Status of ice hockey in the New England colleges

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SNOW - 1935

"STATUS OF ICE HOCKEY IN THE NEW ENGLAND COLLEGES"

by

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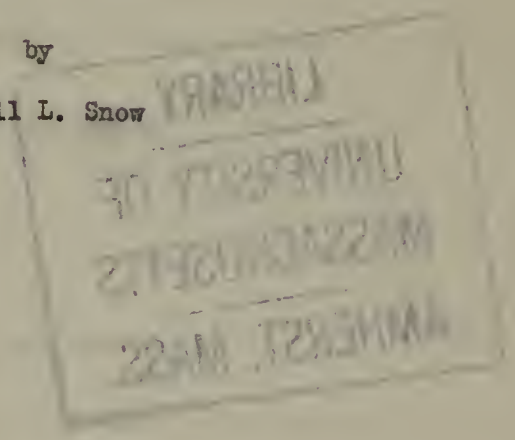

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INTRODUCTION

Directors of physical education programs, and especially those whose programs include the game of ice hockey, have undoubtedly met with the very problem forming the basis of this thesis. The problem is certainly not a new one, but has never, as far as the writer can determine, been thoroughly or scientifically attacked in the light of its most important factors.

Realizing the instability of the game of ice hockey on the physical education programs, the writer determined to make a study of it as an intercollegiate sport in order to determine the feasibility of continuing the game at schools and colleges in the latitude of New England.

SIGNIFICANCE OF THE PROBLEM: The elimination of ice hockey from the physical education programs of several colleges in New England and a threatened discontinuance of the game at others has raised a definite question as to the feasibility of continuing the sport. It is the purpose of this paper to discover, if possible, the outstanding factors which have led to the abandonment or threatened abandonment of the game, and to determine whether or not these factors constitute just reason for discontinuing the game or if the difficulties can be remedied to an extent justifying the continuance of the game. The results of such an attempt should be useful to all those who meet with the same problem, as well as to those who in the near future may consider the adoption

of the game for their winter physical education program. With this in mind, the writer has tried to select the most significant factors in relation to the problem, to make a thorough study of each, and to present the results in an impartial way.

LIMITATIONS IN SCOPE OF PROBLEM: The very nature of the problem indicates several necessary limitations in its scope. In the first place, the writer has been careful to limit the study to the New England colleges. To be sure there are many other colleges in the same latitude as New England. On the other hand, however, New England constitutos a convenient geographical unit, representing a latitude with conditions peculiarly adaptable to the problem. For example, average temperature conditions, during the winter months, range from the favorable to the unfavorable in this region.

Secondly, any attempt to cover all the factors entering into the problem would lead to inaccuracy and confusion. For this reason the study has been limited to the most important factors affecting the problem. A complete study of the ice hockey rules, for example, would have little bearing on the subject of the feasibility of continuing hockey in the colleges, whereas a thorough study of the average financial status of hockey in the physical education programs of the colleges might reveal some valuable information.

A third limitation had to be made in regard to the class of institution included in the study. High school, Preparatory school, and amateur hockey, therefore were almost entirely eliminated, although not because the writer did not believe that these institutions were faced with the same problem, but in order to make the problem more wieldy. In fact, a certain similarity in the problem facing all these institutions was assumed, making the application of the results of this study, if this assumption is correct, significant for all.

The three limitations in the study were deemed advisable in order to reduce the magnitude of the problem and to consolidate the results.

LIMITATION OF STATISTICS: In view of the numerous elements involved in the problem, there are numerous statistical analyses that could have been made but it is certain that they would have had little or no effect upon a solution of the problem. Since no study of a similar nature appears to have been carried on, certain limitations had to be made in the statistical evidence presented. With a great deal of data and such a variety of statistics, simple totals and averages seemed to be the best indicators. Correlations, although possible, were deemed of no great importance.

ORIGIN AND HISTORY OF HOCKEY

There are many versions concerning the origin of ice hockey as a game. The prevalent idea seems to be that it originated in Canada where there is an abundance of ice and good skating four months out of a year. Although this idea is the most prevalent, and sounds logical enough, probably the version given by R. F. Kelley in this article entitled, (1) "Fastest Game on Two Feet", is the most accurate. He traces the motif of the game into ancient history and does so convincingly. In this article he not only states the origin of the game but he also tells what the game is, what it calls for, and points out the high lights in its history.

"What is hockey?.....It calls for more various qualities from its individual players than any other one sport in which Americans engage.....The paramount and prime requisite of hockey is speed, lots of it. More speed in fact than any other game in which the human race plays, and stays on two feet to do it.....Not only speed of foot, or should it be skate, but speed of eye, and mind--every muscle of the body and with it all must be absolute coördination--a masterful command of the body.

"The present game of ice hockey as it is now played throughout the leading universities and athletic clubs of the north, came to us from England and Scotland by way of

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(1) Kelley, R. F. "Fastest Game on Two Feet" Outing--77:132-3. December, 1920

Canada. Up there in the Dominion, hockey holds relatively the same position in the hearts of sports lovers as baseball holds in this country. If the desire is felt, it is possible to trace the motif of the game back to the pages of ancient history, where we find the old Romands knocking a feather-filled sphere about with crooked sticks. The English version was about the same, governed by a few rules. From the fields, it was only a step further to the ice and the consequent development that has brought the game up to a state as highly specialized and scientific as any of our sports.

"In 1880 the game came to Montreal, Canada, and fourteen years later a team made up of players from the various American universities made a trip through the Dominion and came back, to lay the foundation for the present structure of the sport in this country. The leading clubs of the country followed the lead of the universities and then the schools dropped into line."

Another article entitled, (2) American Hockey Goes Home to Europe" also gives something of the origin of the game.

"Considering that ice hockey is of English origin, it is strange that England cannot now offer any real native competition..... .....Most unusual when one recalls that it was Major B. M. Patton's sextet, representing the British Ice Hockey Association, that introduced the game to continental Europe back in 1904.....Still earlier in the 1880's when

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(2) "American Hockey Goes Home to Europe"
Literary Digest, 117:32. January 13, 1934.

Lord Stanley was Governor-General of Canada, the story has it that the English members of his suite introduced the game of ice hockey to the Dominion--The game that has since become the Canadian national sport."

Hockey, as ice hockey then, probably had its origin in England or Scotland. From there it was undoubtedly introduced to the continent of Europe and to Canada. In the regions where cold weather prevailed and ice was abundant, as in Switzerland or Canada, the game flourished. In 1894 the game made its entrance into the United States. Already skating had been common throughout New England, but the inception of this new game created a new interest that took a strong hold on and fascinated the skating public. A few years later organized teams were formed and competition spread. An article (3) in the magazine "Outing" entitled, "Hockey and Its Handicaps", tells of one of these first clubs that undoubtedly did a great deal for the game in this country.

"One of the organizations which has rendered great service to the cause of hockey, not only in the vicinity of New York, but throughout the whole eastern section of the United States, is the St. Nicholas club. Originally started as a skating organization, St. Nicholas was represented by one of the first teams which took the ice when a serious interest in the sport began to develop in America. The encounters between the St. Nicks' and the team which

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(3) "Hockey and Its Handicaps". Rink Side. Outing. 67:631-3. March, 1916.

represented the New York Athletic club served to introduce the game in the Metropolitan district. Throughout the years which have intervened the St. Nicholas Club has consistently stuck to the policy of clean amateurism. It has attracted to itself a public following which supports the team through thick and thin."

But before the game ever came to this country it had taken great strides in the Dominion. After its inception in Montreal in 1880 it spread rapidly throughout Winnipeg and Saskatchawan where conditions were very favorable for its adoption. By 1895 the game had spread all over populated Canada and was played by colleges, schools and amateur clubs.

As early as 1881 the Canadians began forming rules to govern the playing of the game. The "on-side" rule was the fundamental rule of the game in these days and probably led to the inception of other rules later on. At this time McGill University is said to have adopted the game and drawn up a set of rules which remained unchanged for many years. The rules at this time provided that each team should be made up of seven men, goal, point and cover point, these last two called the defense as at present, but one stood in front of the other in those days instead of side by side as they do now, and then a rover, center and two wings. These last four take the place of the center and wings of today and were known as the forwards and did practically all of the

offensive work. They had to be good skaters and fast. The defense had to be able to prevent the puck or the man from getting past him to his goal. He had to be well balanced and sturdy. Stamina was required of all the players because no substitutions were allowed in those days except possibly in case of injury.

The game was first played on open ice, huge areas being kept clear on lakes and ponds for the numerous clubs. A little later the Canadians built banks to enclose their rinks and then started enclosing the rinks with boards. The construction of rinks developed rapidly in Canada. Before long crude covered rinks were erected in the larger cities. These later developed into the huge enclosed, heated, and lighted arenas with artificial ice as we know them in this country today.

Uniforms were unknown at first. A pair of skates and the ability to use them, and a stick were the only essentials. It was not long, however, before some of the better clubs began to get interested in equipment. They developed shin guards, padded gloves and pants, and better skates and sticks. Later, shoulder pads were introduced.

Returning to the history of the game in this country, it may be said that it is difficult to determine exactly where it started. Some say Baltimore, others, New York. The chances are the game was first played in parts of northern New England shortly after its inception in Canada. Certain it

is, however, that the game got off to a good start in New York as early as 1895. At this time the old New York Hockey Club began playing in the Ice Palace on Lexington Avenue. They usod the Canadian rules and the teams were the same, seven men on a side.

During the period 1895 to 1915, hockey took great strides in Canada and the United States. The rules were gradually changed to meet the new needs. Speed became the criterion of the best teams. The cover point began to loosen up and play more offensively. The defense began to play out of line more than ever.

The colleges began to take up the game at this time. Yale, Princeton and Harvard all introduced the sport and formed an intercollegiato league. Interscholastic leagues began to appear at the latter part of this period.

The professional leagues began to develop in the early 1900's and have taken great strides since that time as indicated in a quotation from "Al" Wilson of the New York Evening World published in the Literary Digest in 1927. (4)

"Hockey was originated in Canada over forty years ago, for thirty years it has been played in the United States, and for the last twenty years the professional division has been in existence. The 'pro' game has compared, on the whole, with the amateur and college sport as organized baseball has with the 'semi-pro' and amateur variety of that game."

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(4) "How Puck Chasing Has Become Our National Winter Sport" Literary Digest. 92:78-9. January 15, 1927.

An article entitled, "Number of Things", printed (5) in the New Republic of February 16, 1927, shows in a manner the rapid development of the sport in this country.

"American efficiency has conquered again. It has taken an obscure sport, of which few persons know anything, and in a few months has standardized it, advertised it, and as we love to say, has 'put it over with a bang'. The sport is hockey. Not so long ago, this gentle pastime was played only in Canada, and occasionally in impromptu fashion by a few New England mill pond skaters. Now it has suddenly blossomed out with expensive rinks in several Eastern cities, a series of professional, 'semi-pro', and amateur leagues, and a following of persons willing to pay $2.20 or $3.30 to see three games in succession in an evening. The game is furiously fast and full of thrills and picturesque incidents."

About 1910 came the important developments in the game. The defense, point and cover point, began to play side by side. Another rule, that originated in the schools, was that of free substitution, allowing substitution of men at any time providing a player once removed could not become reinstated. The game was opened up--that is, became more offensive in nature and thus of course was still further speeded up.

The war struck the game hard and for several years very little was done with it. The game was not played in service

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(5) "Number of Things". New Republic. 49:359. February 16, 1927.

and the ammonia was withheld from the artificial ice arenas preventing their opening. The St. Nicholas rink was closed. Prematurely, "Hobey" Baker, one of the greatest players of all times, was killed in action while in the service of the air corps. This was indeed a severe blow to the game.

Recent years have seen the changes that have developed the present day game. The six man team, namely, the two wings, center, left and right defense, and goal, was introduced in 1921 through the amateur teams. The 'zones' were also developed by the amateur teams. In a like manner the game has been standardized throughout, enabling the American teams to meet on even terms the best teams from Canada.

The last few years have seen many developments in the game in this country, especially among the amateur and professional teams. College teams in general have not progressed so rapidly because of certain handicaps, although some of the larger educational institutions have made the game a major sport and have gone to considerable expense to secure the best facilities.

The game has actually developed into the "Fastest Game on Two Feet", and its organization and popularity have developed rapidly.

SURVEY OF LITERATURE

RESTRICTIONS: The nature of this study limits the subject matter of the literature to be reviewed to that pertaining to the main elements in the problem. Literature pertaining to ice hockey facilities, the weather in relation to hockey, the financial status of hockey on physical education programs, and the value of the game to winter physical education programs, shall, therefore, be included in the survey. An attempt will be made to point out the leading contributors in each of these fields.

Quite interesting is the fact that the literature in all these fields is extremely limited, little work of note having been done in any one. Perhaps the reason for this lack of literature on the subject may be found in the fact that ice hockey is a relatively new sport.

TYPES OF LITERATURE INVOLVED: There are no books, studies, or articles published, to the knowledge of the writer, that completely cover the important factors involved in the subject of "The Status of Ice Hockey in the New England Colleges". There are a few books, certain parts of which have a bearing on the matter. These books will be reviewed for the contributions they have to offer to the subject.

Periodical literature contains numerous articles with considerable information which is significant in relation

to certain parts of the subject. For example, there are several good articles on ice hockey facilities and their maintenance. These articles will also be reviewed for practical suggestions bearing on the problem at hand.

BOOKS: All books written on the subject of ice hockey deal mainly with the history of the game, the rules, and how the game should be played. Very few of them mention facilities, weather, or finances. Two such books are (6) "Ice Hockey; How to Play and Understand the Game" by Sales and Hallock, and (7) "Ice Hockey" by Fisher. The former has a good chapter on the history of the game and some good information as to how the game should be played, but little mention is made of anything important pertaining to the problem of the feasibility of maintaining ice hockey as an intercollegiate sport. The latter, however, has a fair chapter pointing out the values of the game and another giving good specifications for a pond rink. Neither one of these books, however, have anything of note to contribute to this study. Specifications for ice hockey facilities may be found in the "Official Ice Hockey Rules" (8) as recommended by the Rules Committee of the National Collegiate Athletic Association 1934-35. Rule one pertains to the rink and rule two to the

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(6) Sayles, A., and Hallock, G. "Ice Hockey: How to Play and Understand the Game. A. S. Barnes & Co., New York, N.Y.

(7) Fisher, Thomas K. "Ice Hockey". Charles Scribner's Sons, New York and London, 1926. Chapter IX.

(8) "Official Ice Hockey Guide". American Sports Publishing Co., New York, 1934.

goal cages. These rules define the limits of facilities but do not describe methods of construction.

The department of Physical Education at Peabody College has published a booklet (9) "Diagrams of Facilities for Organized Games". "Issue Number Two" pp. 12 gives a diagram of an ice hockey rink and specifications for its construction.

There are several books published on subjects related to ice hockey which makes significant mention of that sport. Among the books in this category is (10) "American College Athletics" by Howard J. Savage, a study sponsored by the Carnegie Foundation for the advancement of teaching.

"Recent discussions of the uses and purposes that the various branches of college athletics may serve have brought forth two important observations. In the first place, certain contests, being games of youth, are useful almost exclusively during school and college days. Among this number are to be found most of the contests of personal encounter, or bodily contact,.....hockey. Inspection of Table IX. in this same book, relative to the medical supervision of college athletics reveals that medical supervision is unevenly distributed over the various branches of athletics, and that hockey is lacking in medical supervision.

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(9) "Diagrams of Facilities For Organized Games" Peabody College - Department of Physical Education. Issue No. II. pp. 12.

(10) Savage, Howard J. "American College Athletics". The Merrymount Press. Boston, 1929. Table IX.

Williams and Hughes in (11) "Athletics in Education" recommend the adoption of hockey on intercollegiate programs along with other minor sports in order to increase participation in intercollegiate athletics. They recommend also that all the schedules be shortened if necessary to accomplish this. Financial losses in hockey are about average compared with other sports according to Williams and Hughes.

E. D. Mitchell in (12) "Intramural Athletics", stresses the fact that it is difficult to maintain proper ice facilities and schedules are thus deranged. For schools with good facilities, however, he points out that hockey is an excellent sport.

Draper and Smith in (13) "Intramural Athletics", point out that the selection of sports to be offered depends largely upon two factors--the value of the sport to the pupil and to the school, and the probability of success once it is introduced. A study by a group of advanced students at Columbia University arranged boys' activities in the order of value to junior and senior high school groups. The values for consideration were the worth of the event to the individual in school in terms of physiological, mental, and social needs, and the practicability of the event as an item in the physical education program. Hockey rated eleventh out of eighteen

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(11) Williams, J. F. and Hughes, W. L. "Athletics in Education". W. B. Saunders Co., Philadelphia and London, 1930.

(12) Mitchell, E. D. "Intramural Athletics". A. S. Barnes & Company, New York, 1925.

(13) Draper, E. M. and Smith, G. M. "Intramural Athletics". A. S. Barnes and Co., Inc., New York, 1930. Chapter III.

activities, following the track and field events. "Relative Value of Physical Activities in High School" by Henry S. Curtis rated hockey ninth for a high school program out of sixteen sports. This rating was based on cost and space, feasibility and exercise, appeal, loyalty, co-operation, safety, corrective value and years continued life value.

PERIODICALS: Those periodicals dealing with the history of hockey were reviewed in the first part of the study under the "Origin and History of Hockey".

One of the most important articles in regard to facilities is that of J. R. Batchelor (14) entitled "Skating Rinks and How to Make Them".

"Fundamentals to observe in making a skating rink.

1. Ground and surface
   a. Level
   b. Clay best. Avoid sand
2. Banks
   a. Plough one forrow around. Tamp to eliminate air
   b. 2" Plants - 2 x 4" stakes at joints. End to end on edge. Stakes driven in one inch nailed to planks
   c. Snow banks generally inefficient
3. Sprinkling and freezing process

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(14) Batchelor, J. R. "Skating Rinks and How To Make Them". Playground. 16:565-6. February, 1923.

a. Very cold weather. Spray bottom of banks continually to prevent leakage. Spray at night

b. Hose with no nozzle best

c. Build up a surface allowing time for freezing 2 to 4" (attach inner tube to hose and let water fill rink, drawing hose towards the supply)

d. Mill hose good

e. Connection inside or valve buried and protected by manure

f. Shelter house. (Knockdown type good--24 x 20'. Round coal stove in center)

4. Care of rink

a. Scrape ice before flooding. Iron scraper 4 x 3' - 18" high at back

b. Not necessary to sweep rink. Fill holes or cracks with hot water. Sprinkle at coldest time of day. Let freeze all night

5. Lighting

a. Cable strung at intervals of fifty feet across the rink with a string of incandescent lamps."

The most interesting article on facilities probably is the one published in "The Illustrated World" in August 1916 entitled (15) "Mineral Ice for Skating Rinks". This article

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(15) "Mineral Ice for Skating Rinks" Illustrated World 25: 2782-3. August, 1916.

describes a mineral ice--a substitute for natural ice--which can be laid over any surface and costs $1 a square foot. The mineral is laid in a liquid form and requires only twenty-four hours to harden. It resembles natural ice although it does not cut under sharp skates. Maintenance requires monthly smoothing with an electric floor surfacer. Properties of the material allow for great speed and quick stopping on skates. It has no injurious properties. The material was developed and tried at Ocean Park, Los Angeles. Thorough tests apparently allow unqualified approval of the material. Why it has not been used more extensively the writer has been unable to determine. The material has been tried several times on the West Coast but never in the East to the knowledge of the writer.

There are two articles dealing with the lighting of outdoor hockey rinks. The first of these, (16) "Ice Skating Rinks" by E. F. Morgan recommends the use of twenty 100 watt lamps--four strings with five on a string. Suspended lighting is best according to Morgan. The other article, (17) "Lighting for Outdoor Winter Sports", by W. D'A Ryan recommends the lighting of rinks because generally the evening is the best time to play the game, as it is colder and more convenient. Ryan recommends the use of a few flood lights--1000 watts

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(16) Morgan, E. F. "Ice Skating Rinks". Recreation. il. 25:613-14. February, 1932.

(17) Ryan, W. D'A. "Lighting for Outdoor Winter Sports". Recreation. il. 25:614-16. February, 1932.

with diffusing lenses 25 to 30' high close to the rink. The total load should be 1/20 to 1/30 watts per square foot of objective area and should be more intense than this for hockey. He also recommends suspended lighting. J. N. Harman, Former Commissioner of Parks in New York City, in (18) "Summer Parking Space Becomes Winter Skating Rink" in "American City", December 1923, describes how New York City supplies skating surfaces for the public. The greatest advantage in the parking spaces, according to Harman, is that they can be flooded and frozen quickly. This may contain the germ of an idea for the building of a college rink providing a parking space is available.

T. H. Fewless in (19) "Care of Municipal Skating Rinks" in "American City" Recommends scraping and brushing before flooding rinks, claiming that particles left on the ice tend to make the new ice granular rather than smooth.

The most significant periodical article is that of Westcott E. S. Moulton entitled, (20) "Care of an Outdoor Ice Hockey Rink" printed in the "Scholastic Coach", January 1935. Mr. Moulton is director of athletics at the Pomfret School in Pomfret, Connecticut. He also coaches hockey. This article

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(18) Harman, J. N. "Summer Parking Space Becomes Winter Skating Rink". American City. il. 29:580-1. December, 1932

(19) Fewloss, T. H. "Care of Municipal Skating Rinks". American City. il. 27:315. October, 1922.

(20) Moulton, Westcott E. S. "Care of An Outdoor Ice Hockey Rink". Scholastic Coach; Vol. 4, No. 5. January, 1935.

points out ways of preventing natural ice on hockey rinks from melting along the boards due to the absorption of heat from the rays of the sun. Moulton recommends that the rink be laid out so that only one end is affected by the noonday sun. Along with this, placing snow over the ice during the day helps to keep the ice. Painting the boards white is another method of preventing the absorption of the sun's rays. One of the best methods according to Moulton is the placing of heavy mesh wire in the bottom of the boards to allow the circulation of air. The boring of holes in the boards near the ice is also effective. Moulton highly recommends the sweeping of the rink after each practice to insure good firm ice. Stable brooms are the best for this work. Moulton recommends for the blue lines Alabastine paint mixed with water and heated, to be applied in a narrow line directly before the game, and washed off afterward. Common bluing is also supposed to work well.

There is nothing in any type of literature treating the subject of "The Status of Ice Hockey as an Intercollegiate Sport". There are not to be found any complete studies indicating the relation of weather to the game of ice hockey. No survey of the New England Colleges has ever been made to determine the status of ice hockey on the physical education programs.

No study such as this has ever been published that shows the status of ice hockey in the New England Colleges and that throws light on the feasibility of adopting, continuing or dropping the sport.

MATERIALS AND METHODS

Vitally important to a study of this nature is a thorough knowledge of existing conditions. Very few optional methods are possible for obtaining this knowledge, however. The most effective method, of course, is that of first hand information gained by personal study. In view of the fact, however, that the writer had neither the time nor the means to devote to this method, the logical step was to adopt the method of the questionnaire and to rely on the information of others. This was done, and it was decided to develop a questionnaire to send to all the New England Colleges, that would cover the following topics; hockey schedules, financial status of hockey, hockey in the intramural program, stability of college hockey, participation in college hockey, ice hockey facilities, maintenance of ice hockey facilities and miscellaneous data. These topics will be discussed later on in the light of the questionnaire results as tabulated in the following pages.

OBSTACLES TO OVERCOME. Certain obstacles must be met and overcome in the development of an effective questionnaire. For example, there must be an introduction to the questionnaire that will catch the interest of the prospective informant and provide him with the incentive to answer completely and return the questions. With this fact in mind, the writer introduced the questionnaire with the question, "Would you be willing to fill out the following questionnaire and return the same

in the addressed and stamped envelope enclosed?" Psychologically, starting the questionnaire with a question is sound for it would serve the double purpose of inducing the reader to read further and would also leave a question unanswered in his mind until some reply had been made. Another point to be noted here, is the fact that this introductory question informed the prospective informant that an addressed and stamped envelope was enclosed for returning the answered questionnaire. This would tend to overcome the inertia which is so often the result of having to answer and then address and mail a questionnaire. The introductory question was followed by a paragraph stating the purpose and the importance of the information desired. The questions were selected for their brevity and importance in relation to the information desired. Brevity of reply was also considered. Enough space was left so that the questions could be answered on the same sheet. The complete questionnaire follows:

Would you be willing to fill out the following questionnaire and return the same in the addressed and stamped envelope enclosed?

In the preparation of a thesis on ice hockey, the writer is trying to determine the feasibility of continuing the sport at Massachusetts State College and other New England schools and colleges. The following questionnaire involves data which is extremely valuable to the writer. Some degree

of care taken in the filling out of this questionnaire will materially aid the accuracy of the results.

1. Name of institution
2. Location (town and state)
3. Is ice hockey included in your intercollegiate sports program?
   - A. How many games do you play? (average) (per season)
   - B. How many home games do you play per season? (average)
   - C. How many games do you play away per season? (average)
     - (1) What is the farthest distance you travel to play?
       - a. Do you get a guarantee?
       - b. Does the guarantee pay traveling expenses and keep? Or more?
       - c. Do you lose money on trips? If so how do you pay for trips?
   - D. Does your hockey schedule pay for itself?
     - (1) What are your average returns?
     - (2) What are your average costs?
     - (3) What item involves the greatest expense?
     - (4) What item involves the greatest source of funds?
   - E. How many games have you postponed per year? (average)
     - (1) What is the greatest cause of postponement?
       - a. Would a covered rink help in executing your regular schedule?

4. Is ice hockey included in your intramural program?

   A. Do you have an interclass program?

   B. Do you have an interfraternity program?

   C. Do you play these programs in the afternoons or evenings?

   D. How many participate per year in these programs? (average)

   E. What are your yearly costs of maintaining this program?

   F. Have you any outstanding difficulties with your intramural program? List.

5. Have you recently dropped hockey? Reasons.

6. Have you recently adopted hockey? Reasons.

7. Name of varsity coach? State experience.

8. How many men each year are included on your varsity squad? (average)

   A. Have you a junior varsity and second teams?

      (1) Approximately how many participate on these teams during the season?

9. Approximately how many men participate in your intramural program per year?

10. What ice facilities have you? Check--

   A. Pond rink

   B. Artificial ice--seating capacity? Can you enclose plans of plant? Costs for use if rented?

   C. No boards

D. High boards

E. Low boards

F. Shallow rink (on tennis courts or high hard ground)

G. Deep rink (dug out swamp land or adjacent to pond)

H. Covered rink, natural ice

(1) Seating capacity, facilities. Could you enclose plans?

I. If none of these types, state what

J. How far is your rink from the dressing rooms?

K. How do you keep your ice surface?

(1) Do you scrape the ice?

a. How

b. Paid help or students?

(2) Do you plane the ice?

a. How?

(3) Do you flood the ice? How and when?

(4) If none of these how do you prepare the ice?

(5) Do you scrape the ice between periods?

a. How?

b. Who does the work, paid help or students?

(6) Make note of methods used in keeping your ice surface, such as painting the boards white, moving boards off, use of screening, preparations used for the blue line, how you keep the rink from absorbing the sun's rays, etc.?

L. What kind of nets do you use? Check--

(1) Ordinary (sloped one piece back net)

a. Iron or wooden?

b. State kind of netting used

(2) Art Ross

(3) Other kinds. State what.

(4) How do you fix the nets to the ice? Check--

a. Permanent iron fastenings set in the ice?

b. Nailing or spiking?

c. Sharpened uprights for driving into the ice?

d. If none of these, describe.

11. What facilities have you for public skating?

A. Approximately how many take part per year?

12. Have you any suggestions for improving the game or changing the rules?

13. From what part of New England do most of your players come?

A. Do you give athletic scholarships to hockey players?

B. Do you provide work for hockey players?

14. Do many of your graduates participate in hockey?

15. Have you any problems in the management of hockey?

16. What values do you see in the game?

17. Do you feel justified in keeping the sport under your present conditions?

METEOROLOGICAL OBSERVATIONS. The weather undoubtedly plays an extremely important part in this study. For this reason, it was decided to make a thorough study of the weather conditions during the winter months. Naturally, certain conditions limit the nature and extent of such a study. For example, it was necessary for the writer to select a locality with a longitude and latitude where the results of such a study would constitute a reliable indication of the effects of weather on the sport in New England. With this in mind, then, the writer selected Amherst, Massachusetts, latitude 42° 23' 48.5" N. Longitude 72° 31' 10" W. The average temperatures varying from this locality from 5° less in northern Maine, New Hampshire and Vermont to 2½° more in southern Connecticut and Rhode Island. The meterorological observations were obtained from the Experiment Station of the Massachusetts State College, for a period of twenty years (1915-35), for the months of December, January and February.

Daily averages of temperatures, hours of bright sunlight, and precipitation were determined and the results put in the form of a graph. Monthly averages were also determined. These results, giving the average weather conditions during the normal hockey season, were then interpreted on the basis of their relation to the game of ice hockey.

INTERVIEWS AND LETTERS. A certain amount of information in regard to the weather and ice hockey facilities was gained

through the mediums of interviews and letters. This information will be discussed in relation to the factors in the problem as they are discussed later on.

OBSERVATION. Observation and first hand knowledge of some existing conditions in relation to the problem cannot be overlooked. The writer has done his best to eliminate any prejudices in departing this information which will also be expounded later on in connection with the elements in the problem.

METHOD OF PROCEDURE. In general, the method of procedure has been indicated under the discussion of materials although a few parts have been omitted. A master sheet was used in order to facilitate the tabulation of the questionnaire results. Sections of this sheet have been printed under different topics for discussion. The geographical distribution of reporting colleges will be kept in mind during the interpretation and discussion that follows.

INTERPRETATION OF DATA

COLLECTION OF DATA. QUESTIONNAIRE: The questionnaire was mailed to twenty-six New England Colleges and nineteen answers were received, yielding a 73% return. All the major colleges were included in the number from which answers were received except two.

The geographical distribution of answered questionnaires may be seen on page 31, showing twelve colleges with hockey and seven without. It is interesting to note that the majority of colleges with hockey are either north of Massachusetts or are located near some large center of population where artificial ice is available, such as Boston or Providence. We might conclude from this showing that, on the whole, conditions south of the Massachusetts-New Hampshire State line have been found unfavorable for the support of the game under natural conditions.

The results of the questionnaire have been recorded in tabular form, giving a picture of general conditions. Totals and averages have been taken wherever it was deemed advisable in order to establish a better picture of the general prevailing conditions of the sport on physical education programs in the New England colleges.

Where questions were asked and results not tabulated, they will be explained and results given following the table under the appropriate heading.

All the data from the questionnaires having been recorded, therefore, one can start with the first element in the problem and determine, objectively, all the conditions of the problem.

The results of the studies of the weather as affecting ice hockey will be discussed later.

GEOGRAPHICAL DISTRIBUTION OF ANSWERED QUESTIONNAIRES

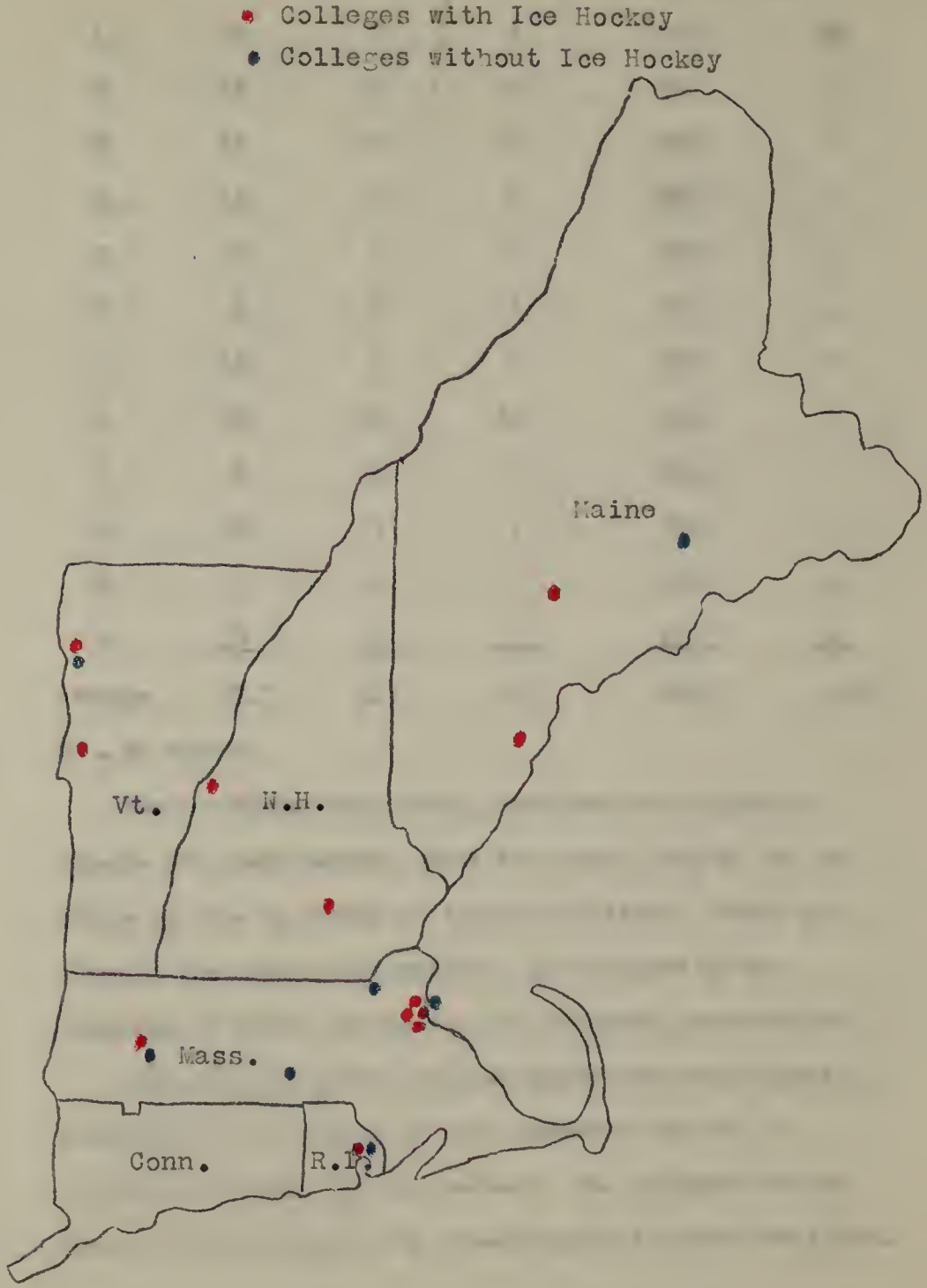


Table I

Hockey Schedules

College	Av. No. Games per season	No. Home	No. Away	Farthest Distance Traveled (miles)	No. Games Postponed
A	10	5	5	150	NR
B	12	4	8	350	0
C	12	8	4	300	2
D	12	8	4	400	0
E	10	6	4	200	2
F	8	5	3	250	1
G	12	6	6	250	2
H	20	10	10	300	0
I	8	3	5	150	2
J	10	3	7	270	2
K	5	2	3	100	1
L	14	9	5	175	0
Average	11.1	5.7	5.3	241.2	1.09

NR = No Report

Those colleges postponing games gave the following reasons for postponement: Poor ice, snow, lack of ice, or change in date in rental of indoor facilities. These are given in the order of importance, as indicated by the frequency of their occurence on the answered questionaires.

Nine colleges stated that an indoor rink would greatly facilitate the execution of their schedule and help to overcome the causes of postponement. Two colleges did not report on this because they themselves used indoor facilities.

One college reported that a covered rink would not help the postponement of their games. This college, however, used indoor facilities.

Table I. gives a picture of the average hockey schedules in the New England colleges. It should be noted that there is a considerable difference in schedules, college H playing twenty games and college K only five. The average number of games per season for all colleges is 11.1, and for all practical purposes is evenly divided between home and outside games. This would seem to offer the best type of schedule.

1.09 games postponed per season is a large average when it is realized that six of the reporting colleges use indoor facilities. Reasons given for postponement of games clearly indicate that weather is the greatest cause. The general consensus of opinion among the colleges reporting was that indoor rinks would greatly overcome the causes of postponement. In view of the fact that six of the colleges already have indoor facilities, it is reasonable to believe that many of the other colleges will have the same in the future.

The average farthest distance traveled to play is 241.2 miles a considerable distance when one realizes the difficulties of winter travel. Many of the colleges report that travel is one of the biggest expense items in their hockey budgets.

Table II

Financial Status

(Guarantees, travel and Schedules)

College	Guarantee	Pay travel More	Lose on trips	Paying Schedule	Returns	Costs
A	yes	no	yes	no	$575	$795
B	yes	no	yes	no	$500	$300
C	yes	no	yes	no	NR	$1440
D	yes	usually	no	no	$5000	$12500
E	yes	yes	no	no	NR	NR
F	yes	usually	some	no	NR	NR
G	yes	yes	no	no	$0	$1000
H	yes	no	yes	no	NR	NR
I	yes	yes	no	no	NR	NR
J	yes	no	yes	no	$1000	$1000
K	yes	yes	no	no	$0	$50
L	yes	no	yes	no	NR	NR
				Average	$1012.5	$2297.8

NR - No Report

Table II. indicates that the general financial status of hockey in the New England colleges is rather uncertain. That is, hockey is a distinctly costly form of sport. The greatest item of expense according to questionnaire returns is the maintenance or rental of facilities. Several remarks made on the questionnaires indicate that the relative values of the sport do not justify the costs. These objections were generally based on the numbers participating, however, rather than the actual values of the sport to the individual.

All reporting colleges indicated that guarantees were received for outside games and half reported that these guarantees usually paid travel expenses, the other half indicating that they did not. The general indications reveal that the majority of trips were financial losses, most of the colleges reporting losses on trips.

No college reported a paying schedule and costs on the average doubled the returns. There seems to be a discrepancy in the case of college B, however, where it is reported that the schedule does not pay and yet indicated the financial returns as being $200 over their costs.

Table III

Intra-mural Program

College	Intra-mural	Inter-class	Inter-fraternity	Time Played	Average No. Participating	Costs
A	no	no	no	-	-	-
B	no	no	no	-	-	-
C	no	no	no	-	-	-
D	no	no	no	-	-	-
E	no	no	no	-	-	-
F	no	no	no	-	-	-
G	no	no	no	-	-	-
* H	yes	yes	yes	Aft.&Eve.	150	NR
I	no	no	no	-	-	-
J	yes	no	yes	Aft.&Eve.	80	$25
K	yes	yes	no	Aft.	50	$25
L	no	no	no	-	-	-
				Average	93.3	$25

* Covered ice facilities

NR = No Report

The question was asked, "Have you any outstanding difficulties with your intramural program?" The prevalent answer to this question was "no". One college suggested that with a covered rink hockey would easily become an important part of their intramural program.

Table III. indicates that intramural, interclass, or interfraternity hockey are practically unknown in the New England Colleges except in a few cases. Colleges H, K, and J are the exceptions. In these colleges where this type of program is supported the games are generally played in the afternoon and evening with an average of 93.3 seasonal participants. The average costs indicated in Table III. amounting to $25.

The general difficulty with hockey as an intramural sport is the lack of adequate facilities. Untimely changes in the weather so greatly affect the game under natural outdoor conditions that it has proven impractical for intramural purposes except at those institutions with exceptional natural ice conditions or with covered rinks. Colleges J and K are examples of the former type and College H, an example of the latter.

Table IV

Stability of College Hockey

College	Recently Dropped Hockey	Recently Adopted Hockey	Coach's Experience (years)
A	no	no	NR
B	no	no	14
C	no	yes	5
D	no	no	12
E	no	no	6
F	no	no	9
G	no	no	12
H	no	no	8
I	no	yes	4
J	no	no	NR
K	yes	no	3
L	no	no	NR
M	yes	no	NR
N	yes	no	NR

NR-No Report

College I, recently having adopted hockey gave the following reasons ; "Felt the need to give the students an outdoor winter activity" - "Students themselves who play were ambitious for program." College C. gave for their reason for adopting hockey that the sport had become "Popular".

College K has dropped hockey temporarily because of a lack of material. The other two colleges M and N dropped hockey because the maintenance of natural ice rinks was too costly.

Table IV. indicates that the majority of the colleges have had hockey for a considerable length of time, only two having recently adopted it, C and I, and only three having recently dropped it, K, M, and N. When one realizes, however, that the recent turnover affects one third of the reporting colleges, it can safely be said that hockey is not a very stable item in collegiate physical education programs.

There is a definite relation indicated in this table between the length of the coach's experience and the dropping of hockey. For example, in the case of college K where the coach had had no experience, hockey was dropped. Those colleges which have supported hockey for a considerable length of time generally had coaches with considerable experience. Those colleges, C and I, recently adopting hockey had coaches with limited experience. This would tend to indicate a correlation between the length of the coach's experience and the length of time hockey was supported by the college. There is not enough data to bear out this indication, however, although it may have some significance.

Table V

Student Participation in Hockey

College	No. on Varsity	No. on J.V. or 2nd	No. in Intra-mural Hockey
A	50	27	0
B	30	0	0
*C	20	0	0
*D	25	0	0
*E	20	12.5	0
F	12	0	0
*G	12	0	0
**H	18	36	100
I	20	0	0
J	15	10	80
K	12	0	50
*L	19	0	0
Average	21.0	21.3	76.6

* Indoor facilities

** Owned Indoor facilities

One of the weaknesses of ice hockey as a college sport lies in the fact that student participation is limited. Table V. in itself does not bear out this point to any great extent, but when these figures are compared with the figures of participation in other sports it is readily seen that hockey does not engage as many participants as the majority of the other sports. Howard J. Savage in the book "American College Athletics" published in 1929 and sponsored by the Carnegie Foundation, rates hockey eighth out of thirteen sports on the basis of the greatest numbers participating.

Table V. indicates that but few colleges have junior varsity or second teams and that very few sponsor intramural hockey thereby decreasing the number of participants. It is interesting to note, however, that college H with the most participants in intramural hockey has indoor facilities which are owned by the college. Rented indoor facilities apparently do not increase participation although it would seem that owned indoor facilities helped a great deal in this respect.

Table VI

Ice Hockey Facilities

College	Artificial Ice	Rink				Boards		Distance To Rink
		Shallow	Deep	Pond	Covered	High	Low	
A		x					x	100 yds.
B			x					1½ mil.
* C	x					x		
* D	x					x		
* E	x					x		
F				x			x	1000 yds.
* G	x					x		
H					x			100 yds.
I			x			x		¼ mil.
J		x				x		15 yds.
K		x				x		50 yds.
* L	x					x		
Totals	5	3	2	1	1	8	2	/Av. 620.7 yds.

* Rented facilities.

Outdoor facilities are still in use in the majority of New England colleges according to the data in Table VI., although five colleges are using rented covered artificial ice, and one college owns a covered rink with natural ice. Shallow rinks seem to be the most popular type, followed by deep and pond rinks in order.

High boards are used in the majority of colleges and would seem best suited to the game.

The distance from the dressing rooms to the rink varies from a mile and a half in the case of college B, to 15 yards in the case of college J. The colleges using artificial ice have only short distances to go to the playing surface, indicating another point in the favor of the convenience of the indoor facilities.

Table VII

Maintenance of Ice Hockey Facilities

College	Ice			Labor		Nets			Fastenings		
	Scrape	Plane	Flood	Pd. Help	Students	Iron	Wooden	Art Ross	Perm.	Nailing	Sharpened
A	x		x		x	x					
B	x		x		Pd.x	x				x	
*C	x		x	x				x	x		
*D	x		x	x				x	x		
*E	x		x	x				x	x		
F	x	x			x	x					x
*G	x		x	x				x	x		
H	x		x		x			x	x		
I		x	x			x				x	
J	x		x		x	x				x	
K	x		x		x		x				
*L	x		x	x				x	x		
Totals	11	2	6	5	6	5	1	6	7	3	1

Rented facilities

The prevalent time given for flooding the ice was "Evening".

Table VII. might be divided into two parts, segregating the colleges with rented facilities from those with their own. It is interesting to note that all the colleges with rented facilities scrape the ice, all flood the ice, all use paid help to do this work, and all use the Art Ross nets with the permanent fastenings. In view of the fact that most commerical rinks seek to please the public, it is reasonable to believe that they would have the best available equipment. If this assumption is correct, then it would seem that we must look to the commercial rinks for tho best equipment.

Colleges with their own facilities most commonly flood the ice. Only two of the colleges plane the ice indicating that the method is apparently not entirely satisfactory. Students do most of the work gratis at these colleges although at college B the students are paid to do the work.

Iron framed nets are the most common--wooden nets being used only at college K and the Art Ross only at H of this group with their own facilities.

Of the methods of fastening the nets to the ice, the permanent fastening is the most common. This fastening is usually made up of an iron bolt sunk in the ground beneath the ice and protruding above the ice surface onto which the net is fastened. Three of the colleges nail or spike the nets to the ice, whereas only one, college F, uses

nets with sharpened uprights for driving into the ice.

The totals from this table indicate that scraping and flooding are the most popular methods of maintaining an ice surface. Furthermore the most satisfactory nets are apparently the Art Ross or the iron, both with permanent fastenings.

Table VIII

Miscellaneous Data

College	Public Skating Facilities	No. Participating	Most Players from	Scholarships to Players	Work to Players	No. of Graduates	Justified Keeping
A	none		Me.&Mass.	no	yes	none	yes
B	none		Me.	no	no	few	yes
C	none		Boston	no	no	N.R.	yes
D	none		Boston	no	no	many	yes
E	Arena Sp. Fee		Boston	no	no	many	yes
F	Pond	100	Boston	no	no	several	N.R.
G	none		Boston	no	no	N.R.	yes
H	none		Boston	no	no	several	N.R.
I	Pond	100	Boston	no	no	N.R.	yes
J	2 rinks	120	Vt.&Mass.	no	no	none	yes
K	none		Vermont	no	no	none	yes
L	none		N.R.	no	no	none	N.R.
M	Lake	75	N.R.	no	no	none	no

N.R. No Report

The miscellaneous data in Table VIII help to complete the picture of the present status of ice hockey in the New England colleges.

Few colleges have facilities for public skating. The outstanding ones with such facilities are those near a pond or lake, as in the cases of colleges F, I and M. Participation is not very great even in these institutions. Public skating is mentioned here because many directors of physical education require that a sport be open to a large number of participants before it is adopted. These results clearly indicate that participation even in public skating is very limited.

Rather significant is the fact that although natural ice conditions in and about Boston are rather poor most of the players in the majority of the colleges come from there. This can probably be accounted for by the fact that schoolboy leagues playing on artificial ice are strongly supported in this region.

Hockey players in the New England Colleges are apparently not subsidized to any degree if the returns are accurate. No scholarships are given to hockey players because of their ability in the sport by any of the colleges and only one college A, supplies the players with work to help them to earn their way.

Only two of the colleges, D and E, have many graduates participating in hockey, the majority having only a few or

none. This would indicate that hockey has little value as a lifetime form of exercise.

Very significant is the fact that ten of the thirteen colleges listed in Table VIII. state that they feel justified in continuing the sport under their present conditions. This of course may be due to the popularity of the game brought about largely probably by the public interest in professional hockey.

Answering the question, "What values do you see in the game?", the majority stated that it was a healthful form of outdoor winter activity. Those colleges with indoor facilities for the most part mentioned that the sport was a fast, bodily contact game requiring rapid coördinations and lots of skill.

OBSERVATION, INTERVIEWS AND LETTERS: Before proceeding to the study of the meteorological observations, the writer wishes to take the time and space to mention the results of a few significant observations and interviews.

Traveling about New England in the winter time, the writer has been able to gain several good ideas in regard to ice hockey facilities and their maintenance. Visiting one college, it was noticed that they had the bottom boards of their rink hinged so that during the heat of the day the boards could be raised away from the rink so as to prevent the absorption of heat from the sun's rays.

Two general methods were observed for preventing the blue lines from absorbing heat. One was to paint the lines just before the game and the other was to keep the lines covered with snow.

Building an ice surface in a shallow rink has its difficulties because of thin spots caused by uneven ground. One of the best methods the writer has observed for overcoming this difficulty was to cut out the broken ice from the thin spot and to cover the bare ground surface with fine chipped ice or hard snow mixed with water. This must be done when the temperature is well below freezing. This rough surface can then be flooded with the rest of the rink. Unbroken thin spots can be protected during the daytime by covering them with snow.

The best indoor natural ice rink that the writer has had the opportunity to observe was not in New England, but in Clinton, New York, at Hamilton College. A ventilating system serves to bring the cold air in from the outside and freeze the ice. The building may then be shut up and even though the temperature may rise considerably above freezing the ice can be kept because of the large amount of cold air space above the ice surface. The playing surface is used for tennis courts when the ice is removed.

The writer has been disappointed in the few interviews arranged because of the conflicting ideas presented.

For example, one person interviewed stated that shallow rinks were impractical and that deep or pond rinks were best. Another person presented the opposite point of view. As a matter of fact, both persons had legitimate arguments for their point of view but neither seriously considered arguments against them.

Letters did not reveal any new ideas in regards to ice hockey facilities or their maintenance, finance, or weather. However, Bulletin #52 of the Western Massachusetts Winter Sports Committee by H. L. Davenport pointed out "Important Features in the Selection and Construction of Hockey Rinks". Davenport points out that dug out swamp lands make excellent sites for rinks as they naturally hold the water. He also recommends the erection of a small heated house near the rink with a wooden runway to the ice surface, this last to save the edge on the skates.

The amount of material gained from these sources, namely, observation, interviews and letters, was meager, indeed, but could not be overlooked.

METEOROLOGICAL OBSERVATIONS

The following studies are based on meteorological observations made at the Massachusetts State College Agricultural Experiment Station in Amherst, Massachusetts. Latitude 42° 23' 48.5" N. and longitude 72° 31' 10" W., 253.5 feet above sea level. Temperatures vary on the average from 5°F. less in northern Maine, New Hampshire, and Vermont to 2½°F. more in southern Connecticut. These variations are from Amherst, Massachusetts. Precipitation, i.e., snow, is slightly greater in northern New England and slightly less in southern New England. Rain varies in the opposite manner, there being slightly more rain in southern New England and slightly less in northern New England.

Altitude, of course, effects temperature. The higher altitudes registering on the average lower temperatures and the lower altitudes registering higher temperatures. This point must be kept in mind in the selection of a site for a hockey rink.

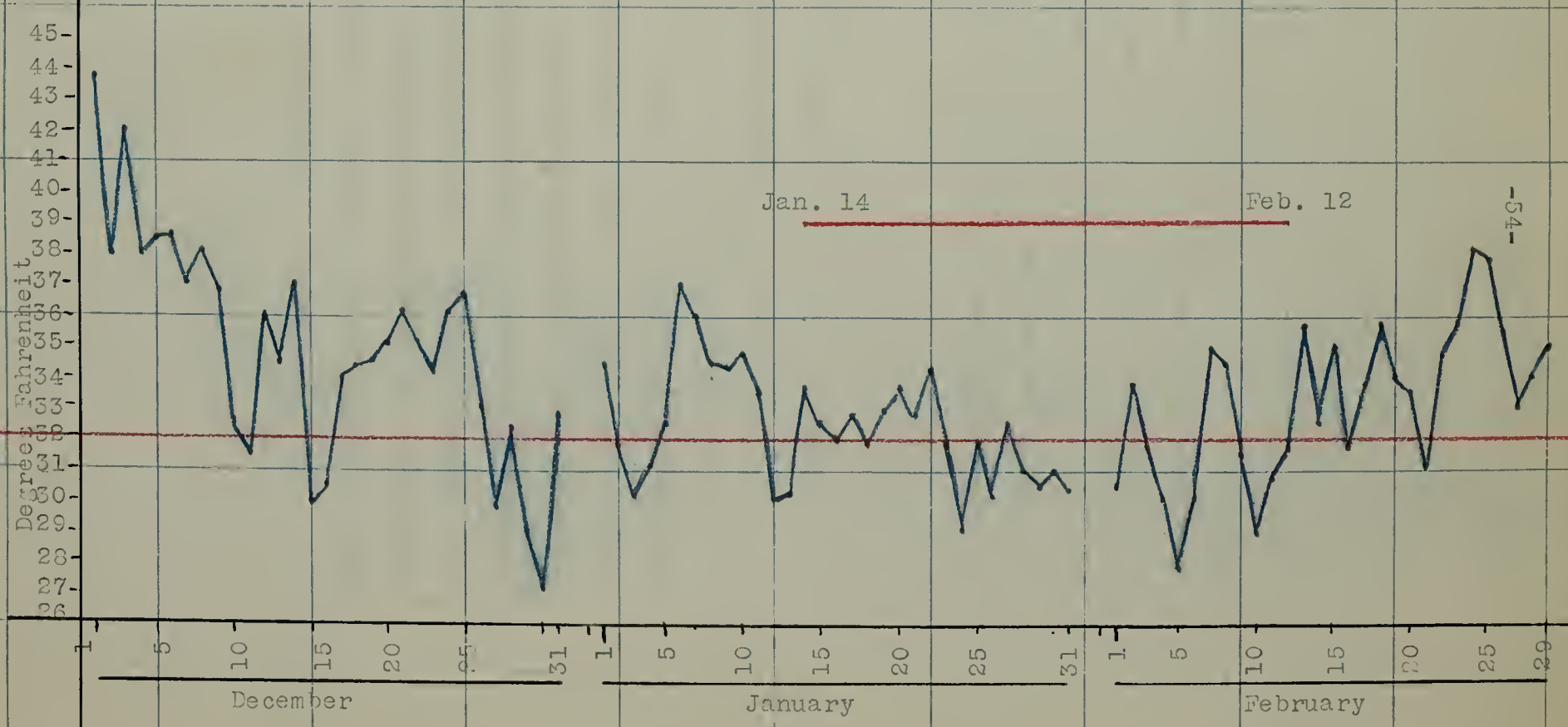
Sheltered and unsheltered conditions also play a part in the effects of the weather on ice facilities. The ideal location of a rink being on the north side of a hill sheltered from the strong effects of the sun but not sheltered from the wind. Exposure to sunlight allows absorption of heat along boards and other equipment, thus

melting and spoiling part of the ice surface. Exposure to the wind on the other hand is beneficial as it keeps the air in circulation all around the rink and prevents the ice from melting along the boards where heat is ordinarily absorbed.

Studies have been made of average daily maximum temperatures, average daily hours of bright sunshine, average daily precipitation, rain and snow, over a period of twenty years for the months of December, January, and February. The results have been put in the form of graphs and will be interpreted in their relation to ice hockey.

Graph I

Average maximum temperatures covering a period of twenty years, for the months of December, January, and February. (1915-1935)

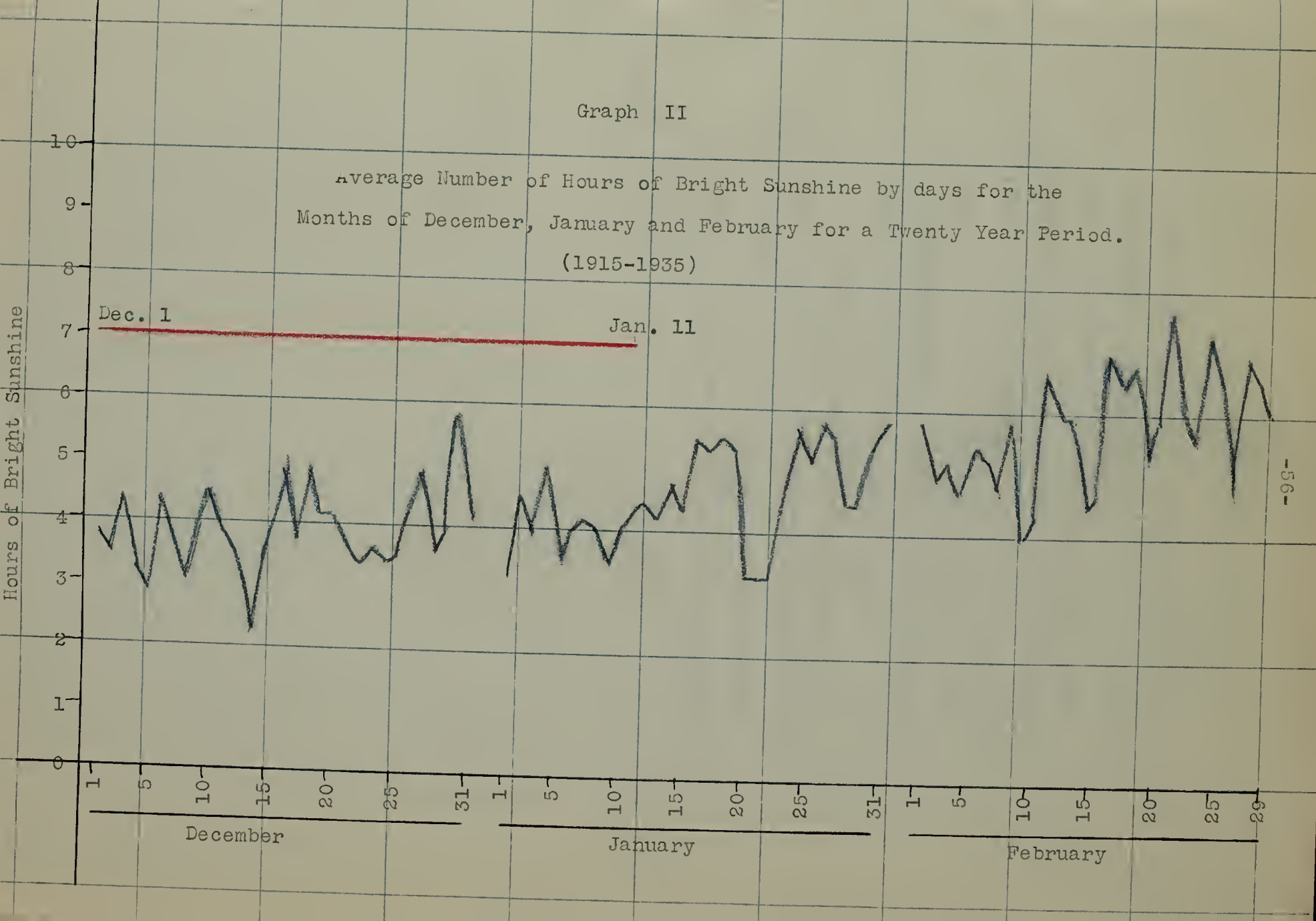


The preceding graph, Graph I., gives a pictorial representation of average daily maximum temperature conditions during the months of December, January, and February for the twenty year period 1915-1935. The straight red line is drawn through the mark of 32°F., the freezing point of water. The red graph line indicating freezing temperatures and the blue graph line non-freezing temperatures. Maximum temperatures were selected for this study as giving a more sound and a more conservative basis upon which to work. Maximum temperatures of 32°F. would in general indicate ice forming days. Mean temperatures, on the other hand, would not necessarily indicate ice forming days as the maximum temperature of a day with a mean temperature of 32°F. might be well above freezing.

Average conditions during this twenty year period, as pictured on this graph, show the best ice forming period between January 14 and February 12. (The period with the lowest sustained maximum temperatures). This period is marked by the red line above the graph, and from the standpoint of temperature marks the best playing season under natural ice conditions, exposed or covered. This period will be taken into consideration under diagram I., showing the best playing season, all factors considered.

Graph II

Average Number of Hours of Bright Sunshine by days for the Months of December, January and February for a Twenty Year Period. (1915-1935)



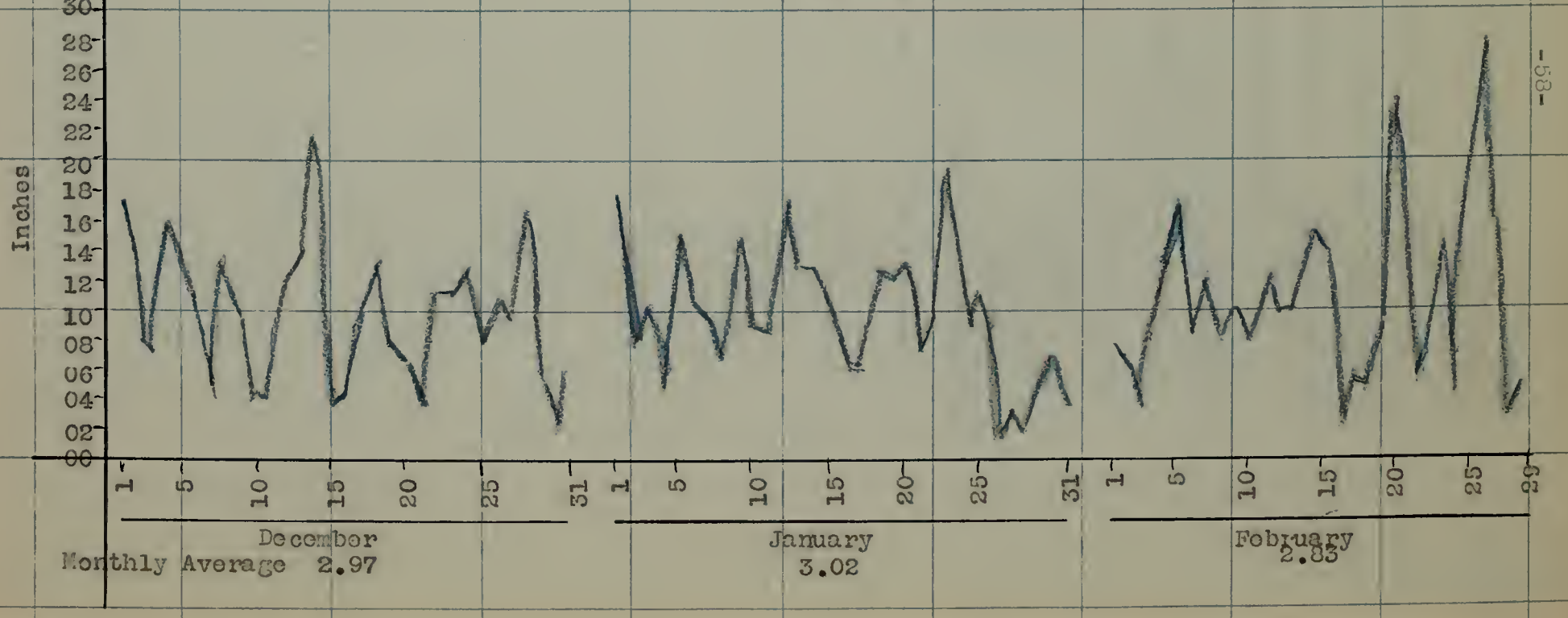
Absorption of heat from the rays of the sun often causes melting of the ice along the boards of a hockey rink. For this reason it was decided to make a study, Graph II., of the average number of hours of bright sunlight by day during December, January, and February, for the twenty year period 1915-1935, to determine the best ice forming season during this time. (That period with the least average daily sustained sunlight).

This period was found to be from December 1st to January 11th and is marked by the red line above the graph.

This period will be taken into consideration under diagram I., showing the best playing season, all factors considered.

Graph III

Average Precipitation (rain) by Days for the Months of December, January and February for a Period of Twenty years.



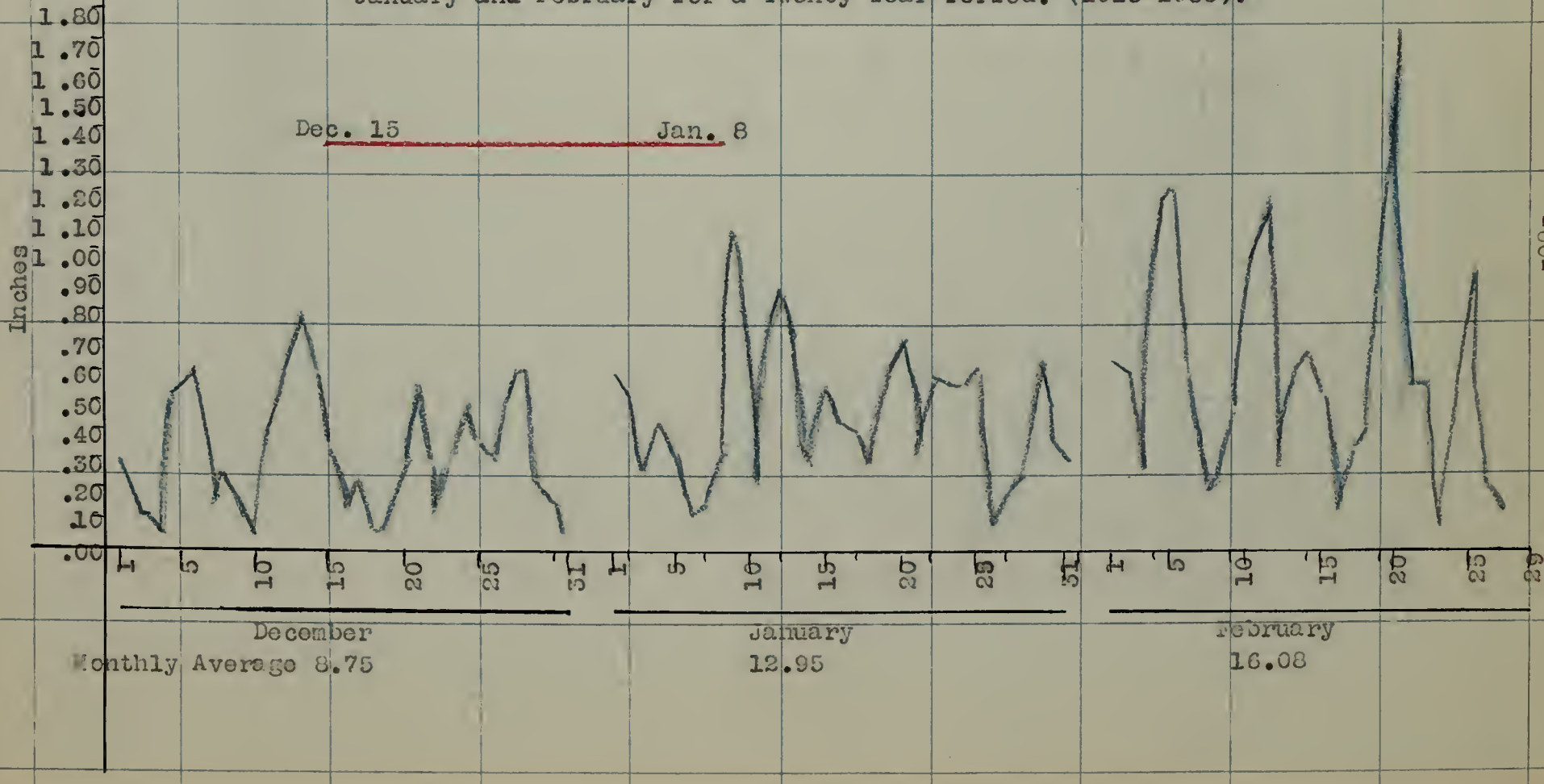
Uncovered natural ice facilities are greatly affected by rainfall. For this reason a study of average rainfall conditions was made during the same period used in the two preceding graphs.

Graph III. indicates that the best playing season from the standpoint of rainfall (that period with the least sustained rainfall) falls between January 16th and February 18th. This period is indicated by the red line above the graph.

This period will also be taken into consideration under Diagram I., showing the best playing season, all factors considered.

Graph IV

Average Precipitation (snow) by Days for the Months of December, January and February for a Twenty Year Period. (1915-1935).



Snowfall also affects playing seasons on uncovered natural ice rinks. A study was made of average daily snowfall conditions during the same twenty year period (1915-1935) that was used in the preceding graphs.

The best playing season from the standpoint of snowfall (that period with the least sustained snowfall) was found to be from December 15th to January 8th. This period is marked by the red line above the graph.

This period will also be taken into consideration in Diagram I., showing the best playing season, all factors considered.

Table IX.

Playable Days

	Dec.	Jan.	Feb.
Number of days with a maximum temperature 32°F. or below-----	11	15	11
Number of days with a maximum temperature 32°F. or below not affected by snow----------	8	11	8
Number of days with maximum temperature 32°F. or below not affected by snow or rain---	4.5	6.9	4.1

This table based on a study of twenty year records (1915 - 1935)

Table IX. gives a very conservative estimate of the number of playable days under different conditions, because it is based on maximum daily temperatures rather than mean temperatures. These numbers would be increased by approximately 50% had mean temperatures been used. In view of the fact, however, that mean temperatures give an unreliable indication of ice forming conditions, it was deemed advisable to use the maximum temperatures.

The first horizontal line of figures, then, shows that under covered rink conditions there would be approximately 11 days in December, 15 in January, and 11 in February for the formation of natural ice.

The last horizontal line shows that under natural conditions there would be approximately 4.5 days in December, 6.9 in January, and 4.1 in February, playable, assuming of course that the snow was not cleared.

Assuming now that the snow was kept constantly cleared there would be approximately 8 playable days in December, 11 in January, and 8 in February.

It must be remembered that these figures are extremely conservative because the number of playable days is based on maximum temperatures. Furthermore, favorable ice conditions occasionally last through days with maximum temperatures many degrees above 32°F.

Diagram I

Best Playing Season

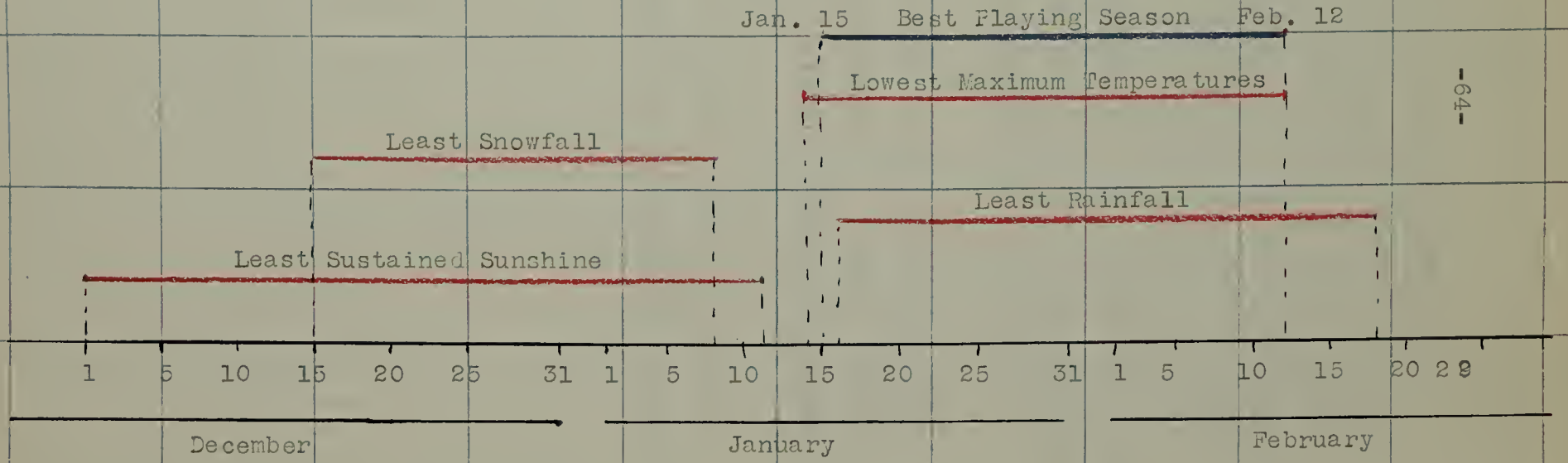


Diagram I. gives a pictorial representation of the best playing season. This season was arrived at by considering the element of lowest sustained maximum temperatures as the most important. With this in mind, one or more overlapping elements would help determine the best playing season. Since only one overlapped this period, the other two factors were disregarded. The best playing season, then, is that season with the lowest sustained maximum temperatures corresponding with the overlapping part of the season of least rainfall.

Hockey schedules of the New England Colleges, that are dependent on uncovered natural ice, should, therefore, correspond as nearly as possible to this season, January 15th to February 12th.

Naturally, every year this will not prove to be the best playing season although in the long run it will prove to be so.

SUMMARY AND CONCLUSIONS

This study was undertaken to discover, if possible, the present status of the game of ice hockey on the physical education programs of the New England colleges and to determine the feasibility of maintaining the sport under existing conditions. In order to accomplish this a questionnaire was developed and sent to the New England colleges. A complete study of the weather in relation to the game was also carried on to discover the actual effects of this most important factor.

In general it may be said, on the basis of accumulated data, that ice hockey holds a minor place on the physical education programs of the New England colleges. The game is an expensive item of the budgets mainly because the maintenance or rental of proper facilities is so costly. The numbers participating are small because facilities are not adequate to handle large groups, team members are limited generally to a small varsity squad, and the game is impractical for intramural purposes under the majority of existing conditions.

The game is not without its values, however, and makes a definite contribution to a physical education program, where good facilities are available. The game is an excellent form of outdoor winter activity requiring bodily contact, skill, stamina and excellent coördination but is so dependent upon

weather conditions in the majority of New England colleges that it has proven to be rather impractical.

Professional hockey and artificial ice rinks have helped to popularize the sport during recent years and in many of the colleges there is an actual demand for the game on the part of the students. This is apparently one of the main reasons why the game has persisted at so many of the colleges in spite of its handicaps.

Weather conditions are favorable to the playing of the game under natural ice conditions only in northern New England i.e., approximately north of the Massachusetts-New Hampshire State line. The number of playable days is very small south of this line although covered facilities increase this number two-fold.

The best hockey season, for natural conditions, all weather factors considered, extends from January 15th to February 12th, most of the playable days falling within this period.

Hockey is apparently here to stay in spite of its handicaps, because several of the colleges are now using indoor or artificial ice facilities, either owned or rented, and all the colleges now supporting the game see fit to continue the game for at least a few years under existing conditions. The chances are that in time many of the colleges will have indoor facilities. When, and if this condition is reached, the game should become a valuable

part of winter physical education programs. This last, however, is mere speculation.

RECOMMENDATIONS: Colleges south of the Massachusetts-New Hampshire State line can support hockey under natural conditions only with great difficulty. If, however, a flexible schedule (allowing games to be played when ice is available) is arranged to be played during the period from January 15th to February 12th the colleges will have made the best possible arrangements. The sport is recommended for colleges in this region only on this basis and providing excellent outdoor facilities are available along with adequate funds.

Uncovered rinks for colleges in this locality are best situated on elevated ground, providing it holds the water well, where it is sheltered from strong sunlight during the day. Some device for the prevention of the absorption of heat along the boards, such as screening, is advisable. High boards and iron frame nets are preferable elements of equipment.

Covered rinks for colleges anywhere in New England are recommended wherever finances permit. Several precautions should be taken in the construction of these indoor rinks, however. In the first place, it is necessary to know that the ground surface covered will hold water. In the second place, there must be an excellent system of ventilation that can be opened or shut allowing circulation or exclusion of outside air as the need may be. Thirdly, there must be a

high ceiling allowing a large enough air space to insure the maintenance of favorable temperatures indoors.

SUGGESTIONS: The writer recognizes the limitations of this study and, therefore, does not make any claims as to the finality or completeness of the work, but it is hoped that the facts discovered may serve as a guide to directors of physical education programs in the New England schools and colleges, relative to the adoption, maintenance, or dropping of the sport.

For those attemtping to discover the feasibility of continuing the sport in any locality under natural conditions, the following facts to be kept in mind may be suggestive.

To justify keeping the game:

1. The institution must be favorably located geographically, preferably north of the Massachusetts-New Hampshire State line, where weather conditions permit a reasonable season of playable days.

2. An excellent rink location must be available, preferably with capacity for holding water, at a high altitude, sheltered from the sun.

3. There must be considerable financial support for the maintenance of facilities.

4. There should be adequate facilities to allow comparatively large numbers to participate.

5. There should be adequate equipment and means for clearing the ice.

6. The playing season should not interfere with examination periods.

7. Home facilities should be adequate to allow a divided schedule--one half home games--one half away.

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