

## BRINGING FEDERAL COORDINATION TO SNOW SURVEYS

by

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Daily, even hourly, the federal government is monitoring numerous aspects of the environment. Though not so well-known as satellite images or the daily weather report, stations in the mountains of the West keep track of the amount of snow. A major objective is to know the amount of runoff in the spring and summer. Snow surveying is part of the development of science in government, as well as the growing demand for information by individuals and businesses in the interest of economic growth. Also, snow has been one of the more striking examples of federal, state, and local cooperation. This article recounts the entrance of the federal government into the snow surveying field.

As agriculture and recreation expanded in the West, some individuals, universities, and companies began collecting information on winter snows so as to predict snowmelt runoff in the spring and summer. Of necessity these surveys were limited to the watersheds of immediate interest; the forecasts were directed to specific purposes such as irrigation, hydroelectric power, and predicting floods. The idea of coordinating snow surveys so that forecasts of spring runoff would be available for all the West may have occurred to many people, but Walter Wesley McLaughlin, chief of the Division of Irrigation in the U. S. Department of Agriculture's (USDA) Bureau of Agricultural Engineering (BAE) was in a position to promote the idea. A Nebraska native, McLaughlin had earned a degree in civil engineering at Utah State University in 1896 and an M.S. degree in soil physics and irrigation from the University of California at Berkeley in 1924. McLaughlin embarked on a career in irrigation engineering in 1904 in USDA while also teaching at Utah State University. In 1925, he became head of the irrigation division, which was in the Bureau of Public Roads before being transferred to the Bureau of Agricultural Engineering.

Since Utah was one of the pioneering states in snow surveying, McLaughlin undoubtedly knew about its value. From his headquarters in Berkeley, California, he followed the growth of snow surveying in the West and participated in some of the snow survey meetings in 1933 and 1934. By mid-1934, he had decided the time was ripe for getting the federal government involved. He sent his supervisor, Samuel Henry McCrory, Chief of the Bureau of Agricultural Engineering, a project proposal entitled "Snow Survey and Stream Flow Forecasting." McLaughlin had observed that neither the Weather Bureau nor the Water Resources Division of the U.S. Geological Survey was particularly active in snow surveying. The pioneers in snow surveying were the users and their allies in industry, public utilities, state agencies, and agricultural experiment stations. Viewing the vacuum, McLaughlin proposed "to set up at the proper time a snow survey project under the Bureau of Agricultural Engineering, believing it to be the logical agency to undertake this work and the best agency to make the greatest possible use of the information in the interest of agriculture."

According to McLaughlin, he was waiting for the perfect opportunity; the drought of 1934 provided it. In May 1934 he had an opportunity to explain the importance of

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snow surveys to Secretary of Agriculture Henry A. Wallace. He told Wallace how snow surveys could have helped farmers adjust to the drought.<sup>1</sup> Also, McLaughlin saw the emergency employment programs under the Public Works Administration (PWA) and the Works Progress Administration (WPA) as an opportunity to expand snow surveys and provide a way for coordinated forecasting. The Great Depression and employment programs of the New Deal elicited hundreds of proposals for a more activist federal role in social and natural resources areas. Thus the economic conditions provided the climate in which the federal government expanded its responsibilities in numerous areas.

The Farm Bureau Federation endorsed McLaughlin's proposal in 1934, and he submitted a request for PWA funds for snow measuring stations, snow courses, shelters, equipment, and maintenance for the first year. Despite their inactivity to date, McLaughlin believed the Department of the Interior would make a similar request if USDA did not take the initiative.<sup>2</sup> McLaughlin specified mostly research projects in his proposal.

McCrorry agreed that the drought and depression had indeed provided an excellent opportunity, but McLaughlin was taking the wrong tactic. The emphasis must be placed on actually providing forecasts to farmers and other water users, rather than on research.<sup>3</sup> McCrorry knew how to spot opportunities. His agency was one of the smallest in USDA, and he had won a reputation for aggressively competing with larger agencies for funding. BAE had neither the manpower nor the large constituencies of agencies such as the Weather Bureau or the Forest Service.<sup>4</sup> In addition to the \$36,000 requested from the Bureau of the Budget for research, McCrorry requested \$40,000 of the emergency drought funds from USDA for making snow surveys and forecasts.<sup>5</sup>

The Bureau of the Budget rejected both requests.<sup>6</sup> Having become a convert to the idea, McCrorry pushed the issue. In November 1934 Secretary Wallace met with Harry Hopkins, head of the federal relief effort, to discuss money for snow surveys. Rather than having a large project at the federal level, Hopkins suggested requests for the snow survey work should come from the states through their regular procedure for requesting project approval.<sup>7</sup> Meanwhile, in late 1934 McLaughlin continued his campaigning in the West. The Association of Western State Engineers and the National Reclamation Association adopted resolutions calling on the Secretary of Agriculture to undertake a coordinated, comprehensive snow survey in the West. McLaughlin and his allies blocked moves to have the Weather Bureau and the Forest Service named as the agencies to lead the effort. They much preferred that the Secretary of Agriculture delegate the authority. In the interest of making sure that the Bureau of Agricultural Engineering was given the authority, McLaughlin reminded McCrorry to keep the Secretary advised. "We must, however, put the matter up to the Secretary so he will be prepared for any move by Forestry or Weather Bureau. Forestry grabs at every thing all the time."<sup>8</sup>

#### LEGISLATION

Having failed, at least temporarily, with the regular budgetary process and the emergency employment funds routes, the campaign now turned to the legislative process. Governor C. Ben Ross of Idaho wrote to U.S. Senator James P. Pope of Idaho to introduce

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<sup>1</sup> Walter Wesley McLaughlin to Samuel Henry McCrorry, July 25, 1934, File 3-234, General Correspondence, 1931-1939, Records of Bureau of Agricultural Engineering, Record Group 8, National Archives and Records Administration, Washington, D.C. All of the correspondence cited in this article is from the same file.

<sup>2</sup> McLaughlin to McCrorry, August 6, 1934.

<sup>3</sup> McCrorry to McLaughlin, August 23, 1934.

<sup>4</sup> Wayne Rasmussen, former historian of USDA, knew McCrorry and provided this characterization. Conversation with Rasmussen, March 25, 1991.

<sup>5</sup> McCrorry, Memorandum for the Secretary, September 4, 1934.

<sup>6</sup> McCrorry to McLaughlin, November 18, 1934.

<sup>7</sup> McCrorry to McLaughlin, November 27, 1934.

<sup>8</sup> McLaughlin to McCrorry, December 8, 1934.

him to McCrory.<sup>9</sup> McCrory kept the Secretary informed of these meetings and his activities to promote snow surveys.<sup>10</sup>

The western Congressional delegation was easily convinced of the need for snow surveys and requested funding in 1935. The Senate appropriations committee discussed the item, but did not include it in the bill submitted to the full Senate. They wanted to resolve the matter of who was going to be in charge of the snow surveys. Senator Frederick A. Steiwer of Oregon contacted Assistant Forester Earle H. Clapp and others in USDA, who told him that authority should be assigned to the Bureau of Agricultural Engineering. The amendment to the appropriations bill in the Senate gave BAE authorities and funding for "snow surveys and forecasts of irrigation water supplies."<sup>11</sup>

#### DESIGNING THE PROGRAM

Before the appropriations bill was signed on May 17, 1935, McLaughlin had already asked James C. Marr, a Division of Irrigation engineer at Boise, Idaho, to familiarize himself with snow surveys in the northwestern states.<sup>12</sup> McLaughlin travelled to Logan, Utah, to discuss snow surveys with George D. Clyde, a professor of engineering at Utah State University and head of Utah's snow survey effort. McLaughlin considered Clyde "the best informed man in the country on this subject." In addition to his expertise, Clyde already had "very pleasant contacts with other agencies," which would be crucial to the success of a cooperative snow survey effort.<sup>13</sup>

McLaughlin thought Clyde would be the only additional employee BAE would need for their new role in snow surveying. He would be a collaborator for two or three months each year. Marr would have general supervision of the snow survey work. Clyde and Marr worked on the general plan of action in early May, preparatory to visiting existing snow surveying operations and prospective cooperators. Clyde and Marr would locate the snow courses in the states selected for work the first summer.

Despite McLaughlin's original intentions, he also signed on James Edward Church to help get the cooperative snow survey program started in the summer of 1935. Church's interest in snow led him from his fairly obscure position as a classics professor at the University of Nevada in Reno to being the most renowned figure on snow surveying in the United States. Undoubtedly, it was a wise move to solicit Church's advice and to add his reputation to the cause. Unlike Clyde, who immersed himself in developing the structure of the program and laying out snow courses, Church conferred with officials in the various states and explored the areas where cooperation could be had. He talked to the hydroelectric power interests in Los Angeles, the irrigators in the Imperial Valley, and the Forest Service and National Park Service people in Arizona. One of the cooperators referred to Church's "goodwill tour." Church liked the term and continued the tour at Marr's behest.<sup>14</sup>

Church was a willing cooperator. If he resented the fact that Clyde had a greater hand in designing the coordinated system, he did not betray it in writing to McLaughlin or Marr. Furthermore there was much in the operations of the new group to enhance his reputation. Church felt that the Weather Bureau had rebuffed his earlier efforts to prod them into developing a national system. Worse, some of the Weather Bureau people preferred snow stakes for measurement, rather than Church's snow courses and tube sampling. (McLaughlin's group would use Church's methods.) Finally, Church held that streamflow forecasting required engineering, rather than meteorological analysis.

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<sup>9</sup> C. Ben Ross to James P. Pope, December 27, 1934.

<sup>10</sup> McCrory, Memorandum for the Secretary, January 31, 1935.

<sup>11</sup> U. S. Congress, Senate, Congressional Record, 74th Cong. 1st. sess., 1935, 79, pt. 5: 4699.; Public Law No. 62, 74th Congress.

<sup>12</sup> James C. Marr to M. R. Lewis, April 26, 1935.

<sup>13</sup> McLaughlin to McCrory, May 6, 1935.

<sup>14</sup> James Edward Church to McLaughlin, July 23, 1935.

Accordingly, most of the recent conferences had been held with engineers rather than meteorologists.<sup>15</sup>

#### EARLY DECISIONS ON STANDARDIZATION

The survey was obviously going to rely on a great deal of cooperation. But McLaughlin believed some of the methods and equipment must be standardized. His group decided to spend their scant funds, \$15,000, on equipment. A standard type would be selected and purchased in volume so as to reduce costs. His group well understood that experience in the field would lead to improvements and correction of defects. Nonetheless they intended to start out with established standards for the equipment and methods. They would use Church's method for snow cover measurements rather than the stake method. The former involved taking a core sample of the snow so as to measure volume and water content. The stake method simply measured snow depth without regard to density or water content. Another Church contribution, "the Mount Rose tube in its original form or as modified in Utah," would be used.<sup>16</sup> The scale to measure the weight of the snow sample would also be standardized. As two of the innovators of snow surveying equipment, Church and Clyde both had a personal interest in the writing of standards. During the first year the Bureau of Agricultural Engineering purchased 150 sets of snow sampling equipment with half going to Marr and the other half to Clyde for distribution.<sup>17</sup> But when they received the equipment, Clyde and Church both had some objections. Church found a deficiency in the weighing mechanism; Clyde found fault with the sampling tube from Nevada. McLaughlin wryly noted that snow surveyors from Colorado had no difficulty in using the equipment, and attributed "some of the comments of Clyde and Church to a little prejudice. This is only natural, since we all have our weakness in this regard."<sup>18</sup> In addition to the snow sampling tubes and the weighing mechanism, the group also supplied skis and snow shoes in some cases.<sup>19</sup>

#### ORGANIZATION

The absence of long-term data plus the need to emphasize the cooperative nature of the work influenced McLaughlin's organizational decisions. There would be regional offices, rather than a national one. Without historical data, personal knowledge of the rivers and streams would be required if the snow survey group expected to make worthwhile forecasts in the first few years. They needed, and wanted, to make their presence known. They definitely planned to make forecasts from the new snow course data the first year. After some years' accumulation of data, McLaughlin believed it would be possible to have a national office. But there was another reason for regional structure. McLaughlin wanted to have the state agencies involved not only in the surveying, but also in the forecasting. The matter of organization illustrated the sensitivity required in federal-state cooperation on the project and how such cooperation could best be achieved. McLaughlin thought his bureau should insist on being involved in all local forecasting. He wrote to McCrory, "Otherwise the work would soon drift out of our hands and we would find ourselves in a position of supplying funds and some state agency making the forecasts."<sup>20</sup>

#### ESTABLISHING SNOW COURSES

The first year McLaughlin planned to expand existing networks in the key drainages and the most accessible areas of Oregon, Idaho, Utah, Wyoming, Colorado, Nevada, and California. As Clyde and Marr travelled about, locating snow surveys, they were "to

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<sup>15</sup> Quotes of a letter from Church to McLaughlin found in McLaughlin to McCrory, August 9, 1935.

<sup>16</sup> McLaughlin to Church, August 3, 1935.

<sup>17</sup> McLaughlin to George R. Boyd, Acting Chief, Bureau of Agricultural Engineering, August 3, 1935.

<sup>18</sup> McLaughlin to McCrory, January 23, 1936.

<sup>19</sup> McLaughlin to McCrory, October 19, 1935.

<sup>20</sup> McLaughlin to McCrory, December 30, 1935.

interest local and state agencies and stimulate an interest in local agencies for snow surveys so they will demand the work."<sup>21</sup>

McLaughlin's group hoped, and suggested, that the cooperators in Nevada, California, Utah, and Oregon who already had extensive networks of snow courses would establish additional ones as well as surveying and mapping existing courses. BAE was to supply the additional snow surveying equipment needed. During the summer of 1935, Marr concentrated on the Snake River and Clyde on the Colorado in establishing new snow courses in Wyoming, Idaho, and Colorado.<sup>22</sup> In selecting the new snow courses, the two considered serviceability, accessibility, and the key areas in a statewide plan, as well as the most urgent requests from cooperators.<sup>23</sup>

During the first ten days of August, 1935, Marr covered 2,300 miles over little travelled roads and trails as he established snow courses in Wyoming and Yellowstone National Park. To avoid the cost of installing a course, he selected areas where little construction work would be needed. Where work was needed he managed to get the cooperation of the Civilian Conservation Corps. Thanks to the cooperation of agencies, the only cost to BAE would be the snow sampling equipment.<sup>24</sup>

Marr's enthusiasm for the work even brought a reaction from McCrory in Washington. He advised McLaughlin to "put on the brakes on a little in his case. He is working so hard that I am afraid he faces a nervous breakdown if he does not ease off somewhat."<sup>25</sup> At the end of 1935, Marr thought the snow surveying group had about a fourth of the 1,000 courses, they would eventually need.<sup>26</sup>

#### COOPERATION WITH OTHER FEDERAL AGENCIES

McLaughlin believed the Forest Service, as part of their cooperation, would clear and mark courses, build and equip snow shelters at their own expense and with CCC labor. He hoped that some of the cooperating state agencies such as the state engineers would be able to use CCC labor and successfully apply for Federal Emergency Relief Act funds for similar work. McLaughlin planned to use all of the scant \$15,000 appropriation for equipment. To establish the whole network in the West would eventually require about \$100,000 to \$300,000.<sup>27</sup>

The Division of Irrigation group never quite secured the large allocation of emergency funding with which to rapidly expand the network by clearing snow courses, building snow cabins, and doing other construction work. Thus they tended to work through the states or with the federal land management agencies. Marr helped Idaho prepare applications for funds to work on snow courses.<sup>28</sup> The federal land management agencies eventually did much of the construction on the lands in their charge. Seeing that BAE had only \$15,000 to get the work started, the other agencies knew well that success depended upon their cooperation. Evan W. Kelly, the U. S. Forest Service's regional forester in Missoula, Montana, wrote to his forest supervisors: "The Bureau of Agricultural Engineering is pitifully short of the necessary appropriation from which to finance this important activity;...the various agencies of the Government directly or incidentally interested, must cooperate to the fullest practical extent."<sup>29</sup> The Bureau of Agricultural Engineering had reason to be pleased with the degree of cooperation the first year. They wrote not only to cooperators, but also to their supervisors thanking them.<sup>30</sup> Success the first year accelerated the degree of cooperation. The Corps of Engineers had been doing some snow surveying work on the watershed of the Missouri

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21 McLaughlin, Memo - Snow Surveys, July 5, 1935.

22 Marr to H. P. Boardman, August 12, 1935.

23 McLaughlin to McCrory, December 30, 1935.

24 Marr to McLaughlin, August 12, 1935.

25 McCrory to McLaughlin, August 12, 1935.

26 McLaughlin to McCrory, December 30, 1935.

27 McLaughlin to McCrory, May 6, 1935.

28 Marr to H. P. Boardman, August 12, 1935.

29 Evan W. Kelly to Forest Supervisors, July 24, 1936.

30 McLaughlin to McCrory, August 12, 1936.

River. In 1936 they contributed \$3,000 so that BAE could set up courses on the Columbia River basin.<sup>31</sup>

#### EXPANSION OF WORK

Following the forecasting work in the spring of 1936, BAE expanded the program in the summer. In all the states there was cooperation with the state engineer and the land-grant agricultural college. Each of the district representatives of the Division of Irrigation made arrangements for the snow cover surveys, provided the equipment, and stocked the cabins. Essentially they handled all of the operations in their state. They reported the snow survey data to the Berkeley office and the Boise office. Clyde handled the work in Utah while Church handled Nevada. Marr, at Boise, and Louie T. Jessup at Yakima, Washington, did Idaho and part of the Columbia drainage. Ralph Parshall at Ft. Collins was responsible for Wyoming and Colorado; and temporarily responsible for New Mexico and Arizona. Arch Work surveyed Oregon and northern California from his office at Medford, Oregon. The state engineer of California did the rest of that state. The district engineer of the U. S. Geological Survey at Helena, Montana, did the Missouri River. The Berkeley and Boise offices jointly publicized the information.<sup>32</sup>

By the second season they had perfected the publicity arrangements. They made measurements monthly from January 1 to May 1. Water supply forecasts were made following the February measurement and the April or May measurement, depending on the state. Broadcasts of information went out on the Farm and Home Hour and various state stations. The cooperating agencies, usually the state engineer or the state agricultural college, put out mimeographed releases. The Weather Bureau also published the data for the federal government. As part of the original agreement with the Weather Bureau, BAE supplied information to them for flood predications. Sampling for flood predictions required additional visits to the snow courses. The snow survey work was actually a part-time duty for the BAE people, except Marr, who would work full-time on it until no longer needed.<sup>33</sup>

#### WINTER SPORTS RADIO BROADCASTS

By the second year of forecasts, the snow survey group began receiving requests for information from winter sports enthusiasts. McLaughlin wanted to get immediately involved since it was a public service and was another "most worthwhile public contact for us..."<sup>34</sup> Initially McCrory resisted, believing that BAE had to strictly limit itself to the authority in the legislation for forecasting irrigation water.<sup>35</sup> Never easily discouraged, McLaughlin managed a meeting with Paul Appleby, Assistant to the Secretary of Agriculture, and got his endorsement. Following the meeting with Appleby, McLaughlin worked out an agreement with the National Broadcasting Company to devote five minutes each Friday on the Farm and Home Hour to reports from each state. Also, many of the state weather bureaus and state highway departments agreed to issue the forecasts. As far as McLaughlin was concerned the service was "an excellent contact with the public."<sup>36</sup>

#### DIFFERENT VISIONS

The issue of the winter sports forecasts illustrated some of the differences in outlook, or zeal, between McCrory and his people in the West. McCrory saw the value for irrigated agriculture and strongly supported the work, but he saw it as only one aspect of BAE's work. When he thought he detected Marr and others working exclusively on the snow survey project, yet charging a large part of their salaries to other accounts, he chided them. He warned McLaughlin to stay within the appropriation for snow surveys and

<sup>31</sup> McLaughlin to McCrory, August 10, 1936.

<sup>32</sup> McLaughlin to McCrory, January 23, 1937.

<sup>33</sup> McLaughlin to McCrory, January 23, 1937.

<sup>34</sup> McLaughlin to McCrory, February 3, 1937.

<sup>35</sup> McCrory to McLaughlin, February 6, 1937.

<sup>36</sup> McLaughlin to McCrory, July 13, 1937.

vowed not to siphon funds from other work for it.<sup>37</sup> He wanted to adhere strictly to the authorization for predicting irrigation water supplies. As far as he was concerned, the agreement with the Weather Bureau was well understood by both parties, and each group would cleave honorably to the agreement.

In practically all these matters, McLaughlin had a different view. Success in the snow survey required a quick success the first year and thus demanded almost undivided attention. Though an irrigation engineer by training, he understood the other uses and potential for the snow survey and moved aggressively into those areas. Given the sparse BAE staff in the West, compared to other Federal agencies, McLaughlin cherished the publicity value and resulting clout that came from activities such as the winter sports radio broadcasts. McLaughlin's operation depended upon the cooperation of the land management agencies, but he also viewed them as potential competitors for the snow survey prize. In his opinion the Weather Bureau had to be watched at every turn. Offers of cooperation must be analyzed closely for ulterior motives.<sup>38</sup> For all these reasons McLaughlin and his people in the Division of Irrigation zealously set out to make the program a success.

#### SUMMARY

More than fifty years after federal coordination of snow surveys was begun, its value is recognized more than ever. The competition for water in the West due to the explosion in population, industry, and agriculture created a demand to know as precisely as possible the amount of water available from snowmelt. The various enterprises whose operations cut across political boundaries demand the basinwide information that a coordinated system produces.

In retrospect, many of the decisions made by McLaughlin and his colleagues were wise beyond their time. One thing they wanted, but did not get, was a large appropriation or allotment from the emergency employment funds to rapidly clear snow courses, build snow cabins, and do other types of construction associated with snow surveys. Would this have changed the course of the history of snow survey? It is difficult to know. As it developed, the enforced reliance on the state and other federal agencies to do much of the work probably was beneficial to the strength of the program. Although the snow survey is operated under the Soil Conservation Service, it is responsible to, and draws strength from, all the cooperating agencies. In a sense it has a separate existence. The users and gatherers, of the snow survey information seem likely to continue to demand some coordination at the federal level for the foreseeable future.

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<sup>37</sup> McCrory to McLaughlin, January 6, 1937 and January 18, 1937; McLaughlin to McCrory, January 12, 1937.

<sup>38</sup> McLaughlin to McCrory, December 21, 1936, McLaughlin to George R. Boyd, Acting Chief, Bureau of Agricultural Engineering, August 16, 1937.