

NORTH AMERICAN INTERSTATE
WEATHER MODIFICATION COUNCIL
Desert Research Institute, Reno, Nevada
April 6, 2000

The annual meeting of the North American Interstate Weather Modification Council was called to order by Chairman George Bomar April 6, 2000, at 9:30 a.m. in the Maxey Conference Room of the Desert Research Institute, Reno, Nevada.

Member state representatives present at the meeting were: George Bomar, Texas; Bruce Boe, North Dakota; Mike Mathis, Oklahoma; Norm Stauffer, Utah; Maurice Roos, California; Darrel Eklund, Kansas; Arlen Huggins, Nevada; and Dennis Gibbs, California.

Others present were: Tommy Shearrer, Texas; Dale Bates, Texas; LeNor Dollinger, North Dakota; Dick Smith, Nevada; Monte Stark, Nevada; Bill Finnegan, Nevada; Stein Buer, California; Joe Warburton, Nevada; Rick Stone, Nevada.

Those present introduced themselves.

MINUTES

Norm Stauffer noted a correction to the minutes of October 21, 1999 on page 3, paragraph 1, line 5. It should read "the Emery Project is now being run by Emery County with technical assistance being provided by the Bureau of Reclamation using computerized automatic stations."

Bruce Boe moved the minutes of the October 21, 1999 meeting be approved as corrected. Seconded by Maurice Roos. Motion carried.

STATE STATUS REPORTS

California - Maurice Roos reported snowpack overall is about average, a little lighter in the south. Southern California is still fairly dry. Thirteen cloud seeding projects operated this past winter season in California, which is the same as last year and has remained steady over the past several years. There is no requirement for license and permits, only that they provide notice of intention published once every five years and provide letters to the board of county supervisors each year that the sponsors will be continuing operations. Most project purposes are for enhancing precipitation. Mr. Roos reported he will be retiring this summer.

Kansas - Mr. Darryl Eklund reported the State of Kansas has issued three weather modification permits for 2000. In the past 25 years they have normally issued one permit. The on-going permit is for the Groundwater Management District No. 1 and has been on-going annually since 1975 and covers southwest and west central Kansas

counties. This year a second permit was issued to Groundwater Management District No.4 which covers the boundaries of northwest Kansas GMD No. 4 except for Cheyenne and Rawlins Counties (22% of district area). The third permit was issued to the State of Oklahoma to oversee in the Kansas border counties. Issues and concerns in northwest Kansas are those of the Concerned Citizens for Natural Weather. Mr. Eklund noted Rawlins county residents voted to make it a misdemeanor to seed clouds over Rawlins County. Also, the Decatur County Commission signed a resolution making it a misdemeanor to seed clouds over Decatur County; and the Cheyenne County Commission also signed a resolution against cloud seeding over Cheyenne County. Therefore, state funding has been withheld from the portions of the areas just described. The funding is down to about \$339,000 from the requested \$390,000 for programs in Kansas for the 2000 projects. Approximately 60% of the funding comes from local sources. The source for the state portion to fund the projects is from the State Water Plan Fee Fund. Approximately \$18 million dollars per year that are divided between many programs. Mr. Eklund noted the Kansas Water Office would like to work with the Oklahoma Water Resources Board to enter into a cooperative program that would cover the panhandle of Oklahoma.

Mr. Eklund noted the most recent evaluations done on Kansas projects was conducted by a graduate student and an economist from Kansas State University. The net results of their work was not greatly different than others in the past and generally positive.

Nevada - Arlen Huggins reported the season started pretty slow with almost no activity in November and December and into the start of January. Then January and February became quite wet. The Tahoe Basin at one point came up to over 100% of the average for the date. The season ended up in the upper 70's to low 90's in most of the basins. The distribution of ground generators was changed this year due to the Tahoe Basin being in good shape. Two generators were moved to the southern part of the Walker Basin close to Walker Lake. This is a new area that we have not tried to seed remotely before. Most of the other basins were about status quo in terms of numbers of generators in operation. Through the end of March, the Tahoe and Walker-Carson has had approximately 32 seeding operations, with similar numbers in the north part of the state. Precipitation came at different times. The north was wetter early then Tahoe caught up and then the north got wet again later. In the new area of Walker-Carson including the East Walker River, we do most of our aircraft seeding upwind of the main Sierra crest, other areas are covered well by ground generators. There has been renewed interest in the Walker Basin for additional cloud seeding. The local citizenry are the most active in the state in urging increased activity of cloud seeding. Mr. Huggins stated they are now looking at ways to increase both ground and aircraft seeding in the Walker Basin.

DRI keeps track of precipitation in most of the basins using snowtel data. These are remote sensors that detect the amount of water in the snowpack. April 1 snowpack is considered the average maximum snowpack. April 1 averages were 84% at Truckee, 86% for the Tahoe Basin, Carson was 73%, and Walker was 74%. The Oahe Basin

was 87%, the Upper Humboldt was highest at 90%, and the Lower Humboldt was at 83%. The driest part of the state was central Nevada.

Rick Stone stated a new facility has been constructed at the Desert Research Institute. A new "clean room" facility has been installed with new advanced instrumentation called ICPMS (Inductively Coupled Plasma Mass Spectrometers). These instruments are much more sensitive than past instrumentation, reaching down to parts per trillion and parts per quadrillion-type levels. New areas of work are new melting techniques for snow and ice and also precipitation.

Santa Barbara Water Agency - Dennis Gibbs reported Santa Barbara County has had a program since 1981 and they are looking at ways of acquiring funding to do research programs and also looking at trying to fine-tune the program in trace chemistry. Through 1997 the program was solicited explicitly to North American Weather Consultants. At that time they looked at Atmospherics, Inc. and contracted with Weather Modification, Inc. the past couple of years. Mr. Gibbs reported the county pays for half of the program and are now starting to lose interest in the program because they don't have "hard numbers" on benefits of the program. They are now working in the direction to ascertain those hard numbers of the program and to fine tune the program by moving and adding ground generators. They would like to bring a little bit more technology to the program and make it more state of the art. The project area is approximately 3000 square miles.

Joe Warburton noted the Santa Barbara Water Agency is now an Associate Member of the NAIWMC.

North Dakota - Bruce Boe reported the North Dakota Cloud Modification Project (NDCMP) is a combined hail suppression and rainfall enhancement project covering five counties and 9 adjacent townships for a total of 10,441 square miles (6.7 million acres).

North Dakota used a variety of techniques for seeding using silver iodide complexes with salt to produce condensation freezing nucleation; wing-tip generators and both burn-in-place and ejectable flares; and also dry ice. Seeding is accomplished with 8 aircraft, all piston twins, two of which are cloud-top, the remainder cloud-base seeders, all provided by contract. The guidance of the project is done with TITAN equipped radars. The ND Atmospheric Resource Board owns its own radars. The NDCMP starts June 1 each year and runs through August 31.

Issues for the North Dakota project are: (1) training and retention of pilots and meteorologists. North Dakota is planning to increase meteorologists salaries to try to be more competitive; (2) commuter airlines continue to hire away the pilots trained through the board's weather modification internship program; (3) verification of targeting by seeding to instrument a cloud-top treatment aircraft to collect pre-treatment microphysical data; (4) optimization of dry ice pellet size. Simple numerical modeling indicates that the 9/16 inch diameter pellet (common size) is too large. ND now working with vendors and contractor to obtain and test smaller diameters; (5) re-engineering the

NDCMP Ground School to emphasize case studies, combining radar and video images to show both sides of a cloud-seeding mission; and, (6) restoration of federal involvement in weather modification research desperately needed.

New Mexico - George Bomar (for Scotty Savage). Mr. Bomar was in New Mexico last week to visit with some citizens who have some interest in a rain enhancement program. There are about 3 million acres on the Texas - New Mexico border in three New Mexico counties that have participated with the Texas project based in Lubbock for the last four years. Those three counties are going to be involved in the rain enhancement program conducted by the High Plains Underground Water Conservation District based in Lubbock again this year. By assisting these counties it allows Texas to secure a license to be allowed to use New Mexico airspace for cloud seeding. A new program will be starting in the Texas panhandle sponsored by the North Plains Groundwater Conservation District. That district needs air space in Union County, New Mexico and have submitted an application for license from the State of New Mexico. In doing so some interest was generated in Union County. A public meeting was held there last week and of those present 90% voted to raise funds and partner with the new project in Texas. The New Mexico Interstate Stream Commission will again contribute \$150,000 for New Mexico's involvement in the joint weather modification project in New Mexico.

Oklahoma - Mike Mathis distributed materials regarding the Oklahoma Weather Modification Program which resumed September 22, 1999 and ran through December 31st. Mr. Mathis reported the southern part of the state is in moderate to extreme drought conditions therefore the advisory board felt it was appropriate to conduct operations and take advantage of any seeding opportunities. The program had 64 flights during that time for approximately 180 hours of flight time. Spring operations were resumed on March 1, 2000. Soil moisture conditions have gone from extreme drought to moderate and now back to near normal. This was very timely for the wheat crop. There were very low levels of reservoirs in that part of the state and they have now recovered some. It has been very beneficial, from a rain enhancement standpoint, to have the program in place during that time.

The Oklahoma program is transitioning from a state program to an insurance industry funded program essentially built around hail suppression. Legislation apportioned a part of the tax assessed on insurance premiums and diverting up to \$3 million to the weather modification fund which would provide a dedicated source of revenue for the program.

Oklahoma has received their license from Kansas and are now working on cooperative agreements with Texas for the program. Funding for this years program includes an appropriation of \$1 million plus \$200,000 collected from the insurance industry.

Mike Mathis reported they are now working with Dr. Ken Crawford of the Oklahoma Climatological Survey, and Dr. Jeff Kempel of the Severe Storms Laboratory to look at what resources and scientists may be appropriate to do an evaluation of the Oklahoma

program.

Texas - George Bomar reported there were 7 rain enhancement programs in Texas in 1999 in place covering 36 million acres. Two new projects will be added in April or May of 2000 which will bring the total acreage up to 44 million acres. That is about 28% of the land area of the state of Texas. The state water agency is funded at a level of \$2.7 million this year to cost share with political subdivisions to pay up to 50% of the cost of 9 programs this year. The 2 new programs will be in the Texas panhandle. One of the new programs will be based in Dumas and the other in White Deer, both of which are north of Amarillo. Once these projects are operational, the program will include all of the Texas panhandle in rain enhancement activity. Texas has an interest in using the Oklahoma panhandle for air space treating systems moving out of Kansas and Colorado across Oklahoma into Texas. The Texas Legislature also appropriated the same amount (\$2.7 million) for the fiscal year that begins in September. A new video has been produced capturing a lot of projects on video last summer. Research was done last summer with the Desert Research Institute last summer operating out of a base in San Angelo. Additional research is being planned for the summer of 2000 using residual funding. The research plan, period of time, and where it will be based has not been determined at this time.

Dale Bates stated experienced weather modification personnel are in extremely short supply. They are now conducting a ground school for personnel and feels in the future case studies using video will be a most helpful tool. He feels the Texas program is in a crisis situation on the lack of assessment of their program. They have hired someone who will be working in the area of assessment. He feels we must come forward with information on assessment of program for those people who support these programs.

Mr. Bates stated they have been questioned by the Department of Transportation and FAA regarding the transport of acetone. It appears that everyone on these programs must go through a school and be certified. According to what they have been told, you have 90 days from the time the employee is hired until they must be certified. Mr. Bates feels the way we handle acetone will change dramatically. Texas will keep others informed on this requirement.

Mr. Bomar noted the project between San Antonio and Laredo will be seeding for hail suppression over a 5.5 million target area. Mr. Bates noted an interest in the program by power companies. There also appears to be interest in cloud seeding in Mexico. Texas would like to see a cooperative effort between Texas and Mexico for a rain enhancement program.

Utah - Norm Stauffer distributed copies of cloud seeding activities in Utah for the water year 2000. In January the water supply in Utah was 15% of normal but a very wet February and March some areas of the state made it up to 100%. Most areas of the state are at 80 - 90% of normal. Most reservoirs are on the full side. Each year we have a water users workshop put on by the Water Users which is well attended by

farmers, municipalities, and conservancy districts. Approximately 500-600 people attend these workshops. This year we had a session on cloud seeding, which had not been done for several years. North American Weather Consultants (NAWC) and Mr. Stauffer gave an hour presentation about the cloud seeding programs. Utah has four major project areas, the West Box Elder Project, East Box Elder/Cache County, Tooele County, Central/Southern Utah Project and the Emery Project (which is within the Central/Southern Utah Project). NAWC has a target/control analysis for the four major projects that they have been running for years. In the southern part of the state they have about 25 years of seeding and they update the target/control analysis every year and it continuously shows increases in precipitation and snow water content. Our programs are sponsored by counties or conservancy districts within the counties. The state will fund up to 50% of the cost of the cloud seeding program which are all ground generator wintertime seeding (December - March). At one time, the programs were funded from the general fund, however, a few years ago the Board of Water Resources which has multi-million dollar projects and revolving funds, were authorized by the legislature to spend \$150,000 per year up to 50% cost share. These are grant monies that are available so appropriation of funds each legislative year is no longer necessary. If more areas join the program then the cost-share percentage would drop accordingly.

Mr. Stauffer reported Utah is doing a study looking at the April 1 water content in the watersheds and relating that to annual runoff. They were able to get correlation coefficients sometimes above .9 with the April 1 snow water content as annual runoff. It was very good. Some of the correlation coefficients were in the high .70's, most were in the .80's, and some even into the .90's. Based on this and the percent increase of snow water content we projected the annual runoff. We are projecting from the four major projects we are getting about 250,000 additional acre feet runoff per year. The cost last year was about \$254,000 or \$1/acre ft.

George Bomar expressed concern that with the contractors doing work on projects in Texas no rudimentary effort is made to evaluate or assess rainfall within the target or a control area. He believes sponsors of projects must have some evaluation to convince those people paying for the projects to keep supporting the efforts.

Bruce Boe stated in North Dakota the experience has been a seasonal evaluation cannot be done because the vagaries of convective rainfall are such that natural variability wipes you out. What can be done is get a collection of years and run analyses where you have a greater sample so these natural variabilities tend to average out. We try to do this when we can but it is difficult at the end of the project to say we produced a certain amount of rain this year. Statistically this would not stand up. Dr. Warburton stated the basic problem in weather modification is the assessment of the results. Long-term programs have been carried out with target and control areas with seeded and non-seeded areas and if you read the literature you will find that all of those claims have been challenged over the years. As a result of the long-term re-analysis, the funding for weather modification gradually disappeared because the

scientific community felt the programs could not stand up to intense scrutiny. The weather modification policy statements from the American Meteorological Society and the World Meteorological Organization are willing to admit that snowpack programs have been able to demonstrate certain increases, but have not made such statements about rain enhancement, nor have they made many statements about hail suppression, although we get more evidence all the time based on insurance studies. The fact of the matter is that the reason it is so difficult to get funds for weather modification research through the national programs is due to this very problem we are all concerned about.

Chairman Bomar asked if anyone present is aware of any ongoing weather modification activity that is not represented at this meeting.

Norm Stauffer stated he had checked with Idaho and Wyoming and there is a little bit of seeding in both those states that the state regulates but there is no state funding. He believes the Idaho project is sponsored by Idaho power. The Idaho Department of Agriculture regulates projects in that state. In Wyoming the Office of the State Engineer regulates the program.

FINANCIAL STATUS REPORT

Dr. Joe Warburton reviewed the financial status report as of April 6, 2000. There were no questions.

It was noted all membership payments should be sent to Dr. Warburton, 20 Moore Lane, Reno, NV 89509.

Bruce Boe moved the financial status report be accepted as presented. Second by Maurice Roos. Motion carried.

FEDERAL FUNDING FOR WEATHER MODIFICATION RESEARCH

Chairman Bomar distributed copies of letters sent to Congressman Rogers regarding funding within Department of Commerce-NOAA for \$3 million, and to Congressman Packard on the Subcommittee of Energy and Water Development regarding funding through the Bureau of Reclamation Precipitation Enhancement Technology Transfer Program for \$2.5 million.

Discussion was held on meetings held in Washington, D. C. in March relative to funding for the Weather Damage Mitigation Program.

The draft report of the National Drought Policy Commission was reviewed and discussed.

ORGANIZATIONAL ISSUES

Chairman Bomar reviewed discussion from the October, 1999 meeting regarding the extent non-state entities may participate on the Council and specifically what voting privilege those entities not have and what they should be given. He noted a By-Laws Committee was named and charged with investigating what is presently in the By-Laws and making a recommendation as to whether any changes in the By-Laws are warranted. The By-Laws Committee members are Bruce Boe, Chairman; Mike Mathis, and Arlen Huggins. Mr. Bomar also noted a copy of recommendations for changes to the By-Laws has been distributed.

Bruce Boe noted some minor changes from the copy previously distributed. Mr. Boe briefly summarized changes to the draft revisions of the By-Laws.

Discussion was held regarding full participation of affiliate and associate members and what this membership should include.

Dr. Joe Warburton moved the matter be tabled and ask the By-Laws Committee to consider additional changes with recommendations from interested parties and return recommendations to the Council at the next meeting. Seconded by Norm Stauffer. Motion carried.

It was suggested parties forward their recommendations on By-Law changes to the By-Laws Committee Chairman, Bruce Boe.

Chairman Bomar stated he hopes for optimum participation by all interested parties.

WEB SITE DEVELOPMENT

Bruce Boe demonstrated for those present the Council web site and asked for feedback about the contents of the home page.

ELECTION OF OFFICERS

Chairman Bomar called for election of officers.

Darryl Eklund moved the Council unanimously reelect the present officers of Chairman, George Bomar; Vice-Chairman, Bruce Boe; and Secretary-Treasurer, Joe Warburton for the next year. Second by Norm Stauffer. Motion carried.

OTHER BUSINESS

Dr. Joe Warburton said he feels the states have a need for information on where they can go to get assessment or evaluation of weather modification programs. He feels the Council by its next meeting collect information from each state on what they want to see done in the area of research and evaluation. Dr. Warburton stated since we are looking for research funding, then we need to know what should be addressed, and where we will go to get this work done. Assessment of programs may vary from one program to

another and we need to be confident of how these are done.

Dr. Warburton said if the Council is successful in getting research funding, then we ought to have a solid idea of where we want these funds expended and which institutions are capable of fulfilling these requirements. It may be that we need to get the scientists together from these institutions to find out if the capabilities exist to get the answers. If we are really going to be constructive in this issue, we not only need to identify the problem, but begin to identify where within the country we have people look at the problem.

Dale Bates suggested workshops on these scientific issues.

Dr. Warburton suggested the Council members and other interested parties identify one or two important issues they feel need to be addressed. From these issues we can identify areas to address at a workshop sponsored by the Council.

The general consensus of the group was to pursue this effort.

Darryl Eklund stated there may be two different approaches to this effort. One may be to identify what rigorous research the programs needs, and the other, some really comprehensive data that would be a compelling argument for continuation of the program and answer the arguments of those who question the validity of the programs. We need answers for the farmers and their needs. Lets not lose the prospective of the bottom line.

WATER MAGAZINE

Bruce Boe reported a special issue of the *North Dakota Water Magazine* on weather modification is being planned to summarize what is going on in weather modification in the western United States. Mr. Boe distributed recent copies of the magazine for those present to review. The publication date is slated for October, 2000. Mr. Boe stated space in the magazine could be purchased, and distributed copies of a proposal for same. Mr. Boe noted there are several different levels for participation ranging from articles to advertisements with a number of copies for particular levels of participation. If anyone wishes to participate, please let Mr. Boe know within the next thirty days.

DICK SMITH, DESERT RESEARCH INSTITUTE

Dr. Smith stated that the Texas programs were interested in determining the chemical composition of cloud water, including calcium, magnesium, ammonium, sodium, sulfates, nitrates, and chlorine. The question then was, "What kind of a probe could be put on an airplane that could tell us this in real time?" The whole issue was, when in-cloud doing some seeding, was there some information we could gather in real-time that might help us, especially if we could modify the experiment, knowing in real-time something that has, in the past, taken months to find out. A device has been designed

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at the Desert Research Institute (DRI) to collect cloud water (warm water) and then analyze what goes into the system. The device could also be modified to collect ice (cold cloud water) for later analysis. This probe could afford the opportunity to collect information and subsequently make adjustments

Dr. Finnegan noted it would be interesting to measure sodium chloride and ammonium sulfate in the area of North Dakota because sodium chloride gives you negative ice and ammonium sulfate gives you positive ice and the combination of the two is going to possibly give you hail because you have no aggregation process going on.

Environmental & Water Resources Institute of the ASCE

Chairman Bomar reported he received a memo from Conrad Keyes, Jr. suggesting the Council give consideration to linking up with EWRI. Mr. Keyes stated he felt the ASCE Washington office could do a better job of working on potential legislation than the present situation. Mr. Bomar also distributed a sample of a partnering agreement EWRI has with other entities. Mr. Keyes stated in his memo he could give a presentation on the EWRI at a future meeting of the Council.

Bruce Boe stated he would be interested in learning more about this partnership agreement. Chairman Bomar will establish a dialogue with Mr. Keyes in this regard and place on the agenda for a future meeting.

NEXT MEETING DATE

The next meeting date was tentatively set for October 4 and 5 at Reno, NV.

Being no further business, the meeting adjourned at 3:50 p.m.

GEORGE BOMAR, CHAIRMAN

DR. JOSEPH WARBURTON
SECRETARY-TREASURER

Transcribed from notes taken by LeNor Dollinger