Denver Journal of International Law & Policy

Volume 6
Number 3 *Special Issue*
Water Needs for the Future

Article 28

January 1976

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Keywords
States, Water Law, Conservation

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I. INTRODUCTION

Water is a basic necessity for both plant and animal life. The availability of water has had a pronounced effect on the physical and social organizations which develop in any particular region. This inherent value has been recognized for centuries. Historically, water has been used for human consumption, irrigation, industry, transportation, recreation, and power generation.

In many regions of the world, water supply is not adequate to meet societal water requirements. The Western United States, in general, and Colorado, in particular, have only limited surface and underground water supplies. Water diversion projects have been instituted to remedy this situation. However, expanding population, increasing industrial and agricultural demands, and inefficient water use have displaced the interim solution of water diversion.

One possible solution to the problem is to limit population, industrial, and agricultural growth in the semiarid western region of the United States. An alternative solution could be to increase the total surface and subsurface water supply through the use of watershed management techniques and wintertime orographic weather modification.[1] When used in combination,

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1. Orographic clouds are formed when air is forced over a mountain. Unlike cumulus clouds, they are relatively simple and their physical descriptions are relatively complete and accurate. The potential for water augmentation from orographic clouds relates to the amount of water that condenses to form the clouds but does not reach the ground as precipitation. Seeding operations can improve the efficiency of such clouds resulting in increased precipitation. It must be noted, however, that this is not a long-term solution. Both watershed conservation and wintertime orographic weather

these techniques are estimated to be capable of increasing streamflow in the Western United States by 15 million acre-feet annually.[2] Even though this water might enter the water use priority system at the lowest end of the value structure (irrigated agriculture), the value of this additional water would be approximately three hundred million dollars per year.[3] When reuse and higher valued uses are considered, the direct gains in production in 1976 prices could amount to several billion dollars per year.[4] The direct costs of weather modification and appropriate watershed management techniques are not high. In fact, a considerable margin in the cost/benefit structure would exist.[5]

The ability to enhance streamflow in the Western United States through wintertime orographic weather modification is a technique which has been studied extensively for well over a decade. The physical principles are understood, and the capability of the technique to enhance streamflow is well documented in the literature.[6] Similarly, the physical principles

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modification will serve to meet the water needs of the Western United States only until such time as augmented water supplies are utilized by ever-expanding water demands.

2. This would result from 10 million acre-feet being produced by wintertime orographic weather modification and an estimated 5 million acre-feet resulting from watershed management. The region-wide potential of watershed management to increase water supplies has not yet been fully evaluated. Experimental results to date indicate that the potential of watershed management to augment water supplies may be equal to or greater than that of weather modification. For the purposes of this analysis a conservative projection of 5 million acre-feet was utilized. NATIONAL ACADEMY OF SCIENCES, COMM'N ON NATURAL RESOURCES, NATIONAL RESEARCH COUNCIL, COMMITTEE ON CLIMATE AND WEATHER FLUCTUATIONS AND AGRICULTURE AND RENEWAL RESOURCES, CLIMATE AND FOOD 131-62 (1976) [hereinafter cited as CLIMATE AND FOOD]; R. ELLIOT, J. HANNAFORD & R. SHAFFER, TWELVE BASIN INVESTIGATION: ANALYSIS OF POTENTIAL INCREASES IN PRECIPITATION AND STREAM FLOW FROM MODIFICATION OF COLD OROGRAPHIC CLOUDS IN SELECTED RIVER BASINS OF THE WESTERN UNITED STATES 1-200 (1973); C. LEAF, WATERSHED MANAGEMENT IN THE ROCKY MOUNTAIN SUBALPINE ZONE: THE STATUS OF OUR KNOWLEDGE 1-28 (1975) (U.S.D.A. Forest Service Research Paper RM-137)[hereinafter cited as LEAF].

3. This projection is based on an assumed cost of $20.00 per acre-foot for agricultural water.

4. The costs of water for industrial and domestic water users has been estimated to range up to ten times the cost of water for irrigated agriculture. The specific values vary substantially with location.

5. CLIMATE AND FOOD, *supra* note 2.

6. *See generally* L. GRANT, C. CHAPPELL, L. CROW, J., FRITSCH, & P. MIELKE, WEATHER MODIFICATION—A PILOT PROJECT (1974) (Final Report, Bureau of Reclamation Contract No. 14-06-D-6467). *See also* note 2 *supra* and note 8 *infra*.

and application techniques utilized in watershed management are defined, tested, and documented.[7]

The major problems encountered in applying these techniques to increase water supplies do not lie with scientific understanding or technological limitations. The fundamental problems are environmental, social, and legal.

The direct environmental problems introduced by employing these techniques (not including increased population growth) have been addressed on a limited basis.[8] Numerous studies have defined many of the environmental problems. The problems thus far identified, while important, do not present any major obstacles to the development of operational water augmentation programs. As such, they are not considered in this analysis.

Problems relating to sociological considerations are quite complex. For watershed management, these are relatively minor. For weather modification, they present significant difficulties.[9] The primary issue is that those people who benefit from water augmentation activities (senior water right holders) are generally not the same individuals who incur disbenefits from the activities (increased snowfall plus associated inconveniences and costs). It is unlikely that those individuals receiving disbenefits will voluntarily accept a degradation in their quality of life for the benefit of others. It may be that monetary compensation will not remedy this situation.

The responses of local, state, and federal governments to legal problems related to water augmentation have been varied. The bulk of legal system actions have been at the state level, though a number of proposals have recently been considered by the federal government.

The problems of water augmentation are twofold. First, the complexity of the weather modification portion of water augmentation must be considered. Weather modification can

7. LEAF, *supra* note 2.

8. *See generally* STANFORD RESEARCH INSTITUTE, THE IMPACTS OF SNOW ENHANCEMENT: A TECHNOLOGY ASSESSMENT OF WINTER OROGRAPHIC SNOWPACK AUGMENTATION IN THE UPPER COLORADO RIVER BASIN (1974); *see also* note 2 *supra*.

9. B. Farhar, Weather Modification in The United States: A Socio-Political Analysis, 150-367, April, 1975 (unpublished Ph.D. dissertation in Dep't of Sociology, University of Colorado).

be used on wintertime orographic clouds to enhance precipitation and on summertime cumulus clouds to reduce or enhance precipitation or to decrease hail; additionally, to dissipate cold and warm fogs, to control cirrus clouds in order to control surface temperatures, and for many other purposes.[10] Some of these treatments are well defined. Others, however, are not. The legal system response to the problems of water augmentation should facilitate the application of those techniques which are well defined while controlling, and in certain cases limiting, the application of other weather modification techniques. Only wintertime orographic cloud seeding, for which modification techniques are well defined, will be considered as weather modification in the following discussion.

Water augmentation via watershed management, which has both well defined and developing techniques, must also be analyzed. Many watershed management techniques will require legal system responses to protect both water rights holders and the general populace.

The second aspect of legal uncertainties concerning water augmentation involves the issue of water rights. Questions of subsidizing and controlling augmentation activities, taxing for compensation, liability, record-keeping, and the administration of streamflow enhancement programs all depend on the ownership of "new" water. The following analysis examines different approaches to the ownership of water. Because of the application of the *Shelton Farms* decision of the Supreme Court of Colorado[11] to the question of the ownership of water produced by water augmentation activities, specific attention will be focused on it.

II. GENERAL STATE CLAIMS TO WATER

State claims to the ownership of water which may have a critical impact on the ownership of water produced by water augmentation must be evaluated. All eight appropriation doctrine states of the Western United States, without exception, claim the waters within the state. Their claims are based on the presumption that state waters are the "property of the public,"

10. W. HESS, WEATHER AND CLIMATE MODIFICATION 227-765 (1974).

11. Southeastern Colo. Water Conservancy Dist. v. Shelton Farms, Inc., 187 Colo. 181, 529 P.2d 1321 (1975) [hereinafter cited as Shelton Farms].

"belong to the public," or are the "property of the state."[12] Traditionally, the appropriation states have acted as a public trustee, administering the waters of the state in the public interest. The appropriation system, the usufructory nature of a water right, and the requirement of beneficial use as the basis, measure, and limit of a right, exist in all eight states.

The questions of those waters subject to state jurisdiction and appropriation for beneficial use come into critical focus when the ownership of waters developed by water augmentation activities is considered. It is possible that a theory of ownership might be developed based on a definition of the waters produced by water augmentation as "unnatural" waters. This may free such waters from state ownership claims. Four of the eight western states consider the "natural" characteristics of the water to which they assert a claim.[13] Three of the appropriation doctrine states do not make mention of the "natural" characteristics of the waters within their jurisdiction.[14]

The claims of the State of Colorado appear to be a combination of the "natural" claims of Wyoming, Arizona, Idaho, and New Mexico and the more inclusive claims of Utah, Montana, and Nevada. The Constitution of the State of Colorado includes a provision asserting claim to "the water of every

12. Colorado (COLO. CONST., art. 16, §5; COLO. REV. STAT. ANN. §37-82-101 (1973), Utah (UTAH CODE ANN. §73-1-1 (1953)), Nevada (NEV. REV. STAT. §533.025 (1975)), and New Mexico (N.M. STAT. ANN. §75-1-1 (1953)) all declare the waters of the state to be either the "property of the public" or to "belong to the public." Wyoming (WYO. CONST., art. 8, §1; WYO. STAT. §41-2 (1957)), Idaho (IDAHO CODE §42-101 (1947)), and Montana (MONT. REV. CODES ANN. §89-866(1) (Supp. 1975)) all assert title to waters as the "property of the state."

13. Wyoming states a claim to "the water of all *natural* streams, springs, lakes or other collections of still waters" (WYO. CONST., art. 8, §1). Idaho claims "all the waters of the state, when flowing in their natural channels" (IDAHO CODE §42-101 (1947)). Arizona asserts title to the "waters of all sources flowing in streams, canyons, ravines or other *natural* channels" (ARIZ. REV. STAT. §45-101(A) (1956), §45-180 (Supp. 1976)). New Mexico claims "all *natural* waters flowing in streams and watercourses" (N.M. STAT. ANN. §75-1-1 (1953)) and "the unappropriated water of every *natural* stream" (N.M. CONST., art. XVI, §2) (emphases added).

14. Utah asserts title to "all waters in [the] state, whether above or under the ground" (UTAH CODE ANN. §73-1-1 (1953)). Nevada claims "the water of all sources of water supply . . . whether above or beneath the surface of the ground"(NEV. REV. STAT. §533.025 (1975)). Montana appears to make the most expansive state water claims by asserting title to "all surface, underground, flood and atmospheric waters" (MONT. CONST., art. IX, §3(3)) and to "all water of the state, surface and subsurface, regardless of its character or manner of occurrence" (MONT. REV. CODES ANN. §89-867(1) (Supp. 1976)).

natural stream."[15] This claim, however, has been expanded by statute to include "all water originating in or flowing into this state."[16]

III. WATER FOR WEATHER MODIFICATION

Four of the eight appropriation doctrine states make specific claims to the waters produced by weather modification activities. New Mexico claims "the right to all moisture in the atmosphere which would fall so as to become a part of the natural or percolated water" of the state.[17] Wyoming asserts a "sovereign right to . . . the moisture contained in the clouds and atmosphere."[18] The statutory provisions of Colorado regarding the ownership of water produced by weather modification, asserting claim to all water "suspended in the atmosphere"[19] or "artificially induced to fall,"[20] reflect the approaches taken by both Wyoming and New Mexico. Utah, which bases its water claims on very expansive definitions of cloud seeding, has provided that "all statutory provisions that apply to water from natural precipitation shall also apply to water derived from cloud seeding."[21]

Arizona seems to have taken a quite different approach. Its weather modification statute does not contain a statement of the ownership of the water produced. It does provide, however, that nothing in the statute is to be construed to prohibit the owner of land used for agricultural purposes from doing weather modification on the individual's property for exclusive benefit.[22] This statute seems to have been intended to deal with some forms of summertime cumulus cloud seeding. The application of a statute so designed for both wintertime orographic cloud seeding and watershed management would be doubtful as the benefits of these two activities frequently occur in areas other than the area where the activity was conducted.

Both Montana and Nevada assert claims to those waters which may have been produced by weather modification.

15. COLO. CONST., art. 16, §5 (emphasis added).
16. COLO. REV. STAT. ANN. §37-82-101 (1973).
17. N.M. STAT. ANN. §75-37-3 (1953).
18. WYO. STAT. §9-266 (1957).
19. COLO. REV. STAT. ANN. §36-20-103 (1973).
20. *Id.*
21. UTAH CODE ANN. §73-15-4 (Supp. 1975).
22. ARIZ. REV. STAT. §45-2406 (1956).

These claims, however, are not contained in the weather modification statutes of either state. Montana, in its state constitution, asserts a claim to "atmospheric" waters.[23] Nevada appears to be asserting a claim to atmospheric water when, by statute, the state claims water "above . . . the surface of the ground."[24] Finally it should be noted that only Idaho does not, in some way, address the problem of the ownership of atmospheric waters. Statutory claims to waters produced by water augmentation activities must be understood if the issue of ownership is to be resolved. It would appear, in some states, that private claims to such waters are impossible. In other states, private claims to water so developed would appear to be possible. Such ownership questions must be resolved by legislation if private water augmentation activities are to be encouraged.

IV. WATER FROM WATER AUGMENTATION

As with weather modification, the question of the ownership of water produced by water augmentation activities is critically important to those individuals and organizations contemplating water augmentation activities. It can be argued that the waters produced by these activities fall under the "water from all sources" types of water ownership policies previously considered. Such general policies, however, are not conducive to water augmentation activities in that they do not guarantee a water right to those individuals and organizations augmenting water supplies.

Colorado appears to be the only state in the region to have developed specific statutory provisions concerning water augmentation.[25] Under the statute, augmentation is defined, in part, as an increase in the supply of water "by the development of a new or alternate means or point of diversion, by a pooling of water resources, by water exchange projects, by providing substitute supplies of water, by the development of new sources of water, or by any other appropriate means."[26] The statute

23. MONT. CONST., art. IX, §3(3).

24. NEV. REV. STAT. §533.025 (1975).

25. This statute, however, is not aimed at the ownership question regarding new sources of water supply. It is primarily intended to encourage the development of alternate sources of supply to protect the rights of senior appropriators.

26. COLO. REV. STAT. ANN. §37-92-103(9) (Supp. 1976). While not specifically mentioned in the Statute, it would be difficult to argue that water produced by weather modification and watershed mangement falls outside the scope and intent of the legislation.

specifically excludes from the definition of water augmentation programs phreatophyte eradication and the use of water runoff collected from land surfaces which have been made impermeable.[27]

Under the Colorado procedure, an application and a plan for water augmentation are filed with both the water clerk of the specific division and the State Engineer. The State Engineer can then approve, on a temporary basis, the augmentation plan. The water judge of the specific division is then to hold a hearing on the augmentation plan to consider either a final approval or denial. At this hearing, the conclusion of the State Engineer is *prima facie* evidence unless challenged by "competent countervailing evidence."[28] It is apparent, under the Colorado water augmentation statutes, that one augmenting water supplies pursuant to an approved plan has first claim to the waters produced in accordance with the plan.

V. ARTIFICIAL WATER: DEVELOPED WATER

New Mexico has defined artificial water as water "whose appearance or accumulation is due to escape, seepage, loss, waste, drainage, or percolation from constructed works."[29] In both New Mexico and Arizona, artificial waters are not subject to appropriation.[30] In New Mexico, however, the exemption for such waters from appropriation exists only as long as the water is on the property of the individual who created the artificial waters.

The aforementioned definition of "artificial waters" is very similar to the definition of "salvaged waters" developed by the Supreme Court of Colorado.[31] Under both Colorado and Utah law, however, persons salvaging water do *not* have first claim to the water. Such waters remain a part of the stream system and are subject to a call on the river.

The Supreme Court of Colorado has, however, drawn a distinction between "salvaged waters" and "developed wa-

27. *Id.*

28. COLO. REV. STAT. ANN. §37-92-307(5), (6) (Supp. 1976).

29. N.M. STAT. ANN. §75-5-25 (1953).

30. Hagerman Irrigation Co. v. East Grand Plains Drainage Dist., 25 N.M. 649, 187 P. 555 (1920); Fourzon v. Curtis, 43 Ariz. 140, 29 P.2d 722 (1934).

31. Shelton Farms, *supra* note 11, at 1325.

ters."[32] Developed waters are those waters which are transported from another source, flood waters which are captured and stored, or waters "which would never have reached the river or its tributaries."[33] In essence, the definition of developed waters "implies new water not previously part of the river system."[34] Under the *Shelton Farms* rule, developed waters "are free from the river call, and are not junior to prior decrees."[35] In the final analysis, it would appear that an individual developing waters under this rule, and in accordance with the aforementioned plans for water augmentation, would have first claim to the water. Such issues must be resolved before private water augmentation plans can be developed. This is particularly true when the cost of proving the quantity of water developed is considered.

VI. POSSIBLE SYSTEM RESPONSES: PRIVATE DEVELOPMENT

If the assumption is made that an increase in the total water supply of the Western United States is in the public interest, then legal institutions should seek to facilitate rather than discourage the development of potential "new" water supplies. Review of the legal institutions of the eight western states indicates that private claims to water developed through weather modification and watershed management techniques are open to question and subject to the claims of existing appropriators. A study by F. B. Jones, C. F. Leaf, and W. H. Fischer[36] points out that the private concern asserting a claim based on water augmented through weather modification has no assurance that such a claim would not be contested by existing appropriators. Water augmented through watershed management techniques may also result in contested rights under the existing systems. Assurances of ownership are critical if private water augmentation activities are to be conducted.

In fact, it is highly unlikely that development of augmented water supplies by private concerns will occur until

32. *Id.*
33. *Id.* at 1324.
34. *Id.*
35. *Id.* at 1325.
36. *See generally* F. JONES, C. LEAF & W. FISCHER, GENERALIZED CRITERIA FOR PROOF OF WATER DEVELOPED THROUGH WEATHER MODIFICATION (1975) [hereinafter cited as GENERALIZED CRITERIA].

legal and institutional assurances of ownership are developed. This is clearly apparent in light of the initial procedures and, in some instances, expenses which would be necessary for a private concern to prove the magnitude of the augmented water claim.[37] These assurances must guarantee that the actions of private concerns to augment and to prove augmentation will result in a legal right to the augmented portion of the water when adequate proof of augmentation is provided.

There are numerous legal system responses which would facilitate *private* concern development of "new" water. One option is legislation at the state level. This could be easily implemented if "new" waters resulting from watershed management and weather modification were defined as "developed" waters in the manner in which the Supreme Court of the State of Colorado has defined them.[38] In Colorado, it is established that "one who adds to an existing water supply is entitled to a decree affirming the use of such water."[39] Colorado recognizes that developed water includes "water within the system which would never have normally reached its tributaries."[40] Water created by watershed management and by weather modification would seem to fit these criteria. A definition of this water as "developed" water is advantageous since it is consistent with the distinction drawn between "developed" and "salvaged" water in the *Shelton Farms* decision. This would allow the augmentor first claim to "developed" waters.

Once state legislation has resolved the question of water rights in a manner that would allow development of this resource by private concerns, a number of additional issues must be addressed. Initially, proof of the amount and availability of augmented water supplies, which would meet "preponderance of evidence" requirements in judicial proceedings, must be developed. Methods for development of this proof of water based on weather modification have been proposed.[41] It should be noted, that specific proof may have to be offered following

37. *Id.*
38. Shelton Farms, *supra* note 11, at 1325.
39. *Id.* at 1324.
40. *Id.*; *see* notes 30-34 *supra*.
41. GENERALIZED CRITERIA, *supra* note 36.

each water augmentation activity from which benefit is claimed. If judicial notice of specific methods of proof had been taken, however, such repetitive proofs would be economically feasible. No example of a technique capable of proving the magnitude of augmented water from watershed management is available in the literature. Development of such a technique, however, would probably be less complex than for weather modification.

The statistical and numerical techniques proposed to prove the amount and availability of augmented water supplies may not conform to current evidentiary requirements. In essence, probability and fact may not be seen as synonymous. Since statistical and numerical techniques assert proof in terms of probabilities, their admissibility as proof of the characteristics of water augmentation activities may be questioned. Even though readily accepted by the scientific community, judicial acceptance of such procedures is as yet untested.[42]

A broad range of issues relating to the liability of individuals attempting to augment water supplies must be addressed. Initially, the question of procedures for compensation of individuals who experience a reduction in quality of life by virtue of their living in a treatment area is a serious one. An example of such a reduction would be increased snowfall in a region from wintertime orographic weather modification efforts. The question can be raised as to whether increased snowfall, and the resultant loss in the enjoyment of property (assuming it is not a ski slope), would constitute a "taking."[43] If the assumption is made that this does constitute a "taking," a possible solution would be to tax the concern performing the treatment while simultaneously providing a tax benefit to those individuals adversely affected. Another possible solution would be to make a one-time monetary compensation to those currently owning property in the region since those that move into the

42. Fischer, *Weather Modification and the Right of Capture*, 8 NAT. RES. LAW. 639 (1976). If judicial notice of the statistical method is taken, then by a preponderance of the evidence it would be necessary to show that the specific statistical method is appropriate and that it demonstrates the magnitude of the claim.

43. The question of whether the interference with private property would constitute a taking must be resolved. It would seem that minor interferences would not be a taking. By way of analogy, zoning requirements which limit the use of private property have not usually been seen as constituting a taking of property.

area "post hoc" have full knowledge of the quality of life that exists. Since the value of the water produced by water augmentation is substantially in excess of the costs of implementing the techniques, a considerable margin exists in the cost/benefit relationship. These revenues, which would initially accrue to the private developer, could be tapped by the state via taxation to compensate those adversely affected.

Liability for catastrophic occurrences resulting from water augmentation activities must also be considered. An example of such an occurrence, which might be construed to have resulted from these activities, would be an avalanche following heavy snowfall during which winter orographic weather modification activities were conducted. A second example would be a situation in which a percentage of trees in a watershed had been removed in order to enhance streamflow where, following the removal, heavy rainfall resulted in flooding within the watershed. In both of these examples, the legal issue which must be resolved is whether the water augmentation activities were, in fact, the proximate cause of the resulting damages.

If liability in such instances can be established, the legal system must develop means to insure that compensation is available to those injured. Two possible responses could be developed. The water augmentor applying for a permit would be required either to prove adequate insurance coverage or to post a bond sufficient to cover possible damages. In the event of an incident, either the bond or the proceeds of the insurance policy could be administered by the state (possibly through the office of the State Engineer) to compensate those damaged by water augmentation activities.

A problem with water augmentation with which many states have already dealt involves the qualification for the issuance of licenses and permits to do water augmentation. Licensing requirements are necessary to assure the state that competent individuals and firms are providing the treatment. Permits are needed to assure the state that water augmentation activities are coordinated on a statewide basis to reduce conflicting programs. Records of these activities, already required by some states, would be useful in providing a means of monitoring and evaluating program success. An additional use of records might be in the determination of liability for unforeseen occurrences.

VII. POSSIBLE SYSTEM RESPONSES: STATE DEVELOPMENT

Another approach to the question of water rights resulting from water augmentation programs would be for the state either to carry out the program itself or to contract with firms which would be responsible for carrying out the treatment for the state but which would have no right to the water produced. The additional water supplies would then go to current (and possible future) appropriators. It is assumed that the state would conduct such activities for the benefit of its citizens.

State funding of water augmentation activities could evoke a variety of public and private responses. The political feasibility of using public revenues to meet private water requirements is open to question. On the one hand, those who would argue against the state subsidies of private enterprise might question whether or not the use of state funds to meet the needs of a select few (existing and potential water rights holders) is a proper use of such funds. Under normal climatological conditions, this argument may have substantial merit.[44]

On the other hand, unusual climatological conditions resulting in reduced streamflow threaten the general welfare of the state. At such times, the general economy of the region suffers due to reduced water availability. This results in increased unemployment and reduced state revenue which, in turn, endanger social programs. The result is that both liberal and conservative policymakers and the general populace support efforts to enhance streamflows. In such situations, state-supported water augmentation programs have substantial merit and a high probability of being instituted.

The liability question could be more easily resolved since the state can exercise both taxing and eminent domain authorities. As with a private concern engaged in water augmentation activities, the state must provide compensation to those suffering injury in a treatment area. Regardless of the nature of the injury, be it an ongoing diminution in the quality of life resulting from water augmentation interference with the use and enjoyment of property, or a short-term cataclysm resulting from a catastrophic event, the liability of the state cannot be

44. It is interesting to note, however, that Utah allows only the state division of water resources to conduct cloud seeding activities. UTAH CODE ANN. §73-15-3 (1953).

denied. Toward this end, records, licensing, and permits would remain valuable and should be maintained.

VIII. POSSIBLE SYSTEM RESPONSES: MULTISTATE AND FEDERAL

Since many of the augmentation techniques could involve a number of states, simultaneously, it is conceivable that interstate agreements would be necessary. Such agreements might take the form of new multistate compacts or amendments to existing compacts. Federal legislation controlling private water augmentation programs, which would supersede state legislation, is also a possibility. The main advantage of such legislation would be its ability to control private concerns to prevent conflicting programs without regard for state boundaries. One issue, which would suggest substantial further research, is the relationship of water augmentation programs to interstate water compacts. It would appear that waters developed by private concerns would be free from "the call of the compact" whereas such waters, if developed by the state, would not be free from compact obligations.[45]

A federal program for water resource development through weather modification and watershed management would be yet another possible legal system response. The Bureau of Reclamation, which has been a lead agency in the development of weather modification programs, and/or the U.S. Forest Service, which has been responsible for major advances in watershed management, are likely candidates for administration of national programs. Under this approach, the federal government would assert a claim to all waters developed on federal lands or pursuant to a federal program. This situation might well develop regardless of federal action because the multistate nature of weather modification might well raise a "diversity of citizenship" issue. It is possible, however, that the federal government, under the "implied reservation doctrine," already has a valid claim to the waters produced by water augmentation activities on federal land.

IX. CONCLUSIONS

The greatest land use value of the alpine and subalpine

45. Fischer, *supra* note 42, at 651-56. This article contains an excellent overview of the problems that may emerge if the states themselves conduct water augmentation activities. Specifically, the potential effects of existing interstate compacts are discussed.

portions of watersheds is as an area for the collection and storage of water. While recognizing the legal, social, and technological problems implicit in water augmentation activities, it is apparent that substantial public benefit could be derived from such activities.

Land use regulations which protect the watershed function of alpine and subalpine areas would not prohibit their use for other purposes (*i.e.*, mining, residential development, etc.). These other land uses, however, should not be allowed to interfere with water augmentation activities. In the final analysis, the optimal use of a watershed is to produce water.[46] Legal and political obstacles which impede this use must be overcome. The possible legal system responses presented herein may provide some insight into surmounting these obstacles.

46. This point is the subject of ongoing research. Initial conclusions indicate that the value of the water produced exceeds the value of the use of alpine and subalpine portions of a watershed for any other purpose.