

PUBLIC RESPONSE TO PROPOSED SNOWPACK AUGMENTATION 595-75

IN THE SIERRA NEVADA 1/

By

Barbara C. Farhar and Julia Mewes 2/

Introduction

This paper is a summary and analysis, from a sociological perspective, of comments and questions which arose from citizen participation in a series of public information meetings on a proposed snowpack augmentation project for the Northern Sierra Nevada. The format and content of the meetings are briefly described. The method used for stratifying meetings geographically and for categorizing the comments made by the public is discussed. The meaning of each category of comments is explicated. Finally, patterns of public concern by geographical location in relation to the project area are discussed.

Meetings

Between June and September 1974 the California Department of Water Resources, the U. S. Bureau of Reclamation Regional Office in Sacramento, and the Division of Atmospheric Water Resources Management (located at the Bureau of Reclamation, Denver) conducted a series of public meetings on weather modification. The purpose of the meetings was threefold: (1) to inform the public of a "contemplated" weather modification research program to augment snowfall somewhere in the northern Sierra Nevada, (2) to present to the public the draft of a report commissioned by the Bureau of Reclamation entitled "A Plan of Investigation for Assessing the Environmental Impact of Snow Augmentation in the Sierra Nevada, California," and (3) to involve the public in project planning very early in the process.

The draft report, prepared by Charles F. Cooper et al. of San Diego State University's Center for Regional Environmental Studies, recommended a series of studies on the climatological, ecological, environmental, global, hydrological, and economic effects of the potential project 3/. The authors expected the public to respond to the draft prior to preparation of the final report in order that their responses might be included.

Teams composed of staff from the three agencies involved conducted 21 public meetings in county seats* throughout the potentially affected area and adjacent counties. Meetings followed the same general format. Introductory remarks included mention of the justification for the project (disjunction between water supply and demand in California; being out of phase seasonally and geographically with regard to water supply and demand); the place of the research in the overall state plan for production and distribution of water (the need for comparative information on all possible methods because "conservation and transportation facilities will be inadequate by the end of this century")** and a brief explanation of the Cooper report. The project's "ultimate objective is to develop the techniques to do operational cloud seeding," in the words of one official.

Next on the agenda would be a meteorologist presenting a brief description of cloud formation and the techniques of orographic seeding. It was explained that decisions to seed would be based on reservoir storage capacity and snowpack water content.

A brief description of the planning and decision process prior to the project implementation included mention of coordination among interested agencies, preparation of an Environmental Impact Report (EIR), instrumentation of affected and downwind areas, assessment of the project's cost/benefit ratio, and public hearings on the EIR.

1/ Presented at the Western Snow Conference, April 23-25, 1975, Coronado, Calif.

2/ Human Ecology Research Services & University of Colorado, Boulder, Colorado

* Jackson, Auburn, Placerville, Sonora, Quincy, Susanville, Nevada City, Tahoe City, Downieville, San Andreas, Bridgeport, Modesto, Stockton, Marysville, Woodland, Sacramento, Oroville, all in California, and Yerington, Minden, Fallon, and Reno in Nevada.

** Quoted from an agency official's remarks at a meeting.

Meetings were then opened to audience participation. Forthcoming comments and questions were recorded on a large flip-chart at the front of the room by an agency official, although answers to them were not recorded. Citizens were asked to correct the wording of comments as written on the flip-chart if they did not accurately reflect their intended meaning.

The public meeting was usually concluded with a showing of a 30-minute film entitled "Mountain Skywater," on the Bureau of Reclamation's Colorado River Basin Pilot Project.

All meeting attendees were asked to sign a sheet indicating their names and addresses. Attendance ranged from a low of one person at Bridgeport, California, and Fallon, Nevada to a high of 32 persons at Downieville, California.

Subsequent to each meeting, the comments and questions resulting from the meeting were typed separately by meeting. These lists of comments* provided the data base for the summary and analysis in this paper.

Method

The total body of 387 comments given by 194 citizens at 21 public meetings comprise the data source for this paper. The meetings from which the comments emerged were stratified according to the major topographical characteristic of the area represented. Three strata were used: primarily a mountain community, primarily a valley community, or primarily a community on the lee side of the Sierra crest.** Because meetings were held at county seats, and some counties cover terrain that could be considered both mountain and valley, the categorization of meeting sites is somewhat arbitrary. Citizens at a meeting categorized as "valley" could conceivably represent a mountain area, or vice versa. The primary basis for categorization was geographic location; in borderline cases (specifically Bridgeport and Oroville, Calif.) comments reflecting concerns of citizens actually present at the meeting determined the category used. As categorized by these criteria, there were 11 mountain, 6 valley, and 4 lee meetings.

The purpose in stratifying meeting sites according to geographical characteristics is that the relationship of the community geographically to the proposed weather modification project might well affect public response in each area. Those located in mountainous regions could expect to experience artificially-induced increments in snowfall if the project were successful in achieving its purpose of enhancing snowpack, while those in the valleys would not. Valley residents would possibly be more directly affected by runoff from the snowpack, while those on the lee side (downwind of the proposed project area) might exhibit concern about the effects of seeding beyond the specified target area. Therefore, meeting sites were stratified in order to reveal whether or not comments exhibited concern about the direct effects of cloud seeding that could reasonably be expected for that area.

Stratification by area produced 211 comments at 11 meetings attended by 145 citizens in mountain areas, 122 comments at 6 meetings attended by 28 citizens in valley communities, and 54 comments at 4 meetings attended by 20 citizens on the lee side of the Sierras. There was a grand total of 387 comments.

This approach has certain limitations which should be kept in mind in understanding the findings. First, citizen attendees at a public information meeting cannot be expected to represent adequately the entire cross-section of views in an area nor a preponderance of opinion and belief in an area. Those who attend public meetings of this kind are self-selected on the basis of individual motivation. Any discussion of their motives for attending would be purely speculative, there being no data on this point; however, some interest and/or concern probably led most people to attend. Factors extraneous to the meetings themselves such as weather conditions and other competing public events undoubtedly affected meeting

* The term "comments" is hereafter used to include both questions, remarks, information, and points of view stated.

** Mountain: Jackson, Auburn, Placerville, Sonora, Quincy, Susanville, Nevada City, Tahoe City, Downieville, San Andreas, and Bridgeport
Valley: Modesto, Stockton, Marysville, Woodland, Sacramento, Oroville
Lee: Yerington, Minden, Fallon, Reno

attendance. Therefore, the results of this analysis cannot be generalized to the area involved.

Furthermore, one or two persons at a meeting could have been responsible for the entire set of comments made. Meetings varied in the degree to which there was full audience participation. Therefore, comments themselves may not accurately reflect the range of opinion nor the majority opinion of those attending the meetings. In addition, comments as recorded at the meetings were paraphrases, not verbatim quotes of actual questions and remarks. The possibility exists that some comments or questions actually made may not have been recorded.

Given these limitations, what the analysis can reveal is the nature of the concerns raised, information sought, and opinions expressed in the areas involved, and how frequently these concerns were voiced at the meetings in the various areas. If there is a pattern of concern such as that suggested for mountain, valley, and lee areas, the analysis will reveal it.

Findings

Comments were divided into nine topical areas as follows:*

1. General Information on Weather Modification
2. Specific Information on the Sierra Project
3. Information about Weather Processes and Local Climate
4. Justification for the Sierra Project
5. Potential Benefits of the Sierra Project
6. Beneficiaries of the Project
7. Potential Problem Areas Connected with the Project
8. Decision Making and Funding
9. Other

Table 1 shows the frequency and proportion of comments falling into each category, stratified by geographical location and for the set of meetings as a whole.

1. Weather Modification -- General Information

Comments and questions about weather modification in general, not about the project contemplated for the Sierras specifically, were categorized here. These comprised 12% of the entire set of public comments.

Citizens inquired about the results of other weather modification projects. Those mentioned included the Pyramid Lake Pilot Project and the Colorado River Pilot Project, (both funded by the Bureau of Reclamation), the Pacific Gas and Electric cloud seeding project in the Lake Almanor area and the "Fresno area" project (probably a reference to a cloud seeding research program, "Project Censare," carried out by the Atmospheric Water Resources Research Group at Fresno State College).

At least half the remarks on weather modification were questions inquiring into the state of the art. Citizens asked about seeding techniques, effects of seeding on storms, the safety of cloud seeding, and the possibility of decreasing precipitation by seeding. A few wanted reassurance that the latest developments in the technology would be applied in the proposed project.

Several questions were asked at the various meetings about whether other weather modification projects were being carried out in California and what these were.

To summarize, the kinds of questions and comments categorized under general information about weather modification were: results of the other projects, existence of other projects in California, and inquiries as to the state of the art.

* All coding of comments was carried out independently by two judges. Discrepancies in coding decisions were discussed until unanimity was achieved.

Table 1.

Kind of Comment	Valley		Mountain		Lee		Total	
	%	(N)	%	(N)	%	(N)	%	(N)
1. General Information on Weather Modification	11	(13)	13	(28)	9	(5)	12	(46)
2. Specific Information on the Sierra Project	17	(21)	15	(32)	20	(11)	17	(64)
3. Information about Weather Processes and Local Climate	3	(4)	4	(9)	4	(2)	4	(15)
4. Justification for the Sierra Project	8	(10)	6	(12)	0	(0)	6	(22)
5. Potential Benefits of the Sierra Project	3	(4)	3	(6)	6	(3)	3	(13)
6. Beneficiaries of the Project	4	(5)	6	(13)	7	(4)	6	(22)
7. Potential Problem Areas Connected with the Project	39	(47)	37	(77)	33	(18)	37	(142)
8. Decision Making and Funding	12	(15)	13	(28)	19	(10)	14	(53)
9. Other	3	(3)	3	(6)	2	(1)	2	(10)
Total	100	(122)	100	(211)	100	(54)	100	(387)

2. Specific Questions About the Sierra Project

Questions from citizens about specific aspects of the proposed Sierra Project comprised 17% of the total number of questions asked.

There were a number of inquiries concerning the anticipated methods of implementing the project with reference to how the seeding would be done, weather modification techniques and equipment to be used, placement of generators, and forecasting methods.

Other questions referred to the scale of the project in terms of manpower, funding and instrumentation, the purpose of the project, and the amount of precipitation increase expected. There were many questions concerning the time-frame of the project, and the location and extent of the target area. Several questions arose about the season of operation and these tended to be asked in conjunction with expressions of concern about flooding and other possible negative effects of cloud seeding.

There were also a number of inquiries as to plans for data collection, evaluation, and monitoring of downwind effects, environmental and ecological impacts, and hydrological, climatological, and sociological results of cloud seeding.

Citizens expressed strong interest in specific information about the proposed project, without which it would presumably be difficult to form an opinion on its desirability.

3. Information About Weather Processes and Local Climate

There was a variety of inquiries and comments (15 in all, 4% of the total questions asked) concerning local weather patterns, such as the length and periodicity of droughts and wet periods and the current capability for predicting cycles and determining above- or below-normal precipitation levels.

There were several questions regarding the impact of the Sierras on weather patterns and the movement of air masses over the mountains. One of these latter remarks expressed concern about the possibility that seeded systems might back up, causing extra-area effects.

In addition, two inquiries arose about the percentage of atmospheric moisture falling as precipitation.

With the one exception mentioned above, the bulk of the comments on weather processes or climate were requests for factual information rather than expressions of concern.

4. Justification for the Sierra Project

There were a number of remarks from citizens seeking reassurance on the need for the Sierra Project (6% of total questions asked). Fully a third of these inquiries referred to the possibility of need for increased water storage facilities to contain the added moisture, suggesting a concern that the project might be intended to justify the construction of more dams.

Other citizens wondered whether more water or snow was really needed, and one person asked why seeding was to be conducted for snowpack rather than rainfall augmentation.

There were several comments expressing concern that water shortages were attributable to misuse of water supplies, which should be corrected prior to employment of weather modification. One person asked whether cloud seeding was the "last resort", and another asked if there had been funding for water recovery or new storage systems as alternate measures. Also in this category was a question about other water studies being conducted, and another suggesting that increased water supplies might create artificial demands for water.

One person inquired about the need for further research in weather modification, since it had been done for years in the area. And finally there were several seeking the reasoning for seeding in the Northern Sierras specifically.

Citizen remarks in this category imply concern that the project may not be needed or that its planned implementation involves ulterior motives such as the justification of new dam construction. There were also suggestions that alternatives to weather modification should be considered.

5. Potential Benefits of the Sierra Project

About 3% of comments made at the public meetings concerned possible beneficial uses of weather modification in the local area. Here citizens seemed to be exploring how the technology might be beneficially applied to weather problems experienced in their local areas.

For example, ski areas were mentioned in two comments as possibly benefiting from increments in snowpack. Mono Lake, described as "drawing down", would benefit from additional inflow, according to two citizens. Others were favorable to increased water for the Walker and Carson Rivers.

Other beneficial uses of weather modification suggested at the meetings were: to reduce precipitation from warm storms to preserve the snowpack and prevent flooding, to induce precipitation to fight forest fires, and to inhibit precipitation in burned-over areas to prevent erosion, or to prevent damage to fruit crops.

A few questions asked what the benefits of the proposed project would be; other comments expressed favorability to the project or asserted that additional moisture is desirable.

The proportion of questions and comments about potential benefits from weather modification and from the proposed Sierra Project was the smallest of any of the nine categories (with the exception of "Other"). The relative lack of discussion about beneficial aspects may be interpreted in at least two ways: (1) people tended to concentrate attention on possible problem areas and on gaining information rather than on potentially positive outcomes, or (2) people in the area did not view the project as providing benefits directly to

them. No definite conclusions about this phenomenon may be drawn from the present data. Since several comments categorized here had to do with applications of the technology in ways that were viewed as positively beneficial, the data suggest that the public were exploring the possibility of direct benefit. It should be noted, however, that these suggestions (e.g., inhibiting precipitation) were in no way presented as part of the proposed project, the purpose of which is to enhance snowpack. The data show, therefore, that those attending the meeting had little to say about beneficial aspects of the proposed Sierra Project, as compared to other topics.

6. Beneficiaries of the Project

On a number of occasions questions were raised by citizens about the anticipated beneficiaries of the additional water expected to result from weather modification. Of the 22 remarks in this category, seven requested factual information on who would own or benefit from this added water. Five citizens wondered what weather modification would do for their local area, and one pointed out that in mountain areas, additional rainfall would be more beneficial than snow.

There were eight remarks concerning anticipated benefits to Southern California residents from snowpack augmentation in the Northern Sierras. Of these, three were clear complaints suggesting an inequity in seeding over one area for the benefit of another.

Finally, one citizen wondered whether the county, if it received benefits from the project, would share liability in the event of damages.

In summary, the inquiries in this category expressed concern about who would benefit from the Sierra Project, specifically with reference to the expectation that other areas would receive additional water at the expense of the local area. Questions in this category comprised 6% of total questions asked.

7. Potential Problem Areas Connected with the Project

A sizable minority of all comments fell into this category (37%) necessitating its subdivision into five smaller categories. These are presented in Table 2 with their frequency and percentage of occurrence by geographical area and for the set of meetings as a whole.

Table 2

Kind of Potential Problem Area Mentioned	Valley		Mountain		Lee		Total	
	%	(N)	%	(N)	%	(N)	%	(N)
A. Extra Area Effects	17	(8)	25	(19)	44	(8)	25	(35)
B. Flooding	21	(10)	13	(10)	17	(3)	16	(23)
C. Environmental/Ecological	45	(21)	19	(15)	22	(4)	28	(40)
D. Local Damage and Costs	4	(2)	29	(22)	11	(2)	18	(26)
E. Other	13	(6)	14	(11)	6	(1)	13	(18)
Total	100	(47)	100	(77)	100	(18)	100	(142)

7A. Extra-Area Effects

Of all problem areas, extra-area effects comprised twenty-five percent of all comments categorized as addressing potential problem areas. Although two questions were asked about increasing precipitation upwind of the affected area and one inquiry was made about cross-wind effects, the vast majority of comments in this category concerned downwind effects.

In addition to straightforward questions about the effects of seeding on areas downwind of the target, there were questions expressing concern or conviction that cloud seeding might rob downwind areas of precipitation they would have received if seeding had not occurred. A few citizens inquired as to how far the target area effects of seeding might be experienced.

Another major set of inquiries had to do with evaluation of downwind effects. Several citizens asked whether downwind areas would be instrumented and monitored as part of the research effort. Others commented that such evaluation would be desirable and important. At least one question or comment about downwind effects was raised at almost all the meetings, indicating a widespread interest in information about current knowledge of these effects, and in many cases recommendations were made that extra-area effects deserve further study. Taken as a whole, the set of comments seems to comprise a recommendation from the public that evaluation of downwind effects be an integral part of research on weather modification in the Sierra Nevada.

7B. Flooding

Of the potential problem areas mentioned, flooding was the topic of 16% of the comments made at the public meetings. Several citizens inquired about the possibility of warm storms melting an accumulated snowpack resulting in flood conditions. Concerns were also expressed about run-off rates on rivers, run-off peak flows, lakes with no outlets, rivers with little or no flood control, and granitic areas from which precipitation runs off rapidly.

One citizen asserted that there was some local belief that weather modification had contributed to flooding of an airport, sewage disposal system, gas pumps, and so on.

Some concern was expressed about not seeding during particularly rainy months (November and December) because of excessive moisture.

In general, public concern about flooding seemed to center around adequate control of snowpack run-off so that it occurred as a safe, non-damaging phenomenon. It seemed to be the public view that those seeking to augment the snowpack are responsible for considering how its melt can be handled in a safe, non-destructive manner.

7C. Environmental/Ecological Concerns

The most-mentioned potential problem area was the environment. Twenty-eight percent of comments on problematic aspects of the proposed project concerned the possibility of adverse environmental effects as a result of cloud seeding.

Several comments inquired as to whether environmental effects would be investigated as part of the project, as well as whether an environmental impact report would be prepared.

A few citizens expressed fear of "irreversible adverse processes" that would damage the ecology of the target area. "When will man begin to realize we live in a closed system?" In a when-did-you-stop-beating-your-wife frame of mind, one citizen asked, "How is the proposed project in conflict with the Environmental Protection Act?"

Some expressed fear that studies in themselves would not be adequate to detect latent or very long-term adverse environmental consequences of weather modification.

Specific topics of concern were effects of snow on trees (bristle cone pine, young saplings, breakage of limbs); resident glaciers; different altitude ecosystems; wildlife survival instincts; effects of chemicals on the environment generally; effects of silver iodide on animals, fish, crops, lakes and streams, and effects of seeding on hydrological cycles.

One citizen reported research findings which showed that moderate increases in snow depth had insignificant effects on plant life, but greater depths could have marked effects.

In general, questions on environmental effects seemed to reflect a genuine search for information on subjects about which little is known. A plurality of expressions of

opposition to the project was cast in environmental terms. Since there was a notable lack of anti-environmentalist sentiment reflected in the comments as a whole, the public attitude as expressed at the meetings seemed to be favorable toward studies of its environmental impact if the project is to proceed.

7D. Local Damage and Costs

This category was intended to include comments about disbenefits which conceivably could be experienced by those living in the project's affected area itself. Of all comments pertaining to problematic aspects of the project, 18% were directed toward such problems. These disbenefits included possible damage to persons, property, and economic interests in affected areas.

In terms of the local economy, one person asserted that each day's delay in the opening of logging season in the spring costs money. A few persons expressed concern about effects of snow on recreationists; e.g., avalanche danger to cross country skiers. Three comments were made on effects of the project on fruit and frost-sensitive crops.

A major concern in this category was the problem of highway snow removal. Several citizens suggested that those running the program should share in the cost of snow removal. With regard to highways, additional concerns were expressed about damage to roads because of snow and snow removal, travel time and convenience, and highway safety. Other potentially affected forms of transportation mentioned at the meetings were trucking and railroads.

Concerns about revision of standards for buildings and mobile homes because of the weight of additional snow were expressed.

Two persons wondered whether silver iodide is harmful to humans in any way.

In one community without a local physician, the access to medical assistance during winter months, particularly during emergencies, was a matter of concern.

In summary, the potential disbenefits mentioned by citizens included avalanche danger, possible negative effects on recreation, agriculture and logging, costs of highway snow removal and maintenance, possible structural damage to buildings due to weight of snow, and safety of the project with regard to the health of the local population.

Suggestions for solutions of these problem areas were limited to proposals for assistance from the responsible agencies with the cost of snow removal in highway maintenance.

7E. Other

Several other problem areas that did not fit into the categories already discussed were brought up at the meetings. These were classified together under "Other" to designate a miscellaneous category of potential problems or expressions of opposition to the project.

Effects of cloud seeding on weather patterns was the topic of several comments. One person wondered whether there would be an increase in electrical storms. Others inquired as to how rain at lower elevations rather than snow at upper elevations could be prevented.

Liability was the topic of four comments -- primarily the question of who would be liable, and to what extent, should damages occur as a consequence of project activities.

Two persons mentioned inter-project contamination as a possibility; that is, how would the proposed project affect other projects being carried on in the area?

One citizen complained that inadequate evaluation had been done on the effects of weather modification programs which had been carried out, referring to "a lack of responsibility" on the part of those in charge.

One comment suggested that moral issues are involved in changing the natural system.

In sum, questions of liability, changes in weather patterns, evaluation of project effects in general, inter-project contamination, and general opposing remarks constituted

13% of the comments on potential problem areas.

Table 3 puts the proportions of comments on the various problem areas into the context of comments as a whole. It shows, for example, that 10% of all comments made at the public meetings concerned environmental effects, 7% concerned local damage and costs, and so on.

Table 3

PROBLEM AREAS COMMENTS AS PERCENT OF TOTAL COMMENTS

Kind of Potential Problem Area Mentioned	Percent of Total Response			
	Valley	Mountain	Lee	Total
Extra Area Effects	7	9	15	9
Flooding	8	5	5	6
Environmental/Ecological	17	7	7	10
Local Damage and Costs	2	11	4	7
Other	5	5	2	5
Total Percent	39	37	33	37
Total N	(122)	(211)	(54)	(387)

8. Decision Making and Funding

Fourteen percent of all comments at the public meetings fell into this category. A total of 53 questions and remarks explored the areas of who would decide about and pay for the project.

Other than several questions as to who would be in charge of project decisions, citizens generated a list of several agencies they thought should be contacted by those responsible. These included the Forest Service, county governments, ongoing weather modification programs, Sacramento Municipal Utilities District, Desert Research Institute, the California-Nevada Compact Commission, highway departments, and utilities.

Public involvement was a major topic within this category. Some said the public should be notified of project operations. A few wanted to know what the public response to the proposed project and to other weather modification projects had been. Recommendations in favor of keeping the public informed about the project occurred at several meetings.

Concern about public impact on the project's decision process was expressed in statements like these:

"Should the feelings of people against weather modification who live in the higher elevations in the Sierras be given consideration especially when the induced water supplies are for other areas?"

"There is a concern that the mountain areas do not have the political muscle to influence whether or how a weather modification program should be implemented."

"What recourse will the public have if they decide they don't like the project?"

"Will the people have a say on whether the pilot weather modification project goes through?"

With regard to funding, those at meetings wanted to know the project's cost, who would pay for it, and the cost/benefit ratio, often in terms of dollars per acre-foot of water produced.

9. Other

A small number of remarks (2% of the total) offered by citizens at the meetings fell into none of the categories thus far described. Of these there were two comments criticizing the Cooper report, one pointing out the importance of carrying out the studies suggested by Dr. Cooper and citizens, and one suggestion that questions posed by Dr. Cooper should be answered by prospective weather modification licensees.

One query arose regarding the existence of impact studies on weather modification conducted by utility districts. One citizen wondered how utilization of additional water supplies could be controlled to assure beneficial usage.

There were two remarks concerning other proposed efforts to increase water supplies which had never materialized. Finally, there was a comment on the importance of weather for farmers, and an assertion that one of the local areas was not concerned about flood hazard.

Comparison of Valley, Mountain, and Lee Responses

Based on the sets of meeting comments, areas of citizen interest which appear to be most influenced by geographical location were (1) potential problem areas connected with the project, and (2) beneficiaries of the project.

Earlier we suggested that we might anticipate residents of lee areas to exhibit more concern about downwind effects than those in other areas. Data presented in Table 2 bear out this expectation, with 44% of comments on potential problems focusing on this matter. Concern about extra-area effects as expressed by comments also occurred in valley and mountain communities, but not in as high a proportion as in lee communities.

We also anticipated that comments about flooding would occur more frequently in valley communities than elsewhere. While data presented in Table 2 show that proportionately more valley comments concerned the potential for flooding (21%), the difference from mountain and lee communities is not great (13% and 17%, respectively). Concern about flooding as a possible result of the Sierra Project is not limited to valley areas, then, although it may be slightly more pronounced there.

We thought mountain areas would express a greater concern about potential disbenefits of the project. Data in Table 2 fulfill this expectation -- 29% of comments in mountain meetings concerned these matters while 4% and 11% of the valley and lee comments, respectively, fell into this category.

One notable difference between areas was that concern regarding environmental effects was more frequently expressed at valley meetings than at either mountain or lee meetings. While 45% of the problem area comments at valley meetings fell into this category, 19% of mountain and 22% of lee comments expressed interest in environmental matters. No explanation is offered for this finding; the data are insufficient to interpret it.

Mountain residents offered the majority of comments regarding locus of anticipated benefits. There was clear concern that the area being asked to undergo the possible inconvenience of added snowfall would not after all reap the benefits of an augmented water supply. Similar concerns were expressed in lee and valley meetings, but much less frequently.

Summary

We have here examined, in some detail, the nature of various questions and comments presented by citizens attending a series of public information meetings on a proposed snowpack augmentation project for the Northern Sierra Nevada. It was noted that while the collected comments could not be regarded as generally representative of popular sentiment toward the possibility of weather modification in the area, they could be valuable indicators for the kinds of concerns and information requirements which may arise in connection with the project.

The comments were categorized according to areas of concern and interest. The plurality of citizen inquiries (37%) expressed concern about potential problem areas connected with the project. This category was further broken down into concerns about extra-area effects, flooding, environmental and ecological effects, and local damage and costs.

Other major areas of expressed interest were in general information on weather modification (12%), specific information on the Sierra Project (17%), and funding and decision-making processes (14%).

Information about weather processes and local climate, justification for the project, potential benefits from the project, and anticipated beneficiaries was also requested.

Selected comments were stratified by geographical areas into mountain, lee, and valley groups. It was found as anticipated, that mountain areas expressed most concern about local damage and costs and the possibility that other locales were to benefit from the project at their expense. Lee areas showed a preponderance of concern with downwind effects. Valley residents attending the meeting showed more concern about flooding than other areas, but the magnitude of concern was not as pronounced as anticipated. Valley residents also showed far greater concern for environmental and ecological effects, a serendipitous finding which cannot be adequately explained with the data at hand.

In conclusion, those concerned about public involvement in the decision process have, through these meetings, obtained a clear expression of some basic citizen concerns. To the extent that agencies are responsive to public wishes, these concerns will be taken into account in project planning and implementation.

ACKNOWLEDGEMENTS

The research on which this paper is based was supported under grants #GI-35452 and #GI-44087 as part of the research on A Comparative Analysis of Public Support of and Resistance to Weather Modification Projects, sponsored by the Weather Modification Program, RANN, National Science Foundation.

REFERENCES

- 3/ Cooper, Charles F., George W. Cox, and Warren A. Johnson: "A Plan of Investigation for Assessing the Environmental Impact of Snow Augmentation in the Sierra Nevada, California." Draft prepared for Division of Atmospheric Water Resources Management, Bureau of Reclamation, USBR Contract No. 14-06-D-7287, Denver, Colorado, January, 1974.