Mileposts of Progress in Fire Control and Fire Research[1]

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In this paper Mr. Gisborne gives his selection of the outstanding events in the development of forest-fire control in the United States. The editor hopes that it will stimulate comments and suggestions as to other mileposts of progress from many readers of the JOURNAL, particularly among the "old-timers."

AT Spokane, a month ago, Dr. Carl F. Taeusch of the Bureau of Agricultural Economics told us that for common understanding of any problem it is essential that we first establish the "framework of ideas within which we are trying to work out the problem." Walter B. Pitkin stresses the same point when he says: "The next task is to take some position toward the subject you propose to discuss. . . . When you take a position toward a field of fact or fantasy, you do something strangely like the choosing of a vantage point from which you view a valley. . . . Point of view and perspective determine the special arrangement and design of the entire panorama. Any valley may be seen from a thousand outlooks. Always the same valley, it presents itself in a thousand manners according to the outlook." Personally, I welcome the opportunity to develop this topic and to do my part to make sure that we are at least all looking at the same valley and that we are not mistaking some of the minor gulches for the main valley.

I am convinced that failure in recent years to look at the whole problem first, and its parts second, has caused a large part of what we now call the fire problem. For the past 20 to 25 years, we have been so engrossed with certain exceptionally pressing phases of the fire problem that at times we have almost lost our perspective. I believe that I can demonstrate this to you. In the process I hope that I can establish a common vantage point and thereby reveal the true size and complex topography of our "valley." To do this, I propose to go back to the beginning of nation-wide fire control and come down the 35-year road, citing what I have selected as the outstanding accomplishments. In this selection I have had the help of Major Kelley, Axel Lindh, C. K. McHarg, Roy Phillips, W. W. White, and Clarence B. Sutliff. I take full responsibility, however, for all omissions of events which you may think should have been included.

In venturing to select and designate certain events as mileposts of progress, I realize now, better than I did when I started, the difficulty of the task. Probably no one will agree with all of my selections. My major criterion has been whether or not the event was of national and lasting significance in fire control,—federal, state, or private. In some cases I have used the first proposal or broaching of an idea if it "took." In other cases, where the original idea failed to take, or to become nationally effective until clarified, amplified, or given the right push by some individual, I have used the push that put it over. In a few cases there has been real progress along broad lines but I have not been able to name the event or date it. I have also probably overlooked some deserving events.

I have tried to distinguish three types of events,—(1) progress toward better objectives in fire control, (2) progress through better methods in pursuing the objectives, and (3) progress through more adequate financing which permitted the use of better methods.

1904.—The creation of a widespread framework of Forest Reserves in 1904, 1905, 1906, and 1907, with the assumption by the government for the first time of responsibility for preserving and protecting great areas of public forest land, is set up as milepost number 1. Previous to this time recognition of the forest fire problem and action to solve it had been purely local in scope and significance. Now with the federal government practicing forestry on a national scale, the nation-wide problems in forest-fire control objectives, methods, and finance began to be defined and the way cleared to deal with them on a similar scale. This led naturally to the recognition of individual state and private fire-control problems as parts of something that could not be fenced in by land ownership boundaries and dealt with entirely on that basis in *either* the public or private interest. Hence, although Sargent compiled the first fire statistics in

[1]Presented December 1, 1941, before the U. S. Forest Service Fire Control Research meeting held at Priest River, Idaho, December 1-6, 1941, and edited for publication by A. A. Brown.

1880, the active history of the fire-control undertaking seems to me to commence in 1904.

1905.—In 1905 was born the first cooperative agreement and work plan between private and state timber protective agencies. This move proved to be so profitable that the formal cooperative protection movement spread rapidly, first throughout the Northwest and subsequently throughout the nation. This first cooperative association greatly improved the objectives and reduced the costs of state and private protection. It was so beneficial that similar "cooperation" has even been forced by law in many states, beginning with the Oregon compulsory patrol law of 1913 and continuing to date.

1906.—The *Use Book* for 1906 was a definite milepost in bringing all of our major problems of objectives, methods, and finance into focus in terms of the job ahead. "At the beginning of the summer season, or before March 15, each supervisor will recommend to the Forester the number of men needed adequately to protect his reserve, the rate each should be paid, and the number of months each should serve." There, in one pregnant sentence, are all of our problems—beginning, ending, and degree of fire danger, man-power placement, "adequate" protection, temporary employees, and finances. Even Mr. Headley's major problem was there, in the next sentence: "After consideration of these recommendations the Forester will fix the number for the full summer force of each reserve, and this allotment will be final." As Gowen and Headley will probably be willing to testify, the Forester's office is still "considering" similar recommendations and still trying to make allotments that will be "final."

1909.—The formation in 1909 of the Northwest Forest Protection and Conservation Association was more of a national milestone of progress than many of you may think. This organization soon became the Western Forestry and Conservation Association and under the exceptionally aggressive leadership of E. T. Allen, the steady guiding hand of C. S. Chapman, and the farsightedness of Geo. S. Long, it has had a nation-wide influence for more than 25 years. It was especially helpful in promoting federal appropriations for fire control, fire research, and fire-weather forecasting. It exerted and still exerts an extremely beneficial influence on many state legislatures for the improvement of fire laws, brush-disposal requirements, and other objectives. It has contributed steadily to the improvement of methods of fire control, especially on state and private land, through its several editions of *The Western Fire Fighters Manual.* This text on fire control is probably used in every forestry school in the country. If not, it should be.

1910(a).—This is the first and the last milepost which I can find contributed by a Chief Forester of the United States while he was Chief Forester. If any man here has not read Forest Service Bulletin No. 82, *Protection of Forests from Fire,* by H. S. Graves, he should take time—make time—to do it. There you will find such a keen and clear analysis of the fire problem that many of its statements have not yet been improved upon.

For instance, if you think that methods of fighting fire, crew organization, skill in sizing up and attacking fires, are new problems, listen to this: "The following are of first importance: (1) quick arrival at the fire; (2) an adequate force; (3) proper equipment; (4) a thorough organization of the fighting crew; and (5) skill in attacking and fighting fires." What factors have we added to that list in the 30 years that have fled since Graves saw these phases of the problem and described them so clearly? While many old-timers have probably now forgotten this bulletin, many later events indicate that much subsequent progress began right here.

1910(b).—I may be wrong in erecting a monument of progress to the great Idaho fires of 1910, but I am told that before they occurred public interest in forestry and the Forest Service was almost nonexistent. The dramatic incidents and loss of lives in those fires made newspaper headlines all over the country and wakened "the people" to two things. First, that timber wealth was burning up; second, that there was a federal organization trying its best to protect that wealth. A marked upswing in public interest and in funds for fire control was evident immediately after these 1910 fires, which were probably the greatest object lesson as to the importance of fire control that ever occurred, anywhere.

1911(a).—The first forest fire deficiency appropriation in 1911 was certainly a milepost of progress in finance. Some of you may not know that in 1910 several supervisors in Region One furloughed all of their unmarried rangers for one month in order to acquire the funds to pay fire-fighting bills of the previous summer. Such situations, which were typical of the period prior to

1911, reveal the most serious weakness in organized forest-fire control at that time, inadequate and poorly adapted financing. They give emphasis to the very close relationship between policies in fire-control financing and the progress attained. The provision in 1911 for E.F.F.F., emergency fire-fighting funds, more commonly known as FF, remedied this weakness and made aggressive fire suppression a matter of accepted policy. Most unfortunately somebody made this godsend into a Damocles sword which has been dangling over our heads ever since. Looking back at its origin, it does not seem conceivable that Congress could possibly return to the fire financing methods of 1910, with all that such methods imply.

1911(b).—While the Weeks Law of 1911 was aimed primarily at the acquisition and protection of the headwaters of navigable streams, and hence was a milepost in objectives, it also appropriated federal funds for the first time for fire control in cooperation with the states and thereby became a milepost in finance. It was the forerunner of the monumental and highly effective Clarke-McNary Act that followed 13 years later.

1912(a).—*The National Forest Manual* issued in some six or more sections, 1911 to 1913, contained in the volume on "Protection" the first detailed breakdown of the fire problem which I have been able to find. There is not time here even to list all the features separately recognized. "The Fire Plan" was named, however, and this was clearly the forerunner of duBois' "Systematics" for California which followed 2 years later, and for Hornby's highly detailed integrations which followed 12 years after that. Firebreaks were given great emphasis, which, rightly or wrongly, has carried through in some form for 30 years. Permanent lookouts were indicated as possibly desirable as follows: "Main lookouts are those from which an exceptionally large territory can be seen and where it might pay to keep a permanent lookout." This last statement indicates lack of coordination in the Washington Office because the same year that this manual came out, Forest Service Bulletin No. 113 appeared with photographs of permanent lookout towers and houses already in actual use on the Arkansas National Forest. Field practice seems here to have been ahead of Washington Office recommendations.

This manual of 1912 also took a definite step ahead in objectives with the statement that "Practically all of the resources of the national forests are subject to severe injury, or even to entire destruction by fire. Besides the direct damage which fire may do to merchantable timber, to the forage crop, and to watershed cover. . . ." For the first time that I can find, "the forage crop" is included in addition to commercial timber and the old stand-by—watershed cover.

Dr. Shea will be interested to note that 25 years before he entered the field of prevention research, our forefathers stated, "Since the best way to stop fires is to prevent them, a fire plan must include a careful study of prevention methods." Note that they said "prevention methods." I believe you will all agree that we were a long, long time getting past the mere listing of prevention cases and concentrating on the study of prevention methods! There is a vast difference.

Here I would like to digress for one-half minute on the subject of cases versus methods. I have attended quite a few fire meetings, and I have been struck at most of them by the time spent in attempting to solve cases, with so little effort intentionally directed to draw either methods or principles from those cases. Twenty years ago Howard Flint wrote, in a comment on Sparhawk's liability ratings, "Why not stick to a *method* that is fundamentally sound, using figures that are admittedly arbitrary?" I certainly believe that we, here at Priest River in 1941, should keep our eyes open for methods and avoid quibbling over the split-hair accuracy of minor figures or cases that are, perhaps, being used in an unsound method.

1912(b).—Daniel W. Adams' *Methods and Apparatus for the Prevention and Control of Forest Fires*, Bulletin No. 113, published in 1912, is so clearly the forerunner of both the *Fire Control Equipment Handbook* and the various fireman's guides and fire-suppression handbooks, that were to follow 20 years later, that it certainly rates a monument in methods. Yet I will venture the guess that not more than two men here ever heard of D. W. Adams or have any recollection of this bulletin. But if you doubt that this was a "first" and should be recognized as such, look at the drawing, in Figure 8, showing where to locate a fire line on a ridge, and compare it with the drawing for problem 6, page 21, in the Region Five *Fire Control Handbook* issued in 1937; or with problem 1, page 88, of the Region One *Fireman's Guide* issued in 1940; or with Bob Munro's Figure 4 in his article in the Oc-

tober, 1940, *Fire Control Notes*. That old drawing of 1912 shows not only the best fire-line location, but also the convection currents involved, just as well as many of the similar attempts 28 years later.

As for equipment, if you think that the Los Padres shield for a flame thrower, illustrated in the July, 1941, issue of *Fire Control Notes*, is something new, take a look at Figure 2 of Plate III of Bulletin No. 113 published 29 years ago. For chemicals on the fire line see Figure 2 of that same bulletin. For a quick get-away with water tanks on a pack horse, see Figure 3 of Plate IV. For railroad tank cars see Figures 3, 4, and 5. For something really new, see the logging system suited to better fire control, outlined by Figures 6 and 7.

Incidentally, this pioneer work in fire control in Arkansas seems to have borne fruit. Dean Walter Mulford recently stated that "Arkansas, which has 15 million acres of active forest lands, is probably the foremost state in the United States as regards forestry matters." I believe that we here should salute D. W. Adams and the Arkansas National Forest. They were so far ahead of us in some respects that we have not caught up yet; if we are not careful we may include in our research program a project or two aimed at features of the fire problem that were pretty well thought out as much as 30 years ago.

1914.—In 1914 Coert duBois' *Systematic Fire Protection in the California Forests*, an unnumbered publication that is not labeled as either bulletin or circular and is marked "Not for public distribution," was very definitely a national milepost in progressive thinking on methods even though the Californians did try to keep it exclusively to themselves. I read that bulletin from cover to cover several times when I was a lookout in 1915. It was all new to me then. Every time I read it now I still find something that is new and useful.

DuBois pointed the way for nearly everything that Hornby and I ever did when he said, "A way must be devised of reducing all of these factors (inflammability, season, risk, controllability, liability, and safety) to concrete terms, so that any forest area, after careful study, can be given a rating which will convey to our minds something in the nature of an exact measure of its total fire danger." The expression "class 5.8 danger in a high-high fuel type" does that for Region One men today, for any instant and spot, with one exception—"liability" or values. They are still omitted. Hornby wanted to include those in his "total danger rating" and they were in his first formula, but the 10 a.m. policy came along about then and under it "values are out." Some day we will go the rest of the way for Coert duBois and put those "liabilities" or values back into the prominent place they deserve, but there is one small matter which must be settled first, the subject of "objectives in fire control." When we clear that up the road will be open again.

1916.—It may have been a coincidence, but if so it was a monumental one, when in 1916 Silcox first proposed the one-tenth of one per cent objective of fire control and about the same time Headley proposed the "least cost plus damage" or "economic" objective. To me, the flat "tenth of one per cent" was an expedient, only a little bit more sound than the 10 a.m. policy which was to come 19 years later, while Headley's theory was and is fundamentally the soundest yet proposed. It is difficult to apply properly, but if we can approach it in the way which duBois believed essential and which has been applied so successfully to danger ratings by "reducing all of these factors to concrete terms," we can make that theory work. When we do that we shall really have *applied economics*.

1919.—There is some evidence that the Canadians were ahead of us in the use of airplanes in fire control, since this phase of progress did not develop until 1924 or 1925. But Howard Flint had long been investigating lighter-than-air craft, and by 1920 the U. S. Army had become interested. The latter is witnessed by Erle Kauffman who, in an article in the April, 1930, issue of *American Forests*, quotes an army officer (whom he should have named) as follows: "The day will come when large numbers of men and equipment will be carried by airship to the scene of a forest fire, both men and equipment dropped by parachute, while the airship will rain down fire-extinguishing chemicals from above." From this use of the term "airship" it appears that this army officer was, like Flint, thinking primarily of dirigibles.

The earliest printed record of Flint's interest, which I can find, is in an issue of *The Forest Patrolman* (Western Forestry & Conservation Assoc.),[2] which quotes Major Kelley, then fire inspector out of the Washington Office, as fol-

[2]Made available to the writer through the courtesy of Mrs. H. R. Flint.

lows: "H. R. Flint, fire chief in District One, holds credit as the first forest officer to recognize the possibility of real value in the dirigible as a vehicle for transporting fire crews and supplies, and as a means of effective patrol and detection service. In the fall of 1919 Flint corresponded with a concern in the East about the use of a lighter-than-air machine." Flint, himself, in the December 7, 1931, issue of the *Northern Region News*, says that airplanes were first used on fire control work in this region in 1925. Possibly first use of planes in other regions antedated this. I hope that someone will check that point.

There are three features of this development well worth noting. First, the long, slow, uphill drag indicated by part of Flint's *News* note: "In the seven seasons since that time, backed up by a little real support, but accompanied by a great deal of discouragement, and some ridicule, I have seen the airplane slowly taking a definite place in our work. It has come to stay." Second, an entirely unforeseen value of this new departure almost usurped the place of the original idea. Photographic mapping, pioneered in 1925 by Flint, J. B. Yule, and T. W. Norcross, almost stole the show and for several years was more significant nationally than was the fire-control idea. Third, Flint's original idea involved the use of blimps. That has not yet come to pass. But the blimp idea obviously led to airplanes, and it is not at all inconceivable that the latest development in airplane use—parachuting men and supplies—may later lead back to the blimps.

1920.—I believe that all fire chiefs, fire bosses, and rangers, will agree that when Orrin Bradeen began in 1920 to centralize the purchasing, packaging, and delivery of fire-fighting food, tools, and other equipment, he removed one of the great headaches of previous fire-control efforts and made the future job both more efficient and less costly. Bradeen erected a milepost in methods and finance from which we have forged ahead, probably to as near perfection as in any phase of our problem.

1921.—Radio, like airplanes, also opened a new epoch in fire-control methods. While the Radio Laboratory of the Forest Service has, without doubt, made steady progress, credit for the milepost should go to R. B. Adams, who first made radio actually work on a going fire in 1921, and to Dwight Beatty, who 6 or 7 years later produced the first truly Forest Service sending and receiving set.

1922.—Some time in the early twenties, a new idea evolved which has since become standard practice in all Forest Service regions. This is organized, nation-wide training. While it began as general administrative training, its value in fire control was soon appreciated, and fire-training schools and correspondence courses are now recognized as indispensable. The one man who deserves most credit for this milepost of progress is Peter Keplinger. His full contribution amounted to much more than the first idea, for he stayed with it and developed the method, showing all of us how to use it.

Fred Winn informs the writer that on November 26, 1916, District Forester Paul G. Redington sent an official message 40 miles by radio and then by wire to all other regional foresters and the Washington office. The radio used was built by Ranger Wm. R. Warner and Ray M. Potter, radio amateur. A portion of the pasture fence was "borrowed" for use as the antenna.

1923(a).—Up to 1923 I cannot find a single event produced by Research that should be called a milepost of national progress in fire control. Mr. Clapp's first working plan for fire research, written about 1916, and the research work of Sparhawk, Show, Larsen, Hofmann, and Osborne from 1916 on would rate a tremendous monument in the history of fire research alone, but fire research is only one means to an end and here we are discussing the big end.

Publication of the relative humidity theory in 1923 by J. V. Hofmann and W. B. Osborne seems to me to be the first contribution by research which was of nation-wide significance. The "relative humidity" idea literally and actually swept the country. For a while it appeared to be the total and final answer to the 1916 Working Plan request for "some simple, single index" of fire danger. For certain individual fuels it is still the simplest and best.

There is one feature of this milepost which should be of special significance to this Priest River assembly of fire-control and fire-research men. While Hofmann was an experiment station director engaged in full time research, Osborne was chief of fire control in this region, and an administrator. But there was no "fence" here between Research and Administration, and this happy combination of an investigator and an administrator proved to be highly efficient. Brevier Show, then a full time investigator, and Ed Kotok, another fire chief, had also joined forces

about that same time, and the world knows what a prolific source of ideas, methods, and techniques that partnership became. It continued to be just as efficient after these two men swapped jobs in 1926, when Show became regional forester and Kotok director of the California Forest Experiment Station.

1923(b).—When Show and Kotok, in 1923, distinguished between the "economic" and the "minimum damage" theories, I believe that they erected a milepost which should have accelerated progress more than many of their later contributions. On page 59 of Circular No. 243, they demonstrate that, even while proposing the minimum damage theory, they also favored the hypothesis of least cost plus damage. For they state, in their summary: "Successful protection is reached at the point where the cost of prevention, suppression, and damage is a minimum." Hence, "minimum damage" was offered not in opposition to the "economic theory" but merely as a brake to unsound applications. This is clearly evident when they state, on page 4, that their main objection to the economic theory is that it will not work when too much emphasis is given to holding down the costs of prevention and presuppression. My own opinion, based on 19 years of observation in Region One, supports this view. The economic theory is fundamentally sound. Its defects arise from the manner of application.

1924(a).—The Clarke-McNary Act of 1924 hardly needs any justification as a milepost of national progress. It recognized more clearly than did the Weeks Law the federal interest, hence responsibility, in fire control on both private and state forest lands, and it provided those highly essential funds without which the best ideas must lie dormant. It did another significant thing in reviving a phrase from the *Use Book* of 1906, "to adequately protect." That was the stated objective of fire control on the national forests in 1906. It is repeated as the objective of federal, state, and private cooperative fire protection under the Clarke-McNary Law in 1924. But, I ask you in 1941, what does it mean "to adequately protect," "to provide adequate protection"? I am quite sure that we do not know specifically what we are talking about when we put these words into our federal laws and fire-control manuals. We should.

1924(b).—The first written agreements between the Weather Bureau and the Forest Service providing for "fire-weather warnings" were dated August 11, 1916, and March 12, 1917. I cannot regard them as milestones of progress, since they provided for measurements of wind velocity only from the forest stations, and the forecasts, when furnished, were of doubtful value. In about 1924, however, a meeting of Weather Bureau and forest protective agencies was called by the Western Forestry and Conservation Association, at which methods of measurement and types of forecasts were thoroughly discussed. Out of this came the first congressional appropriation of funds specifically for fire-weather forecasting. I believe that this meeting in 1924 rates the milepost.

1925.—Everyone here is aware of the vital and extremely practical problem of allotting fire-control funds. You fire chiefs probably appreciate it most keenly. It cuts you the most. Headley and Gowen undoubtedly know more about it than anyone else in the world. How many of you know that Sparhawk worked on this particular problem from 1915 to 1921, and wrote a bulletin[3] on it that was published in 1925? In his tremendous compilation and analysis of Forest Service fire records from all over the country, Sparhawk was not attempting to tell anyone how much money should be allotted to each region, forest, and ranger district. He was hunting for a method by which that could be done, and, of more significance, for an over-all justification for fire-control expenses. He was trying to answer that extremely basic question,—what is the cost of adequate protection?

Sparhawk had to work with inadequate and inaccurate fire statistics. He was not in as good position as we are today to define adequate protection, to formulate correct economic balance, or to develop economic justifications. Yet we can claim little advance in these respects over the clear analyses he developed in 1925.

As evidence of his attitude toward the economic theory, Figure 1 of his report carried a diagram illustrating the effect of the law of diminishing returns. It is the same diagram Mr. Headley was using last summer in an attempt to re-awaken forest officers to the full implications of this relationship. The term "hour control" was used by Sparhawk and was the starting point of work such as done by Show and Kotok in their "Determination of Hour Control." But they

[3]Sparhawk, W. N. The use of liability ratings in planning forest fire protection. Jour. Agric. Research 30: 693-762. 1925.

avoided the question of justifiable cost of meeting a particular hour-control standard, and such standards gradually became an end in themselves. Their only justification is as a means of attaining adequate fire control, but adequate fire control still lacks any exact definition.

Sparhawk knew the necessity of answering such questions. He listed, for the first time to my knowledge, all the kinds or values of forest resources which justify protection. No one has since added *anything* to that list of timber, including mature timber, young growth, the forest capital, and soil productivity; forage for livestock; regulation of stream flow and the prevention of erosion and floods; game resources; recreational use; improvements; and other occupancy values. That list is a true masterpiece of perception. Note, for instance, the inclusion of "the forest capital." When the silviculturists get a working circle into managed age classes, it is obvious that a fire which destroys or even seriously depletes one or two classes does damage far exceeding the maturity value of those particular trees discounted to date. The whole working circle is thrown seriously out of orderly future progression, and a form of loss results that is still far ahead of us in 1941. Sparhawk saw it, and named it, in 1925! Research program makers of 1941 can well go back and begin at this 1925 milepost in many respects.

1926.—This milepost, *A National Program of Forest Research* by Earle H. Clapp, is so well known and so well appreciated that it needs no explanation. There are certain features of the forest protection section, however, which I should like to emphasize.

First, protection from fire, protection from fungi, and protection from insects are tied together so closely that every time I read these three sections again I wonder why the Forest Service has a solitary division of fire control when the job, on the ground, could be so much more efficiently handled by a division of forest protection. If you will follow this through, you will find that here may lie one of the most effective methods of solving the problem of the temporary employee, or keeping a trained organization.

Second, is another case of lack of coordination in the Washington Office. In 1925 Sparhawk named all of the many reasons for fire control, of which commercial timber was only one. A year later, Mr. Clapp implied, by his words "forest management" and "to grow timber," that timber alone for dollars alone is our major and perhaps sole justification. Are we still at odds on this issue, or is there now a closer coordination of ideas?

Third, that Mr. Clapp subscribed to the economic theory is shown by his statement: "Possibly they [foresters] should also be able to set limits beyond which expenditures for protection are not justifiable, that is, the determination of that point where the law of diminishing returns becomes effective." In his next sentence he opened the door to the ultimate answer when he said, "But if used at all these limits should be set upon very comprehensive rather than narrow considerations." As will be brought out later, the dollar value of destructible resources is not the sole criterion of damage, and a much more comprehensive basis, as Mr. Clapp called it, is absolutely essential.

Fourth, under "Protection Standards," Mr. Clapp stated, 15 years ago: "Satisfactory timber crops cannot be grown unless certain definite standards or objectives of protection are attained. . . . Those standards must be definitely determined. . . . This is a task best attempted by research methods."

1928(a).—The McSweeney-McNary Act of 1928 is perhaps merely a result of the 1926 national program, but it is well to point out one difference. The "program" was an idea, a plan for a "functional operation." It could not function, however, without finances. The McSweeney-McNary Act liberated these essential dollars, like putting water into an irrigation ditch. A lot of fine work had gone into building the ditch and laying out the orchard, but until some water was turned into the ditch the orchard could be neither planted nor irrigated. The McSweeney-McNary Act permitted both plantation and growth.

Here, again, when we come to our fire research program, let us remember our history. We here at Priest River are merely extending that same ditch and laying out some more orchard. The other half of the job still remains to be done. Somebody must divert water into our ditch. Unless that job is specifically assigned, and another McSweeney-McNary Act puts golden water into our ditch, our work here at Priest River will join Sparhawk's fine work on the bookshelves.

1928(b).—Another milestone of progress in

methods was erected in 1928, or thereabouts, which should be credited specifically to the chief of our Division of Engineering, T. W. Norcross. On the basis of certain personal information I date this milepost as 1928, instead of 1931 when the Norcross-Grefe report was published. When Norcross saw this opportunity, devised a systematic attack, and rang the bell with his transportation planning methods, he gave all future investigators and administrators a well-designed tool. In my opinion that is a major contribution.

1930(a).—Although Sparhawk may have originated the "hour control" idea in the early twenties, and Norcross designed transportation planning to meet hour-control standards in the middle twenties, there is no doubt that Show and Kotok erected a milestone in 1930 when they published Technical Bulletin No. 209, *The Determination of Hour Control for Adequate Fire Protection in the Major Cover Types of the California Pine Region*. This popularized the idea and the term sufficiently to produce action in many parts of the country.

In this bulletin, Show and Kotok also added to all previous concepts of "adequate protection" when they went one step beyond Silcox by setting "an annual average of 0.2 per cent for the commercial and potential timber types and at 0.5 per cent for the nontimbered types" as the criteria of adequate protection in their region. Here was recognition of something new, an objective varying according to economic demands. There were many other outstanding features of this particular publication, but none, to my mind, either here or in their earlier *Role of Fire* and *Cover Type* bulletins, which so strongly influenced national ideas and action as this variable standard.

1930(b).—The milepost erected by the District Foresters' Washington meeting in 1930 seems to have been largely a nation-wide application of the "variable standard" originated by Show and Kotok. In view of all previous statements of fire-control objectives, it is well to note here how the district foresters affirmed the past basis of *damage* as a criterion: "Damage from fires to forest values varies considerably in the different forest types and the objectives in fire control must be based mainly upon consideration of these variations in damage." The fire control committee, of which Kotok was chairman, then listed (1) timber, (2) site, (3) reestablishment process, and (4) future fire danger, as the four main features of damage. Forage, recreation, and game were ignored, as well as that feature which Show and Kotok were to inject later, "downstream federal financial interests." It is evident that while the objectives were incompletely stated, still there was no doubt that damage was the sound basis. Every milepost in objectives from 1906 up to, but not including, 1935 will be found to be in agreement on that point.

1933.—The advent of the C.C.C.'s in 1933 appears to me to have been a milepost first in finance and second in methods. Money and labor of a sort were here made available to carry out Norcross' transportation plans, to approach Show's and Kotok's standards of speed of attack, and to build more airplane landing fields for Howard Flint. Besides implementing these ideas, the C.C.C. program gave urgency and immediate application to the development of new systematic methods of presuppression planning, involving new concepts in transportation systems, detection systems, and communication systems. The planners who charted out the methods and developed the techniques had, for the first time, the satisfaction of seeing them tested and applied on an adequate scale in an unprecedented investment program. This area of presuppression planning is still too recent to evaluate fully. A large part of the fire-control group present have taken leadership in some or all phases of it. A whole body of literature has grown up around it, with many new concepts that are finding increasing application. Cooperation between federal, state, and private agencies also was pushed ahead in a significant surge. Coincident were funds for considerably expanded research of certain types, and the construction of better plant facilities.

The C.C.C.'s brought a surge in methods too, for with them came both the opportunity and the necessity of training fire-fighting crews. Development or improvement of the man-passing-man, the sector, the one-lick, and the 40-man shock crew methods of large-fire suppression all seem to have been accelerated. New ideas not only grow best but can be tested best when both money and men are available. A similar period seems highly probable after the end of the present war.

1934.—I have been advised by some of the consultants who helped me prepare this list of mileposts, that fire danger meters should be included. Because of my personal interest in those particular devices, I am automatically disqualified from judging that point. I therefore leave

them out. [It would be unfair to let this statement by Gisborne stand without positively adding a milepost to the "fire danger meter" which he introduced in 1934. This was actually doing something about the philosophy for which he eulogizes Coert duBois. He, a "researcher," undismayed by the lack of basic studies, boldly proceeded by empirical methods to combine the influence of weather factors, season, and fire risk at any given time into a single rating which the confused administrator could use to determine the intensity of fire organization called for on the ground by each combination of factors. This was a new and better answer to an old idea. Gisborne's fire classes, and the meter by which they are determined, made possible for the first time a simple expression of exceedingly complex relationships. His idea has since been applied throughout the country, with the many variations and adaptations required by local conditions and needs, and has given rise to a bewildering array of fire-danger meters, each with some new and valuable feature. It deserves a major monument not only for its contribution to more efficient fire-control management but for the part it has played in reorienting fire-research programs and in giving new stimulus and significance to investigation of relationships and factors not yet clearly understood.—A. A. BROWN.]

1935.—The so-called "Forester's policy of control by 10 a.m." undoubtedly rates either a milepost or a tombstone on our 35-year road of progress. If and when that policy becomes clearly recognized as a temporary expedient, I believe that it will rate a milepost. If, however, it has already become or ever does become the death knell of all previous objectives based on damage, then it rates a tombstone executed in the blackest of black granite. It has already cost us 6 years of neglect of variable damage as an objective, but it seems to have achieved something else which may have been, at the time, worth more than the little thought which might have been given to damage.

It is futile to open a discussion of that policy here and now. It has such a direct bearing, however, on any fire-research program which we may recommend that its import deserves serious thought. First of all, it is important to recognize that while the 10 a.m. policy theoretically specifies the same standard of protection for commercial timber, reproduction, forage, water control, recreation, and wildlife, in practice it is not fully enforced. To this amateur historian, it appears that the policy actually had the same objective as the Show and Kotok minimum-damage theory of 1923, to wit: Stronger prevention and presuppression action to catch fires small, rather than stronger suppression action aimed primarily at keeping 10,000-acre fires from becoming 20,000- or 30,000-acre burns. There is a vital and basic difference here which will come out in our discussion of the economics of fire control. But if the main idea of the policy was to control fires while really small, the use of a time criterion would seem to be open to further investigation; for fires can be caught small and cheaply, often more cheaply, *without* controlling them by 10 a.m. tomorrow. If one function of research is to assemble and array all the significant facts, it seems more than possible that it might contribute something here.

1936.—Hornby's methodical treatment of all the significant features of fire control, especially his weighting of each factor and final integration of all of them, has been approved as a milepost of progress by all of my advisers. Perhaps his most outstanding contribution was his analytical approach to the planning problem and his reemphasis on physical conditions on the ground as the proper starting point for all fire plans. His concentration on fuel types, rate of fire occurrence, rate of spread, and fire danger, as fundamental, measurable factors of the fire job everywhere, constitutes a sound basis for future progress. Fire-control planning work is not new. It began with the organization of the Forest Service. But Hornby systematized that planning, made it so methodical, and incorporated so many new features that all future fire-control planners were greatly aided.

1938.—From Hornby's milepost in 1936 to date I cannot find a single event in objectives, methods, or finance that has proved to be of national significance in fire control. I believe that there are three reasons for this. First, in any field of human endeavor, whether it be forest-fire control or the effort to produce a temperature of absolute zero, the nearer you approach your goal the harder it is to take the next step ahead. Second, progress requires men and time to work, and these require funds. Since 1936 funds for all kinds of Forest Service work have been steadily reduced. While we have had additional "relief labor," intellectual progress in objectives and methods of fire control has not been and never

will be assisted in the least by E.R.A. and W.P.A. labor. Third, it is difficult to judge the most recent past. Perhaps some steps have been proposed or taken during the last 5 years which will show up later as milestones of progress.

One recent step of which I believe this may be true is illustrated in Region One by the scheme devised by Sutliff in 1938 for maintaining a standard relationship between current fire danger and the percentage of man power on duty. Shank had established a standard relationship and was using it on Region Four forests shortly before this, and Brown started his "Step-up" plan in Region Two in 1937, all of which were moves toward this one objective. The acceptance of this scheme in Region One has for 4 years done for current fire danger exactly what Hornby's systematic planning did for average bad danger. Hornby's method says that when the permanent factors of danger are thus and so, the following list of stations and facilities must be *available* for occupancy and use. Sutliff's table X-l-c says that when the variable factors of danger are thus and so, the following percentage of those stations will be occupied. These are two clear-cut, logical steps, both essential to adequate fire control at least possible cost. In 1958, when all forests have planned alike, when all are provided with facilities according to uniform consideration of the same factors, and when all are manned alike according to uniformly measured danger, the principle represented by these methods of correlating man power and fire danger may be judged as a milepost of progress. The possibility is at least sufficiently great to justify its mention.

While this concludes the list of definite and datable events which I rate, now, as milestones of progress, there has been one other type of steady progress that must not be ignored. This type is difficult to name and impossible to date. It is illustrated by Kelley's *Fire Code* for the eastern forest region issued in 1926, and by Headley's *Fire Control as an Executive Problem*, mimeographed in 1928. It is illustrated by the drive to "calculate the probabilities" contained in the Forester's 10 a.m. policy of 1935 (which is the best part of that policy). It is the concept that fire control is a tremendously complicated job, but one which is susceptible to orderly dispatch if the man uses his head, looks at all the factors and facilities, forms correct conclusions, and then takes action. To me it seems that this particular phase of the fire problem began when the Forest Reserves were created in 1904, has become increasingly important since then, and will never end.

I am purposefully not saying anything about "regulation" as a milepost in the progress of fire control, although that idea, and especially the recent action concerning it, are certain to exert a tremendous effect in the future.

Conclusion

If this summary of some of the developments of fire control appears to be primarily an attempt to pass judgment on history, then I have failed in my main purpose. My real purpose was to collect, select, and relate enough of the major events of fire control during the past 35 years so that we would have a reasonably dependable background or stage for this Priest River meeting. It may be significant that 19 of the mileposts mark progress in methods, 14 are achievements in understanding our own objectives, while only 11 major steps are evident in finances. One might question whether this shows knowledge ahead of practice, or finance retarding application.

I have tried also to assemble the "framework of ideas" within which we are trying to work out the problem, to see the problem as a whole in the light of past accomplishments. My viewpoint is naturally influenced and perhaps controlled by my own personal experiences to date. I cannot help that, but I admit that mine is not the only viewpoint. Others undoubtedly see this field of fact from a different viewpoint. I know that I should benefit by having them do for me this same job that I have tried to do for them: review the field and tell me how it looks to them. We have done altogether too little of that in the past 20 years and our failure has constituted a serious weakness in our work. I am convinced that many of our present disagreements would disappear if we could get together and look together at the whole valley from each of the several admittedly different vista points. And I am convinced that we here at Priest River cannot expect to lay out a sound fire-research program unless we keep in mind the major events which constitute the history of our particular line of work.

Comments

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IT IS not surprising that Gisborne has a few of his facts wrong. The surprising thing is that he found time to get so many of them right. This business of identifying mileposts in American forest-fire control takes hard, careful digging.

Silcox selected a lookout station on Squaw Peak on the Cabinet National Forest in 1907. The idea dates back that far at least. But who first thought out that method of detection? And who first actually put the idea into effect? I never asked Silcox. If we knew the answer it might help us to set the stage for equally important inventions or adaptations.

The use of aircraft in fire control probably began in California in 1919 when duBois got the Army Air Corps to organize an elaborate aerial patrol system over the national forests in that state. Some of this early history is reported in the article "Wings and Parachutes over the National Forests" in the October, 1940, issue of *Fire Control Notes*.

Gisborne does not go back far enough for the genesis of training. There were Forest Service ranger training camps at Fort Valley, Ariz., and Hot Springs, Calif., in 1909 or 1910. This form of training then suffered something of an eclipse because of hostile legal control that followed the dismissal of Gifford Pinchot; but it later overcame the legalistic hurdle and became recognized as an indispensable feature of personnel management.

Fire-guard training started (naturally?) in California about 1913. I believe that D. P. Godwin, then supervisor of the Mendocino National Forest, first saw the need and held the first training camps for fire guards. I doubt if fire training arose out of general administrative training. It may have been the reverse. Men were usually willing to admit that they needed training in fire control before they could accept the view that they needed training in "administration."

Since Gisborne is the father of danger rating and danger meters, he is modest in speaking of that milepost. In my opinion the danger meter and the ideas and possibilities which go with it are of very great importance indeed. I wish we could have more such fine pieces of fire-control thinking.

In speaking of Hornby's work, Gisborne emphasizes the importance of the "approach." He says it often determines the result of research *before* the research is begun. If I could, I would double and redouble all that Gisborne says and urge that research of the "approach" should not be neglected as it too often is.

However, Gisborne then argues that "physical conditions on the ground" is the approach to use as against the "results attained with past facilities and funds," in deciding on distribution of funds and facilities for fire control. But where does this leave us with respect to the minimum cost and damage objective which he regards as "fundamentally the most sound ever proposed"? If two sides of a barren-topped mountain range have identical cover and other physical conditions, would the physical-conditions approach lead to identical allotments of funds for fire control? Would it still do this if on one side of the range there is an unused desert and on the other a highly productive irrigated valley subject to water shortage and great flood damage?

And what would we do if according to the physical-conditions approach areas A and B should have identical funds while according to the "results attained with past facilities and funds" approach, area A should have 25 per cent more facilities and funds than area B? Should the experimental values determined by past results be set aside in favor of a man-made rating of physical conditions? If so, isn't that a bit hard on the experimental method as against the observational method? And what shall we think if we find that the "physical conditions on the ground" approach tends to call for more money than the other approach?

Gisborne hardly expects any one to agree with him on his selection of mileposts. Agreement at the outset is not so important as critical study, which if kept alive must eventually lead to substantial agreement.

Gisborne omits mention of the mechanization of fire control. There may be no event to identify as a milepost, but it has been a most important development which may prove a life saver during the next few years when labor will be so scarce that it will be impossible to fall back on the principle of "fifty men to do ten men's work."

He makes no mention of cooperation in prevention and suppression of the type that John McLaren and others developed. Such cooperation relapsed under the impact of the C.C.C. but is being revived now that the C.C.C. is folding up and idle labor is no longer available for our sudden heavy demands for suppression labor. Local cooperation can mean as much to us as it meant to our army in the Philippines.

While Gisborne mentions the one-lick method he doesn't really give it a milepost rating. The story is important as a study in how ideas are born, languish, and sometimes revive. Godwin was the inventor in about 1915. But the brain child was stillborn and no amount of effort could seem to revive it—until 1935. In that year it was hopefully attached as a rider to a letter on the Chief's 10 a. m. fire-control policy. Sure enough, some one sparked. Kenneth P. McReynolds went into action. See his story in the December, 1936, *Fire Control Notes*. His activity enabled the one-lick method to get going at long last, and must have been partly responsible for the whole brood of similar methods which have since been hatched. But the important question is, what mistake of leadership was it that kept the one-lick and other ideas for speeding up production of held line dormant for twenty years,—and to that extent retarded an aggressive attack on the problem of the tragically low output of held line per man hour?

Why no milepost for the Mather Field conference in the early twenties? A good many important things started there, including action on the idea of fire-control roads on specifications just sufficient to serve the purpose. A large mileage of such roads actually came into use before that approach to the problem of investment in fire roads lost out.

How about a milepost for the employment of a professional psychologist on fire prevention in 1938? Even if we have no statistics on the fires he has prevented, it represented a break in the tradition that, in fire control, foresters need no help from other professional disciplines. That break could lead by easy stages to the use of specialists in sociology, economics, and eventually even in organization and management.

Along with the employment of a professional psychologist went the employment of an expert in obtaining cooperation in fire prevention from national offices of national organizations. Results in terms of contributed money cost of our series of nationally distributed posters may be spectacular as well as some things national organizations have done, but on a milepost jury I would expect few to vote with me for a favorable verdict.

In 1919 I acquired an acute dislike for the word "smokechaser" because it seemed that the role of the smokechaser was to chase out, look at the smoke, chase back, and wait for a crew from the nearest labor center a hundred miles or more away. Today, it is my belief that our typical smokechasers or firemen perform marvelous exploits of tenacity, devotion to the job, and intelligent heroism. If there is any truth in the contrast, the change surely rates a milepost of some kind. But where? It is the result of years of careful selection, good inspection, and inspirational discipline by many fire-control managers. It is a sample of many developments which, while of vital importance, cannot be identified with a monument or a mile post to mark some particular event.

Why not a milepost for the 1940 start on appraisal of the so-called intangible damage from fire? Tangled thinking had postponed such a start for a long time, but at last it got under way. We could easily get tangled again and fail to follow up on the start that has been made; but it is also true that this beginning could be followed by far-reaching gains in the intelligence with which fire control is managed.

While Gisborne had a special purpose in preparing his paper, we owe him a vote of gratitude for the start he has made on the history of ideas in fire control. As he well says, our future thinking will be more fruitful if we pay some attention to the ideological steps we have taken in getting to where we are now.

For seven years ending with 1941 the national forests of the six western Regions as a whole have more than reached the once seemingly unattainable goal of an average annual area loss of one-tenth of 1 per cent. Perhaps there is a "bad" year around the corner which will humiliate us once more; but for the moment, the record stands.

For 35 years everybody has been too busy trying things, making mistakes, and learning from them to write this saga of American forest-fire control. But the time has now come to study its mileposts; also the slow growths of competence in which mileposts are almost impossible to identify. And Gisborne has given us a good send-off.