-dimensional fire growth models	3.57	0.79	3	5	7	4.00	0.82	3	5	7
14. Development of improved weather interpolation techniques that account for features such as elevation, aspects, lake effects, etc.	2.86	1.35	1	5	7	3.71	0.49	3	4	7
15. Development and application of surface wind models for fire management	3.00	1.41	2	5	7	3.43	1.13	2	5	7
16. Research and development of models for:										
a) human-caused fire occurrence prediction	2.17	1.17	1	4	6	2.33	1.03	1	4	6
b) lightning prediction	3.33	0.82	2	4	6	3.67	0.52	3	4	6
c) lightning fire occurrence prediction	4.00	0.89	3	5	6	4.33	0.52	4	5	6

Table L.   continued

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
17. Development of a comprehensive computerized prescribed fire effects information system	3.86	1.21	2	5	7	4.29	0.76	3	5	7
18. Research on how fire management principles can be incorporated into forest management planning activities such as harvest cycle planning, regeneration, stand tending, etc.	2.00	1.41	1	4	4	2.25	1.50	1	4	4
19. Development of an automatic vehicle location system for fire management	1.25	0.50	1	2	4	1.00	0.00	1	1	4
E. General										
1. Development and maintenance of a fire weather records archive for the Northwest Region	2.43	1.13	1	4	7	2.43	0.98	1	3	7
2. Development and maintenance of a fire management/research publications library at Northern Forestry Centre for use by client agencies	3.00	0.58	2	4	7	3.57	0.79	3	5	7
3. Research on the use of remote sensing for forest fuels mapping, analysis and monitoring (e.g., fuel moisture/green-up monitoring)	3.71	0.95	2	5	7	4.29	0.76	3	5	7
4. Fire history studies	3.71	1.38	1	5	7	3.29	1.50	1	5	7
5. Development of protection guidelines for the wildland/urban interface	3.17	1.83	1	5	6	3.33	1.86	1	5	6
6. Research and development on the impact that fire has on long-term wood supply	2.00	1.41	1	4	4	1.75	1.50	1	4	4
7. Development of a multi-resource valuing system for fire management	2.14	1.21	1	4	7	2.57	1.72	1	5	7

Table L. concluded

Fire research/technology transfer activity	Present importance					Future importance				
	Mean	Standard deviation	Minimum	Maximum	No. of respondents	Mean	Standard deviation	Minimum	Maximum	No. of respondents
8. Research on the socioeconomic impact of fire management practices	1.50	0.55	1	2	6	1.33	0.52	1	2	6
9. Research on improved fire weather forecasting (especially long range forecasts)	3.86	1.21	2	5	7	4.00	0.82	3	5	7

[a] Based on seven respondents to Part I. Ratings are on a five-point scale with 5 being high and 1 being low.

[b] No respondents.

Table L-1. Summary of rating scores for the top 10 fire research/technology transfer activities for the Canadian Parks Service

	Activity	Present importance rating score[a]		Activity	Future importance rating score[a]
B3	Research on the ecological role of fire	4.43	B4	Research on the use of fire for hazard reduction and fuels management	4.71
B4	Research on the use of fire for hazard reduction and fuels management	4.29	A2	Research on fire behavior in fuel types not currently found in the Fire Behavior Prediction System (e.g., mixed wood, spruce–balsam)	4.57
B2	Research on the relationship of wildfires and prescribed fires to wildlife habitat	4.29	B2	Research on the relationship of wildfires and prescribed fires to wildlife habitat	4.50
D16c	Research and development of models for: lightning fire occurrence prediction	4.00	B3	Research on the ecological role of fire	4.43
A5	Research on the effect of slope on rate of spread and fire intensity	3.86	D16c	Research and development of models for: lightning fire occurrence prediction	4.33
B5	Development of guidelines and decision aids for planning prescribed burns	3.86	A5	Research on the effect of slope on rate of spread and fire intensity	4.29
D17	Development of a comprehensive computerized prescribed fire effects information system	3.86	D17	Development of a comprehensive computerized prescribed fire effects information system	4.29
E9	Research on improved fire weather forecasting (especially long range forecasts)	3.86	E3	Research on the use of remote sensing for forest fuels mapping, analysis, and monitoring (e.g., fuel moisture/green-up monitoring)	4.29
A2	Research on fire behavior in fuel types not currently found in the Fire Behavior Prediction System (e.g., mixed wood, spruce–balsam)	3.83	B8	Research on the potential effect of climate change on future fire management scenarios	4.29
D12	Research and development on the use of geographic information systems in various fire management activities	3.71	D12	Research and development on the use of geographic information systems in various fire management activities	4.14

[a] Ratings are on a five-point scale with 5 being high and 1 being low. Ratings are from Table L.

Table M. Priority rank of fire-research activities based on their value to user agencies by respondents to questionnaire Part II

Research activity	Priority rank[a]										No. of respondents	Weighted no. of respondents
	1	2	3	4	5	6	7	8	9	10		
A. Fire Behavior/Danger Rating												
1. Validation of and/or further research on fire behavior in current Fire Behavior Prediction (FBP) System fuel types	4	–[b]	–	–	–	–	2	1	–	–	7	51
2. Research on fire behavior in fuel types not currently found in the FBP System (e.g., mixed wood, spruce–balsam)	4	2	1	3	–	1	–	–	1	1	13	95
3. Production of training packages and/or interpretive guides for the FBP System:												
a) workbooks, posters, etc.	1	1	1	–	1	–	–	–	–	–	4	33
b) computer-assisted training packages	1	1	–	–	1	1	1	–	–	–	5	34
4. Research and development of moisture codes that accommodate:												
a) high latitude conditions	–	–	–	–	–	–	–	–	–	1	1	1
b) different aspects, slopes, and elevations	–	2	–	–	–	–	1	–	–	–	3	22
c) unique fuel types (cladonia, slash, etc.)	–	1	–	–	–	–	–	–	–	–	1	9
5. Research on the effect of slope on rate of spread and fire intensity	–	–	2	–	–	–	–	2	–	–	4	22
6. Validation of and/or further research on the acceleration of wildfires from a point source ignition	–	–	1	–	–	–	–	1	–	–	2	11
7. Development of comprehensive theories and models that relate fire behavior to specific fuel characteristics (e.g., density, age, fuel loading, etc.)	1	2	2	2	–	1	1	–	1	–	10	69
8. Research on the fire characteristics of high intensity fires such as:												
a) spotting	–	–	–	–	–	1	–	–	–	1	2	6
b) convection column dynamics	–	–	–	–	–	–	–	–	–	1	1	1
9. Research on the relationship of the upper atmospheric conditions to severe fire behavior	–	2	–	–	1	–	–	–	1	1	5	27
B. Fire Ecology and Use												
1. Research on the silvicultural use of fire for site preparation, mixed-wood management, stand tending, etc.	–	–	2	1	2	–	3	–	–	–	8	47

Table M. continued

Research activity	Priority rank[a]										No. of respondents	Weighted no. of respondents
	1	2	3	4	5	6	7	8	9	10		
2. Research on the relationship of wildfires and prescribed fires to wildlife habitat	1	4	1	4	1	1	1	1	2	–	16	104
3. Research on the ecological role of fire	5	2	1	–	1	–	2	1	–	–	12	93
4. Research on the use of fire for hazard reduction and fuels management	–	1	–	1	3	–	1	2	1	–	9	46
5. Development of guidelines and decision aids for planning prescribed burns	–	–	1	2	–	2	2	2	–	3	12	49
6. Research on the impacts of various types of ignition patterns and techniques	–	–	–	–	–	–	1	–	1	–	2	6
7. Research on the effects forest fires have on global warming	–	–	–	–	–	–	–	–	1	–	1	2
8. Research on the potential effect of climate change on future fire management scenarios	–	–	1	–	–	–	1	–	–	2	4	14
9. Research on smoke management issues such as:												
a) air quality	–	–	–	1	–	1	–	1	–	2	5	17
b) smoke distribution	–	1	–	1	–	1	–	1	–	2	6	26
C. Fire Suppression												
1. Research and development on the use of infrared scanners for:												
a) airtanker guidance	1	1	1	1	2	–	1	–	–	–	7	50
b) detection of holdover fires	–	2	2	–	2	–	1	1	–	–	8	53
c) near real-time (video) mapping of campaign fires	–	1	1	–	2	1	1	–	–	–	6	38
2. Evaluation of the effectiveness of various global positioning systems for use in fire management	–	1	1	–	1	–	1	1	–	–	5	30
3. Development and application of a geographic information system (GIS) seen area mapping system	–	–	–	1	1	–	–	–	–	1	3	14
4. Development of a low cost video transmission system for disseminating fire intelligence information	–	–	1	–	–	–	–	–	1	–	2	10

Research activity	Priority rank[a]										No. of respondents	Weighted no. of respondents
	1	2	3	4	5	6	7	8	9	10		
5. Research on the initial attack effectiveness (e.g., production rates, line holding capability, etc.) of crews, helicopters, and airtankers	1	–	–	1	1	1	–	–	–	–	4	28
6. Research on the sustained action production rates of crews, heavy equipment, and airtankers	–	–	–	–	–	–	–	–	–	–	–	–
7. Development of guidelines and models that relate fire behavior characteristics (e.g., intensity, rate of spread, etc.) to fire suppression activities	–	–	–	–	1	–	2	2	–	–	5	20
8. Evaluation of the effectiveness and cost-efficiency of various strategies and tactics used in campaign fire suppression	–	–	–	1	1	–	–	1	1	–	4	18
9. Development of guidelines and software that will improve the efficiency of large fire suppression activities (e.g., servicing, planning, mop-up, etc.)	1	–	–	–	–	1	–	–	–	–	2	15
10. Development of guidelines on the use of backburning as a fire suppression tool	–	2	–	1	–	1	–	1	–	–	5	33
11. Research on the effectiveness of fuels management (e.g., thinning, green stripping, etc.) at increasing fire suppression effectiveness in high value areas	1	–	–	1	–	1	1	1	4	–	9	37
12. Research into the effectiveness of foam:												
a) ground application	–	–	2	–	1	–	–	–	1	–	4	24
b) aerial application	–	–	2	–	1	–	–	–	1	–	4	24
c) on structures	–	–	2	–	1	–	–	–	1	–	4	24

D. Fire Management Systems

Research activity	Priority rank[a]										No. of respondents	Weighted no. of respondents
1. Development of the next generation fire management decision-support system (FMDSS) by integrating and enhancing the current fire management systems developed at Petawawa National Forestry Institute and Northern Forestry Centre	–	1	2	–	1	–	–	1	2	–	7	38

Table M. continued

Research activity	Priority rank[a]										No. of respondents	Weighted no. of respondents
	1	2	3	4	5	6	7	8	9	10		
2. Development of the next generation FMDSS that operates on the following workstation platforms:												
a) PC	–	–	–	–	–	–	–	–	–	–	–	–
b) UNIX	–	–	–	–	–	–	–	–	–	–	–	–
3. Development of a new spatial and quantitatively based preparedness planning module within the next generation FMDSS	–	–	–	–	–	–	–	2	–	–	2	6
4. Validation and cost-effectiveness of initial attack preparedness planning system	1	–	–	–	–	1	–	1	–	–	3	18
5. Development of guidelines and/or software for determining optimum aerial detection routes	–	–	–	–	1	–	–	–	1	–	2	8
6. Development of a comprehensive forest fire threat assessment module within the next generation FMDSS	–	–	–	–	–	1	–	–	–	–	1	5
7. Development of a senior executive information module in the next generation FMDSS	–	–	–	–	–	–	–	–	–	–	–	–
8. Incorporate daily and seasonal economic analysis models for detection, prevention, pre-positioning and initial attack dispatch into the next generation FMDSS	–	–	–	–	–	1	–	–	–	–	1	5
9. Development of improved graphic information displays for fire management systems such as the Intelligent Fire Management Information System (IFMIS)	–	–	–	–	–	–	–	–	–	–	–	–
10. Development of training packages for FMDSS such as IFMIS	–	–	–	–	–	–	–	–	1	1	2	3
11. Development of guidelines for customizing fuel types used in a FMDSS	–	–	–	–	–	–	–	–	1	–	1	2
12. Research and development on the use of GIS in various fire management activities	1	1	–	–	1	1	1	–	–	–	5	34
13. Development of 3-dimensional fire growth models	–	–	–	–	–	1	–	–	–	1	2	6

Table M. continued

Research activity	1	2	3	4	5	6	7	8	9	10	No. of respondents	Weighted no. of respondents
						Priority rank[a]						
14. Development of improved weather interpolation techniques that account for features such as elevation, aspects, lake effects, etc.	–	–	2	1	–	1	–	1	–	–	5	31
15. Development and application of surface wind models for fire management	–	–	–	2	1	–	–	1	1	–	5	25
16. Research and development of models for:												
a) human-caused fire occurrence prediction	–	1	–	–	–	2	1	–	–	–	4	23
b) lightning prediction	–	1	–	1	–	2	–	1	–	–	5	29
c) lightning fire occurrence prediction	–	3	–	1	–	2	1	–	–	–	7	48
17. Development of a comprehensive computerized prescribed fire effects information system	–	1	1	–	1	1	–	–	–	4	8	32
18. Research on how fire management principles can be incorporated into forest management planning activities such as harvest cycle planning, regeneration, stand tending, etc.	2	1	–	–	1	–	–	–	–	–	4	35
19. Development of an automatic vehicle location system for fire management	–	–	–	–	–	1	–	–	–	1	2	6
E. General												
1. Development and maintenance of a fire weather records archive for the Northwest Region	–	–	–	1	–	–	1	–	–	–	2	11
2. Development and maintenance of a fire management/research publications library at Northern Forestry Centre for use by client agencies	–	–	–	–	–	–	1	1	–	–	2	7
3. Research on the use of remote sensing for forest fuels mapping, analysis and monitoring (e.g., fuel moisture/green-up monitoring)	–	–	–	–	–	2	1	–	1	–	4	16
4. Fire history studies	–	–	1	–	–	1	1	1	–	1	5	21
5. Development of protection guidelines for the wildland/urban interface	1	–	1	–	2	1	1	–	1	1	8	42

Table M.   concluded

Research activity	Priority rank[a]										No. of respondents	Weighted no. of respondents
	1	2	3	4	5	6	7	8	9	10		
6. Research and development on the impact that fire has on long-term wood supply	–	1	2	1	–	–	–	–	–	–	4	32
7. Development of a multi-resource valuing system for fire management	1	1	–	2	2	–	1	–	–	–	7	49
8. Research on the socioeconomic impact of fire management practices	–	–	–	–	1	–	–	–	–	–	1	6
9. Research on improved fire weather forecasting (especially long range forecasts)	2	–	2	1	–	–	–	–	3	–	8	49

[a] Based on thirty-one respondents to Part II (Section one). Some respondents selected more than one project for each priority rank.
[b] Activity was not given a priority rank in those levels by any respondent.

Table N. Northern Forestry Centre (NoFC) participation level ratings in conducting fire-research projects by respondents to questionnaire Part II

Research activity	Type of NoFC role/involvement[a]						No. of respondents
	1	2	3	4	5	6	
A. Fire Behavior/Danger Rating							
1. Validation of and/or further research on fire behavior in current Fire Behavior Prediction (FBP) System fuel types	–[b]	–	2	4	–	1	7
2. Research on fire behavior in fuel types not currently found in the FBP System (e.g., mixed wood, spruce–balsam)	–	–	–	9	3	1	13
3. Production of training packages and/or interpretive guides for the FBP System:							
a) workbooks, posters, etc.	–	–	1	1	1	–	3
b) computer-assisted training packages	–	–	1	2	2	–	5
4. Research and development of moisture codes that accommodate:							
a) high latitude conditions	–	–	–	1	–	–	1
b) different aspects, slopes, and elevations	–	–	–	2	1	–	3
c) unique fuel types (cladonia, slash, etc.)	–	–	–	1	–	–	1
5. Research on the effect of slope on rate of spread and fire intensity	–	–	1	2	1	–	4
6. Validation of and/or further research on the acceleration of wildfires from a point source ignition	–	–	1	–	1	–	2
7. Development of comprehensive theories and models that relate fire behavior to specific fuel characteristics (e.g., density, age, fuel loading, etc.)	–	–	1	7	1	–	9
8. Research on the fire characteristics of high intensity fires such as:							
a) spotting	–	–	1	–	1	–	2
b) convection column dynamics	–	–	1	–	–	–	1
9. Research on the relationship of the upper atmospheric conditions to severe fire behavior	–	–	2	2	–	–	4
B. Fire Ecology and Use							
1. Research on the silvicultural use of fire for site preparation, mixed-wood management, stand tending, etc.	–	1	1	4	1	1	8
2. Research on the relationship of wildfires and prescribed fires to wildlife habitat	–	1	5	5	1	1	13
3. Research on the ecological role of fire	–	–	4	3	1	1	9

Table N.   continued

Research activity	Type of NoFC role/involvement[a]						No. of respondents
	1	2	3	4	5	6	
4. Research on the use of fire for hazard reduction and fuels management	–	–	3	3	2	–	8
5. Development of guidelines and decision aids for planning prescribed burns	–	2	3	3	3	–	11
6. Research on the impacts of various types of ignition patterns and techniques	–	–	1	1	–	–	2
7. Research on the effects forest fires have on global warming	–	–	–	–	1	–	1
8. Research on the potential effect of climate change on future fire management scenarios	–	–	–	1	3	–	4
9. Research on smoke management issues such as:							
a) air quality	–	–	–	3	1	1	5
b) smoke distribution	–	–	–	4	1	1	6
C. Fire Suppression							
1. Research and development on the use of infrared scanners for:							
a) airtanker guidance	–	–	2	5	–	–	7
b) detection of holdover fires	–	–	2	5	–	–	7
c) near real-time (video) mapping of campaign fires	–	–	1	5	–	–	6
2. Evaluation of the effectiveness of various global positioning systems for use in fire management	–	–	–	4	–	–	4
3. Development and application of a geographic information system (GIS) seen area mapping system	–	–	1	2	–	–	3
4. Development of a low cost video transmission system for disseminating fire intelligence information	–	–	–	2	–	–	2
5. Research on the initial attack effectiveness (e.g., production rates, line holding capability, etc.) of crews, helicopters, and airtankers	–	–	–	2	2	–	4
6. Research on the sustained action production rates of crews, heavy equipment, and airtankers	–	–	–	–	–	–	–
7. Development of guidelines and models that relate fire behavior characteristics (e.g., intensity, rate of spread, etc.) to fire suppression activities	–	–	–	2	2	1	5

Research activity	Type of NoFC role/involvement[a]						No. of respondents
	1	2	3	4	5	6	
8. Evaluation of the effectiveness and cost-efficiency of various strategies and tactics used in campaign fire suppression	–	1	...	2	1	–	4
9. Development of guidelines and software that will improve the efficiency of large fire suppression activities (e.g., servicing, planning, mop-up, etc.)	–	–	...	2	–	–	2
10. Development of guidelines on the use of backburning as a fire suppression tool	–	–	1	3	1	–	5
11. Research on the effectiveness of fuels management (e.g., thinning, green stripping, etc.) at increasing fire suppression effectiveness in high value areas	–	–	2	7	–	–	9
12. Research into the effectiveness of foam:							
a) ground application	–	–	1	3	–	–	4
b) aerial application	–	–	1	3	–	–	4
c) on structures	–	–	1	3	–	–	4
D. Fire Management Systems							
1. Development of the next generation fire management decision-support system (FMDSS) by integrating and enhancing the current fire management systems developed at Petawawa National Forest Institute and Northern Forestry Centre	–	–	–	5	2	–	7
2. Development of the next generation FMDSS that operates on the following workstation platforms:							
a) PC	–	–	–	–	–	–	–
b) UNIX	–	–	–	–	–	–	–
3. Development of a new spatial and quantitatively based preparedness planning module within the next generation FMDSS	–	–	–	2	–	–	2
4. Validation and cost-effectiveness of initial attack preparedness planning system	–	–	–	3	–	–	3
5. Development of guidelines and/or software for determining optimum aerial detection routes	–	–	–	1	1	–	2

Table N. continued

Research activity	Type of NoFC role/involvement[a]						No. of respondents
	1	2	3	4	5	6	
6. Development of a comprehensive forest fire threat assessment module within the next generation FMDSS	–	–	–	1	–	–	1
7. Development of a senior executive information module in the next generation FMDSS	–	–	–	–	–	–	–
8. Incorporate daily and seasonal economic analysis models for detection, prevention, pre-positioning and initial attack dispatch into the next generation FMDSS	–	–	–	1	–	–	1
9. Development of improved graphic information displays for fire management systems such as the Intelligent Fire Management Information System (IFMIS)	–	–	–	–	–	–	–
10. Development of training packages for FMDSS such as IFMIS	–	–	–	1	1	–	2
11. Development of guidelines for customizing fuel types used in a FMDSS	–	–	–	1	–	–	1
12. Research and development on the use of GIS in various fire management activities	–	–	2	3	–	–	5
13. Development of 3-dimensional fire growth models	–	–	–	1	1	–	2
14. Development of improved weather interpolation techniques that account for features such as elevation, aspects, lake effects, etc.	–	–	–	5	–	–	5
15. Development and application of surface wind models for fire management	–	–	–	4	1	–	5
16. Research and development of models for:							
a) human-caused fire occurrence prediction	–	–	–	3	1	–	4
b) lightning prediction	–	–	1	3	–	1	5
c) lightning fire occurrence prediction	–	–	1	4	2	–	7
17. Development of a comprehensive computerized prescribed fire effects information system	–	–	1	5	2	–	8
18. Research on how fire management principles can be incorporated into forest management planning activities such as harvest cycle planning, regeneration, stand tending, etc.	–	–	1	1	1	1	4

Table N. concluded

Research activity	Type of NoFC role/involvement[a]						No. of respondents
	1	2	3	4	5	6	
19. Development of an automatic vehicle location system for fire management	–	1	–	1	–	–	2
E. General							
1. Development and maintenance of a fire weather records archive for the Northwest Region	–	–	–	1	1	–	2
2. Development and maintenance of a fire management/research publications library at Northern Forestry Centre for use by client agencies	–	–	–	2	–	–	2
3. Research on the use of remote sensing for forest fuels mapping, analysis and monitoring (e.g., fuel moisture/green-up monitoring)	–	–	1	2	1	–	4
4. Fire history studies	–	–	1	3	–	1	5
5. Development of protection guidelines for the wildland/urban interface	–	–	–	5	1	1	7
6. Research and development on the impact that fire has on long-term wood supply	–	–	2	1	–	1	4
7. Development of a multi-resource valuing system for fire management	–	–	2	4	–	1	7
8. Research on the socioeconomic impact of fire management practices	–	–	–	–	–	1	1
9. Research on improved fire weather forecasting (especially long range forecasts)	–	1	1	5	1	–	8
Total	–	7	53	176	47	15	298
Percentage	–	2	18	59	16	5	100

[a] NoFC role/involvement ratings as follows:

1. Not involved.
2. Minor involvement (e.g., coordinating role, overseeing a contract, etc.).
3. Involved as a cooperator but not as the leading agency (i.e., the lead agency would be an operational agency, another Forestry Canada research lab, or another research institute like a university, and the Northwest Region would supply staff and/or funding assistance).
4. Acts as the leading agency but work would be conducted in close cooperation with the fire management agencies and/or other researchers.
5. Leading agency with little or no assistance from outside agencies or individuals.
6. Respondents unable to comment.

[b] Activity was not selected by respondents and thus no type of role/involvement was assigned.

APPENDIX 2
PARTICIPANTS

Fire Clients

J.E. Benson
Alberta Forest Service, Forest Protection Branch

G. MacCauley
Saskatchewan Parks and Renewable Resources

H.J. Boyle
Manitoba Natural Resources

R.P. Bailey
Northwest Territories Department of Renewable Resources

Canadian Parks Service
Western Region, Calgary

Canadian Parks Service
Prairie and Northern Region, Winnipeg

Alberta Industry

F. Row
Alberta Newsprint Co., Whitecourt

S. Lang
Alberta Pacific Forest Industries Inc., Edmonton

P. Latos
Blue Ridge Lumber Ltd., Whitecourt

J. Bauer
Canadian Forest Products, Grande Prairie

W. Thorp
Daishowa Canada Co. Ltd., Peace River

H.M. Millar
Millar Western Industries Ltd., Edmonton

M. Starnes
Procter and Gamble Inc., Grande Prairie

D.W. Laishley
Weldwood of Canada Ltd., Hinton

F.W. McDougall
Weyerhaeuser Canada Ltd., Edmonton

Alberta Government

C.A. Dermott
Alberta Forest Service, Timber Management Branch

C.J. Henderson
Alberta Forest Service, Reforestation Branch

R. Andrews
Alberta Fish and Wildlife

D. Chabillon
Alberta Recreation and Parks

Alberta Other

G. Leithead
Alberta Forest Products Association

B.P. Dancik
University of Alberta

P.J. Murphy
University of Alberta

P.M. Woodard
University of Alberta

R.W. Wein
University of Alberta

D. Quintilio
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T.A. Van Nest
Forest Technology School, Hinton

Saskatchewan Industry

R. Brooks
MacMillan Bloedel, Hudson Bay

B. Peel
Mistic Management, Meadow Lake

S.M. Smith
Weyerhaeuser Canada, Prince Albert

Saskatchewan Government

M.E. Little
Saskatchewan Parks and Renewable Resources

Manitoba Industry

W. Jonas
Repap Inc., The Pas

D. Chown
Abitibi-Price, Pine Falls

Manitoba Government

C.D. Rannard
Manitoba Natural Resources

Northwest Territories

A single survey was sent to Northwest Territories, who selected the participants. Survey respondents were selected by the Territorial Forest Fire Centre, which is indicated in the survey respondents list.

D. Ashton
Northwest Territories Department of Renewable Resources

J.E. Benson
Alberta Forest Service, Forest Protection Branch

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H.J. Boyle
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D. Chabillon
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H.J. Desjarlais
Saskatchewan Forest Fire Management Branch

R. Durocher
Abitibi-Price, Manitoba

R. Fingland
Canadian Parks Service, Elk Island National Park

L. Foley
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Northwest Territories Department of Renewable Resources

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Northwest Territories Department of Renewable Resources

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Canadian Parks Service, Wood Buffalo National Park

S. Kearney
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R. Kermer
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Northwest Territories Department of Renewable Resources

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J. McIntosh
Canadian Parks Service, Calgary

J. McQuarrie
Alberta Forest Service, Slave Lake

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Northwest Territories Department of Renewable Resources

J. Moll
Alberta Forest Service, Whitecourt

D. Morgan
Alberta Forest Service, Forest Management Branch

G. Norrie
Northwest Territories Department of Renewable Resources

N. Olsen
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K. Oshea
Alberta Forest Service, Bow-Crow

D. Patterson
Alberta Forest Service, Reforestation Branch

I. Pengelly
Canadian Parks Service, Banff National Park

D. Perraton
Alberta Recreation and Parks

G. Peterson
Manitoba Natural Resources

L. Schmidt
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R. Schwanke
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Daishowa Canada Co. Ltd., Peace River

H. Wollis
Alberta Fish and Wildlife

P.M. Woodard
University of Alberta

K. Zurfluh
Alberta Recreation and Parks

APPENDIX 3
QUESTIONNAIRE

A FORESTRY CANADA, NORTHWEST REGION

CLIENT SURVEY ON FOREST FIRE

RESEARCH, DEVELOPMENT, AND TECHNOLOGY

TRANSFER NEEDS

July 1991

Forestry Canada
Northwest Region
Northern Forestry Centre
5320 – 122 Street
Edmonton, Alberta
T6H 3S5

A Forestry Canada, Northwest Region Client Survey on Forest Fire Research, Development, and Technology Transfer Needs

Purpose -   The primary purpose of this questionnaire is to obtain the opinions and views of the major users of fire research, development, and technology transfer products developed at the Northern Forestry Centre (NoFC).

Format -   The questionnaire is divided into three parts.

Part I provides a fairly extensive list of potential research related topics. It is requested that each topic be rated on the basis of its current and future importance.

Part II requests that the highest priority projects (up to a maximum of 10) be listed and ranked and that the desired level of NoFC involvement be identified.

Part III is a short series of questions relating to the general process of fire research at NoFC and potential interagency cooperation.

Process -   Begin the survey by completing the **Client Information** box on this page. Then continue with the questionnaire on page 3. Instructions for each section are provided, however, if further information or clarification is required about any aspect of the questionnaire please do not hesitate to contact either Bryan Lee or Kelvin Hirsch at (403) 435-7210.

Client Information

1. Name _____   2. Agency _____

3. Position _____

_____

4. Address _____

_____

5. Type of position: Managerial _____   Operational _____

Research _____   Other (specify) _____

6. This questionnaire was completed:

Individually _____   Collectively[a] _____

_____

_____

[a] Please indicate major cooperators if the survey was completed collectively.

NoFC Fire Management Research Client Survey - Part I:

The objectives of PART I of the NoFC Fire Management Research client survey are to:

1) identify the current and anticipated fire research, development, and technology transfer needs within the Northwest Region of Forestry Canada, and

2) determine the **relative** importance of various fire research, development, and technology transfer projects to the user agencies.

Instructions: Please complete the following questionnaire by rating the present (i.e., next 1-2 years) and future (i.e., next 3-5 years) importance of each activity as it pertains to your agency (Low importance = 1, High importance = 5, Not applicable = na, Unable to comment = uc). Please note that the list of potential research studies given below is not all inclusive and therefore you are also encouraged to list and rate any additional projects in Section F.

Fire research/technology transfer activity	Present importance		Future importance	
	Low High		Low High	

A. Fire Behavior/Danger Rating

1. Validation of and/or further research on fire behavior in current Fire Behavior Prediction (FBP) System fuel types

    1 2 3 4 5 na uc   1 2 3 4 5 na uc

2. Research on fire behavior in fuel types not currently found in the FBP System e.g., mixed wood, spruce-balsam)

    1 2 3 4 5 na uc   1 2 3 4 5 na uc

3. Production of training packages and/or interpretive guides for the FBP System:
   a) workbooks, posters, etc.
   b) computer-assisted training packages

    a) 1 2 3 4 5 na uc   1 2 3 4 5 na uc

    b) 1 2 3 4 5 na uc   1 2 3 4 5 na uc

Fire research/technology transfer activity	Present importance							Future importance						
	Low			High				Low			High			

4. Research and development of moisture
codes that accommodate:

a) high latitude conditions	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
b) different aspects, slopes, and elevations	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
c) unique fuel types (cladonia, slash, etc.)	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc

5. Research on the effect of slope on rate of
spread and fire intensity   1   2   3   4   5   na   uc   1   2   3   4   5   na   uc

6. Validation of and/or further research on
the acceleration of wildfires from a point
source ignition   1   2   3   4   5   na   uc   1   2   3   4   5   na   uc

7. Development of comprehensive theories and
models that relate fire behavior to specific
fuel characteristics (e.g., density, age,
fuel loading, etc.)   1   2   3   4   5   na   uc   1   2   3   4   5   na   uc

8. Research on the fire behavior characteristics
of high intensity fires such as:

a) spotting	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
b) convection column dynamics	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
c) other (list) _____	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc

9. Research on the relationship of the upper
atmospheric conditions to severe fire
behavior   1   2   3   4   5   na   uc   1   2   3   4   5   na   uc

B. Fire Ecology and Use

1. Research on the silvicultural use of fire
for site preparation, mixed-wood management
stand tending, etc.   1   2   3   4   5   na   uc   1   2   3   4   5   na   uc

2. Research on the relationship of wildfires
and prescribed fires to wildlife habitat   1   2   3   4   5   na   uc   1   2   3   4   5   na   uc

3. Research on the ecological role of fire   1   2   3   4   5   na   uc   1   2   3   4   5   na   uc

Fire research/technology transfer activity	Present importance							Future importance						
	Low			High				Low			High			
4. Research on the use of fire for hazard reduction and fuels management	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
5. Development of guidelines and decision aids for planning prescribed burns	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
6. Research on the impacts of various types of ignition patterns and techniques	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
7. Research on the effects forest fires have on global warming	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
8. Research on the potential effect of climate change on future fire management scenarios	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
9. Research on smoke management issues such as:														
a) air quality	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
b) smoke distribution	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
c) other _____	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc

C. Fire Suppression

1. Research and development on the use of infrared scanners for:														
a) airtanker guidance	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
b) detection of holdover fires	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
c) near real-time (video) mapping of campaign fires	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
2. Evaluation of the effectiveness of various global positioning systems for use in fire management	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
3. Development and application of a geographic information system (GIS) seen area mapping system	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc

Fire research/technology transfer activity	Present importance							Future importance						
	Low			High				Low			High			
4. Development of a low cost video transmission system for disseminating fire intelligence information	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
5. Research on the initial attack effectiveness (e.g., production rates, line holding capability, etc.) of crews, helicopters, and airtankers	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
6. Research on the sustained action production rates of crews, heavy equipment, and airtankers	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
7. Development of guidelines and models that relate fire behavior characteristics (e.g., intensity, rate of spread, etc.) to fire suppression activities	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
8. Evaluation of the effectiveness and cost-efficiency of various strategies and tactics used in campaign fire suppression	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
9. Development of guidelines and software that will improve the efficiency of large fire suppression activities (e.g., servicing, planning, mop-up, etc.	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
10. Development of guidelines on the use of backburning as a fire suppression tool	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
11. Research on the effectiveness of fuels management (e.g., thinning, greenstripping, etc.) at increasing fire suppression effectiveness in high value areas	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc

Fire research/technology transfer activity	Present importance							Future importance						
	Low			High				Low			High			

12. Research into the effectiveness of foam:

	Present importance							Future importance						
a) ground application	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
b) aerial application	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
c) on structures	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc

D. Fire Management Systems

	Present importance							Future importance						
1. Development of the next generation fire management decision-support system (FMDSS) by integrating and enhancing the current fire management systems developed at Petawawa National Forestry Institute and Northern Forestry Centre	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc

2. Development of the next generation FMDSS that operates on the following workstation platforms:

	Present importance							Future importance						
a) PC	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
b) UNIX	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
c) other (specifiy) _____	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
3. Development of a new spatial and quantitatively based preparedness planning module within the next generation FMDSS	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
4. Validation and cost-effectiveness of initial attack preparedness planning systems	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
5. Development of guidelines and/or software for determining optimum aerial detection routes	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
6. Development of a comprehensive forest fire threat assessment module within the next generation FMDSS	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc
7. Development of a senior executive information module in the next generation FMDSS	1	2	3	4	5	na	uc	1	2	3	4	5	na	uc

Fire research/technology transfer activity	Present importance			Future importance		
	Low	High		Low	High	

8. Incorporate daily and seasonal economic analysis models for detection, prevention, pre-positioning and initial attack dispatch into the next generation FMDSS

| | 1 2 3 4 5 na uc | 1 2 3 4 5 na uc |

9. Development of improved graphic information displays for fire management systems such as the Intelligent Fire Management Information System (IFMIS)

| | 1 2 3 4 5 na uc | 1 2 3 4 5 na uc |

10. Development of training packages for FMDSS such as IFMIS

| | 1 2 3 4 5 na uc | 1 2 3 4 5 na uc |

11. Development of guidelines for customizing fuel types used in a FMDSS

| | 1 2 3 4 5 na uc | 1 2 3 4 5 na uc |

12. Research and development on the use of GIS in various fire management activities

| | 1 2 3 4 5 na uc | 1 2 3 4 5 na uc |

13. Development of 3-dimensional fire growth models

| | 1 2 3 4 5 na uc | 1 2 3 4 5 na uc |

14. Development of improved weather interpolation techniques that account for features such as elevation, aspects, lake effects, etc.

| | 1 2 3 4 5 na uc | 1 2 3 4 5 na uc |

15. Development and application of surface wind models for fire management

| | 1 2 3 4 5 na uc | 1 2 3 4 5 na uc |

16. Research and development of models for:
a) human-caused fire occurrence prediction
b) lightning prediction
c) lightning fire occurrence prediction

	1 2 3 4 5 na uc	1 2 3 4 5 na uc
	1 2 3 4 5 na uc	1 2 3 4 5 na uc
	1 2 3 4 5 na uc	1 2 3 4 5 na uc

17. Development of a comprehensive computerized prescribed fire effects information system

| | 1 2 3 4 5 na uc | 1 2 3 4 5 na uc |

Fire research/technology transfer activity	Present importance							Future importance						
	Low			High				Low			High			

18. Research on how fire management principles
can be incorporated into forest management
planning activities such as harvest cycle
planning, regeneration, stand tending, etc. 1 2 3 4 5 na uc 1 2 3 4 5 na uc

19. Development of an automatic vehicle location
system for fire management 1 2 3 4 5 na uc 1 2 3 4 5 na uc

E. General

1. Development and maintenance of a fire
weather records archive for the Northwest
Region 1 2 3 4 5 na uc 1 2 3 4 5 na uc

2. Development and maintenance of a fire
management/research publications library
at the Northern Forestry Centre for use by
client agencies 1 2 3 4 5 na uc 1 2 3 4 5 na uc

3. Research on the use of remote sensing for
forest fuels mapping analysis and monitoring
(e.g., fuel moisture/green-up monitoring) 1 2 3 4 5 na uc 1 2 3 4 5 na uc

4. Fire history studies 1 2 3 4 5 na uc 1 2 3 4 5 na uc

5. Development of protection guidelines for
the wildland/urban interface 1 2 3 4 5 na uc 1 2 3 4 5 na uc

6. Research and development on the impact
that fire has on long-term wood supply 1 2 3 4 5 na uc 1 2 3 4 5 na uc

7. Development of a multi-resource valuing
system for fire management 1 2 3 4 5 na uc 1 2 3 4 5 na uc

8. Research on the socioeconomic impact of
fire management practices 1 2 3 4 5 na uc 1 2 3 4 5 na uc

9. Research on improved fire weather forecasting
(especially long range forecasts) 1 2 3 4 5 na uc 1 2 3 4 5 na uc

Fire research/technology transfer activity	Present importance		Future importance	
	Low High		Low High	

F. Other Fire Research and Technology Transfer Activities (please list)

1. _____   1 2 3 4 5   1 2 3 4 5

    _____

2. _____   1 2 3 4 5   1 2 3 4 5

    _____

3. _____   1 2 3 4 5   1 2 3 4 5

    _____

4. _____   1 2 3 4 5   1 2 3 4 5

    _____

5. _____   1 2 3 4 5   1 2 3 4 5

    _____

6. _____   1 2 3 4 5   1 2 3 4 5

    _____

7. _____   1 2 3 4 5   1 2 3 4 5

    _____

8. _____   1 2 3 4 5   1 2 3 4 5

    _____

9. _____   1 2 3 4 5   1 2 3 4 5

    _____

10. _____   1 2 3 4 5   1 2 3 4 5

    _____

NoFC Fire Management Research Client Survey - Part II:

The objectives of the second section of the client survey are to:

1) prioritize fire research, development, and technology transfer projects based on their value to the user agencies, and

2) state the level of participation that the Northern Forestry Centre's fire research group should have on various research projects.

Instructions:

1) Based on Part I of this survey please select and prioritize the projects you feel are of the most importance to your agency. Please choose a maximum of ten projects, listing the highest priority project first and the lowest priority project last. Please indicate each project by survey number and an abbreviated title **(Example: A.3. Production of training packages).**

2) For each of the projects you have selected, indicate the type of role/involvement you believe the Forestry Canada, Northwest Region fire research staff should take in conducting this work. Please use the following scale and provide extra remarks where appropriate.

1. Not involved.

2. Minor involvement (e.g., coordinating role, overseeing a contract, etc.).

3. Involved as a cooperator but not as the leading agency (i.e., the lead agency would be an operational agency, another Forestry Canada research lab, or another research institute like a university, and the Northwest Region would supply staff and/or funding assistance).

4. Act as the leading agency but work would be conducted in close cooperation with the fire management agencies and/or other researchers.

5. Leading agency with little or no assistance from outside agencies or individuals.

6. Unable to comment.

Fire research/technology transfer activity	Role/involvement of Northwest Region fire research staff
1. _____ _____	1 2 3 4 5 6 Remarks: _____ _____
2. _____ _____	1 2 3 4 5 6 Remarks: _____ _____
3. _____ _____	1 2 3 4 5 6 Remarks: _____ _____
4. _____ _____	1 2 3 4 5 6 Remarks: _____ _____
5. _____ _____	1 2 3 4 5 6 Remarks: _____ _____
6. _____ _____	1 2 3 4 5 6 Remarks: _____ _____
7. _____ _____	1 2 3 4 5 6 Remarks: _____ _____
8. _____ _____	1 2 3 4 5 6 Remarks: _____ _____
9. _____ _____	1 2 3 4 5 6 Remarks: _____ _____
10. _____ _____	1 2 3 4 5 6 Remarks: _____ _____

NoFC Fire Management Research Client Survey - PART III:

The objective of the final section of this client survey is to obtain some general opinions on the fire research process at NoFC.

Instructions: Please complete each of the following questions.

1. The fire research process at NoFC has historically involved three types of activities:

   - Basic research – the discovery of new facts, principles, and theories (e.g., investigation of the relationship between relative humidity and fuel moisture),

   - Applied research or development – the use of existing knowledge or basic research to develop new or improve products, processes, or systems (e.g., the creation of the FWI System to assess fire danger),

   - Technology transfer – the dissemination of research information so that it can be put into operational use (e.g., conducting workshops on the FWI System for fire management staff).

   (a) Please indicate (in general) what percentage of time the NoFC fire research unit (as a whole) should spend on each of these activities.

   Basic research   _____

   Applied research   _____

   Technology transfer   _____

   (b) Do you believe that effort should be put into basic research even if it is possible that the work may not have an immediate operational application?

   Yes _____   No _____   Sometimes _____

   Remarks: _____

   _____

   _____

   _____

   _____

2. The Forestry Canada NoFC fire research group has an annual budget of approximately $40,000. With this level of funding intensive field work on research projects is difficult.

   Do you feel that the fire management and other resource management agencies should support the efforts of the NoFC fire research group by providing:

   Direct funding   Yes _____ .   No _____

   Direct support   Yes _____   No _____
   (e.g., aircraft time, crews, etc.)

   Staff time   Yes _____   No _____

   Remarks: _____

   _____

   _____

3. If a specific research project is conducted in one province or territory but the results of that project are applicable to your agency, would your agency be willing to support the project by providing:

   Direct funding   Yes _____   No _____

   Direct support   Yes _____   No _____

   Staff time   Yes _____   No _____

   Remarks: _____

   _____

   _____

   Do you feel that funding provided under the federal/provincial forestry agreements should be used for these types of projects?

   Yes _____   No _____

   Remarks: _____

   _____

   _____

4. Interdisciplinary research, when carefully planned, should provide better answers to practical questions than when work is conducted more or less in isolation. For this reason, managers within Forestry Canada and the Northwest Region are planning to have some of their staff participate in more interdisciplinary projects (e.g., fire staff working with silviculture staff, etc.). Given that some of these projects address broader forest and resource management issues, what percentage of time should NoFC fire resarch staff be spending on this type of work?

Percentage _____

Remarks: _____

_____

_____

5. Please provide any other comments, either general or specific, relating to fire research at the Northern Forestry Centre that you may wish to convey at this time (please use extra pages if required).

_____

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